

**ADVIA<sup>®</sup> 2120**  
**ADVIA<sup>®</sup> 2120i**  
Hematology Systems

ADVIA<sup>®</sup> 2120/2120i Hematology Systems

# Operator's Guide

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**SIEMENS**



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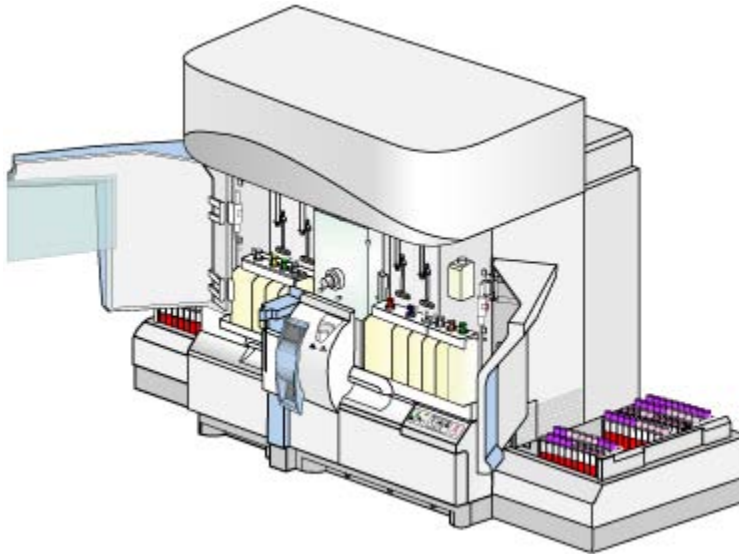




# Welcome to the ADVIA® 2120/2120i Hematology System

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## Overview



The ADVIA<sup>®</sup> 2120/2120i Hematology System is a fully automated diagnostic instrument with a throughput of 120 samples per hour (CBC/diff). The analyzer uses whole blood samples to provide the following types of results:

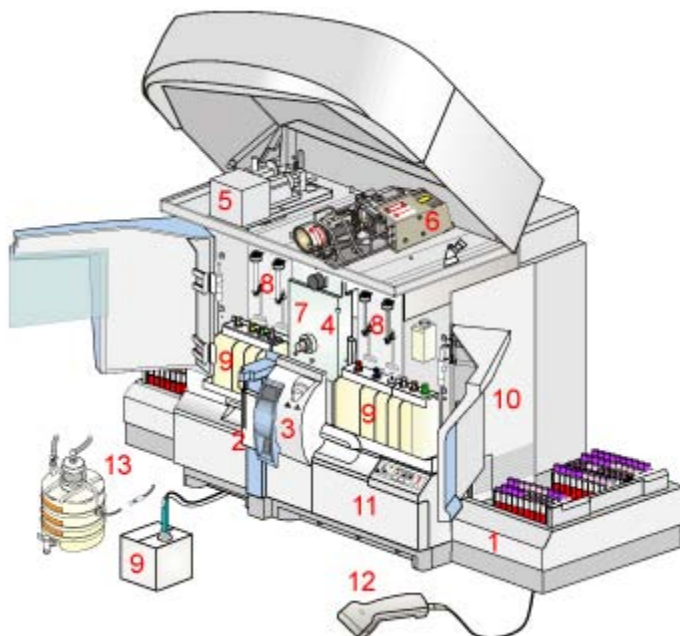
- Complete blood counts (CBC)
- CBC plus white cell differential counts (CBC/diff)
- Reticulocyte absolute, percent and indices counts (retic)
- CBC/diff plus retic (CBC/diff/retic)
- CBC/retic



## Components

The ADVIA 2120/2120i Hematology System is made up of two major components:

- The analyzer contains all the electronics, pneumatics, hydraulics, and sampler mechanisms, as well as the on-board reagent storage for all reagents, DEFOAMER, and wash solutions except SHEATH / RINSE. The waste system is a subcomponent of the analyzer.



- |                              |  |
|------------------------------|--|
| 1 Autosampler                | 8 Sample, sheath, and diaphragm pumps  |
| 2 Manual open-tube sampler   | 9 Reagents, sheath, wash, and rinse    |
| 3 Manual closed-tube sampler | 10 Vacuum and pressure regulator knobs |
| 4 Unifluidics™ technology    | 11 Touchpad                            |
| 5 Perox optical assembly     | 12 Manual barcode reader               |
| 6 RBC optical assembly       | 13 Waste removal system                |
| 7 Hgb colorimeter assembly   |  |

- The personal computer includes a monitor, a mouse, a keyboard, and the interconnect cabling.

## Autosampler

The autosampler automatically transports, mixes, identifies, and aspirates samples in closed tubes.

The autosampler is a rack-style sampler with a capacity of 150 sample tubes: 15 racks of 10 tubes. The individual racks are barcoded for rack and position numbers.

### Allowable tube sizes

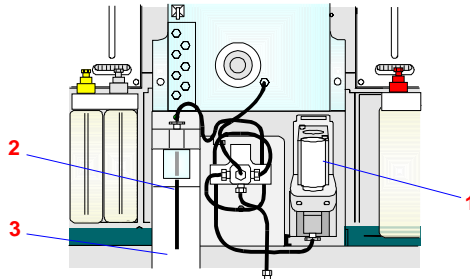
Tube size (mm) diameter x height	Manufacturer	Draw Vol. (mL)	Minimum Vol. Required Dead Vol. (mL)
10 x 50	Becton-Dickinson VACUTAINER	--	0.6
10 x 64	Venoject	--	0.6
11 x 65	Sarstedt Monovette	2.7	1.0
11 x 74	Tapval	4	1.1
11 x 78	screw cap	4	1.2
11 x 83	Sarstedt Monovette	4	1.0
11 x 91	Sarstedt Monovette	5	1.0
12 x 75.6	Greiner Vacuette	2, 4	1.0
12 x 80	screw cap	--	1.1
12 x 80.7	Exetainer	3	1.0
13 x 100	Becton-Dickinson HEMOGARD	7	0.8
13 x 100	Greiner Vacuette	6	
13 x 74	Monoject	5	0.6
13 x 74	Complexon	5	0.8
13 x 75	Becton-Dickinson HEMOGARD	2, 3, 5	0.8
13 x 75	Becton-Dickinson VACUTAINER	7	0.6
13 x 75	Becton-Dickinson VACUTAINER	5	0.6
13 x 75	Lip-Vac	4	
13 x 78	Venoject II	5	1.5

### Some of the allowable tube closure types

- Standard VACUTAINER
- HEMOGARD
- Center puncture Safety-Monovette

- Venoject II

## Manual Closed- and Open-tube Samplers



Single samples and STAT samples are aspirated from the manual samplers.

In closed-tube aspiration, the capped vial is inserted upside down into the centering collar (1). The downward pressure of inserting the tube into the centering collar will cause the needle to push up, puncture the tube closure, and aspirate a sample.

In open-tube aspiration, the sample probe (2) is immersed into the specimen. Pressing the push-to-aspirate plate (3) starts the sampling.

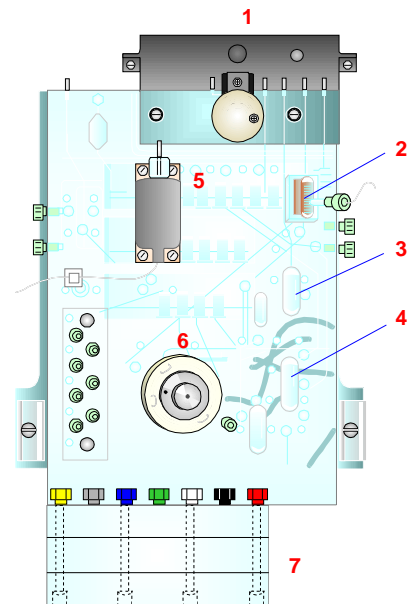
Sample identification and the type of test requested is entered by the manual barcode reader or from the Manual Sample ID tab before starting sample aspiration.

## Unified Fluids Circuit (UFC)

The UFC assembly uses Unifluidics™ technology.

The UFC block is made up of eight acrylic plates. Machined within these plates are the pathways for the fluids and air flow, valves, and four reaction chambers. The perox reaction chamber is mounted on the outside surface of the UFC block.

The reagent pump assembly, mounted to the bottom of the UFC block, is also acrylic. The pump has one membrane with seven individual pump areas that act as diaphragms that force the reagents into the reaction chambers.



1 Hgb Reaction Chamber  
(Not Visible)

4 Retic Reaction Chamber

5 Perox Reaction Chamber

- 2 Baso Reaction Chamber
- 3 RBC Reaction Chamber

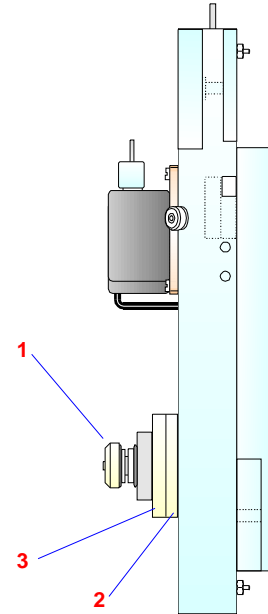
- 6 Shear Valve
- 7 Reagent Pump Assembly

### Shear valve

The shear valve (1) is made up of two ceramic disks. The rear disk (2) is stationary. The front disk (3) rotates to “shear” or divide the sample into appropriate aliquots for analysis.

The front disk also rotates to allow aspiration for direct cytometry.

(side view of the UFC)

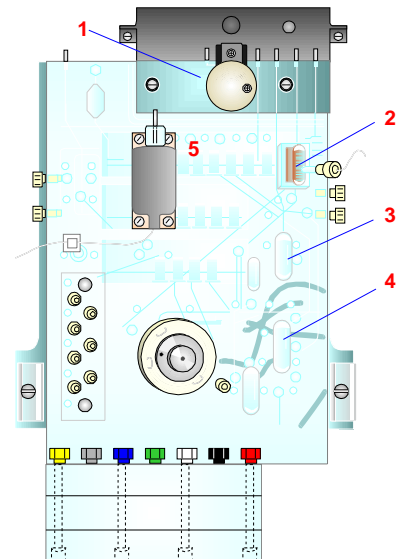


### Reaction chambers

The reaction chambers are machined pockets in the UFC assembly where the sample and reagents are mixed and the cytochemical reaction takes place.

There are five reaction chambers.

- 1 Hgb Reaction Chamber (Not Visible)
- 2 Baso Reaction Chamber
- 3 RBC Reaction Chamber
- 4 Retic Reaction Chamber
- 5 Perox Reaction Chamber



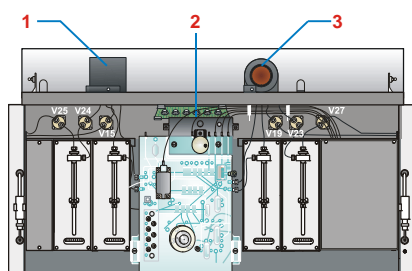
The perox reaction chamber (5) is temperature controlled. The mixture of sample and three reagents, PEROX 1, PEROX 2, and PEROX 3, is heated to achieve the desired cytochemical reaction.

The baso/lobularity reaction chamber (2) is temperature controlled. The mixture of sample and reagent is heated to achieve the desired cytochemical reaction.

The Hgb reaction chamber (1) serves as an optical cuvette in which the hemoglobin measurement is read.

The RBC/Plt and retic reaction chambers (3) and (4) serve as containers in which the reagents and samples are mixed for the desired cytochemical reaction.

## Optical Assemblies



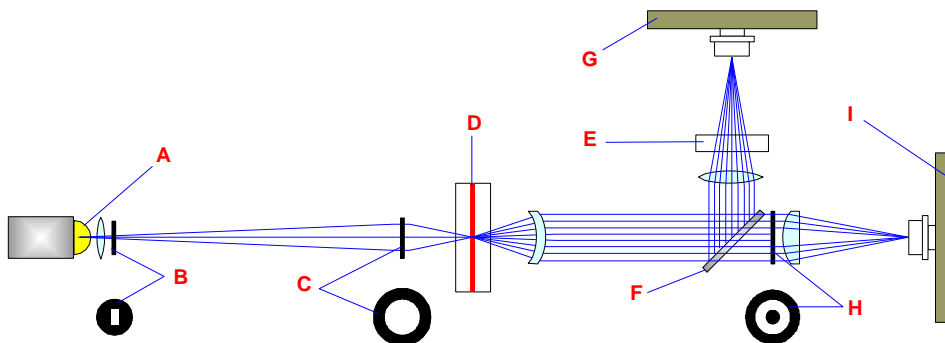
The perox optical assembly (1) directs light from a tungsten-halogen lamp to the perox flowcell. The use of a sheath stream in the flowcell allows a cell-by-cell measurement of light scatter and absorption.

The hemoglobin colorimeter assembly (2) takes voltage readings that correspond to the amount of transmitted light that passes through the reaction chamber. The system uses the readings to derive the hemoglobin concentration.

The laser optical assembly (3) uses a laser diode light source. This optical assembly is shared by the RBC/Plt, retic, and baso/lobularity channels. The use of a sheath stream in the flowcell allows cell-by-cell measurement of low- and high-angle light scattering and absorption.

### Perox Optical Assembly

The perox optical assembly measures scattering and absorption of a tungsten light beam as it passes through a stream of prepared white blood cells in a flowcell.



A Tungsten Lamp

D Sample Stream

G Absorption PC Board

E Filter

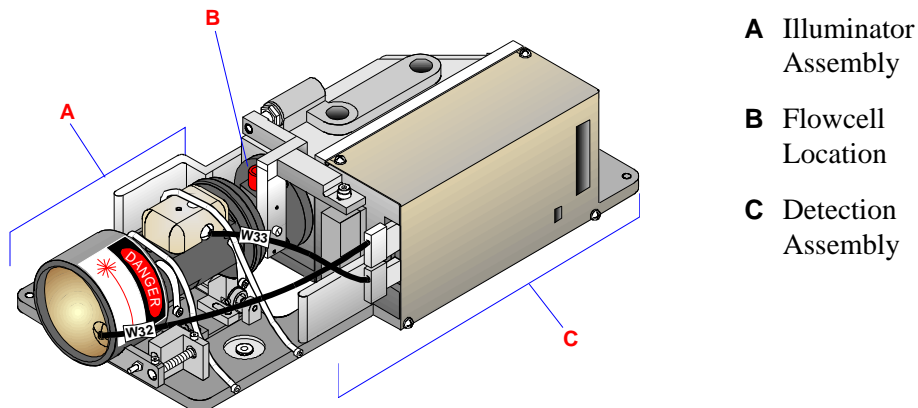
H Dark Field Stop

**B** Slit Aperture                      **F** Beam Splitter                      **I** Scatter PC Board

**C** Circular Aperture

1. The image of a rectangular slit illuminated by the light from the tungsten lamp is focused into the flowcell and onto the photodiodes on the scatter and absorption PC boards. The detected signal pulses from cells passing through the slit image are proportional to the optical power scattered into defined angles and the optical power absorbed or lost. The resulting scattering and absorption of the light from each white blood cell is due to the size and staining characteristics of each cell.
2. The dark field stop intersecting the light beam going to the scatter photodiode only accepts light scattered at angles between  $5^{\circ}$  and  $10^{\circ}$ .
3. The absorption signals are collected over a  $0^{\circ}$  and  $10^{\circ}$  angular interval.
4. The photodiode converts the optical scatter and absorption signals from each white blood cell into two signal currents for each of the two channels (scatter and absorption). Preamplifiers convert these optical signals into signal voltages.

### Laser Optical Assembly



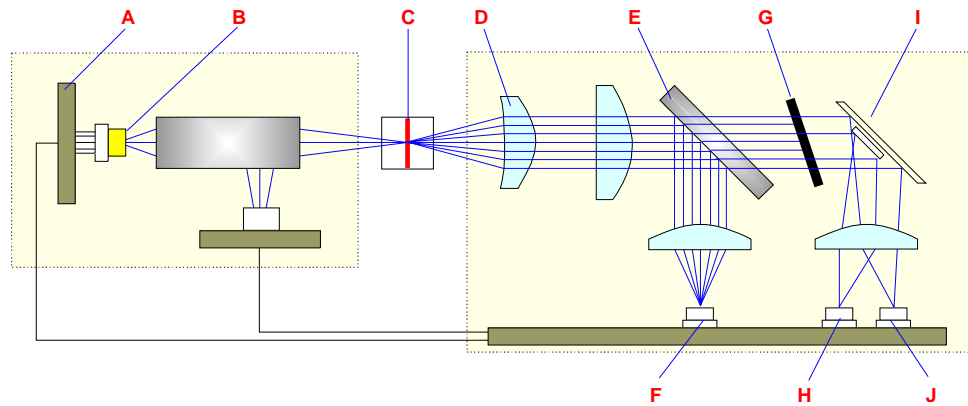
The laser optical assembly consists of the illuminator, flowcell, and detector assemblies. A laser diode, housed in the illuminator assembly, is used as the light source.

The image of a slit illuminated by light from the laser diode is focused into the flowcell. The sample/sheath stream in the flowcell contains iso-volumetrically sphered red blood cells (RBC).

The RBCs and reticulocytes that pass through the slit image in the flowcell scatter light at low and high angles; the stained reticulocytes also absorb a percentage of the light. The scattered light is detected by the two scatter photodiodes and generates the following signals:

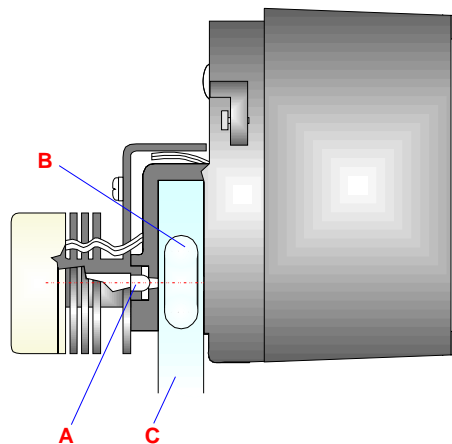
- A high-angle scatter signal corresponding to light scattered at angles between  $5^{\circ}$  and  $15^{\circ}$

- A low-angle scatter signal corresponding to light scattered at angles between 2° and 3°



- |                                   |                              |                                      |
|-----------------------------------|------------------------------|--------------------------------------|
| <b>A</b> Laser Diode Driver Board | <b>D</b> Hi-NA Lens          | <b>G</b> Asymmetrical Dark Stop      |
| <b>B</b> Laser Diode              | <b>E</b> Beam Splitter       | <b>H</b> Low Angle Scatter Detector  |
| <b>C</b> Sample Stream            | <b>F</b> Absorption Detector | <b>I</b> Beam Divider                |
|                                   |                              | <b>J</b> High Angle Scatter Detector |

### Hemoglobin Colorimeter Assembly



- |                        |                               |                       |
|------------------------|-------------------------------|-----------------------|
| <b>A</b> Lamp Assembly | <b>B</b> Hgb Reaction Chamber | <b>C</b> UFC Assembly |
|------------------------|-------------------------------|-----------------------|

The hemoglobin colorimeter assembly straddles the UFC block (C) at the top.

The colorimeter contains a light source (A) set at 3.5 Vdc and a 565 nm or 546 nm interference filter, according to the HGB method selected.

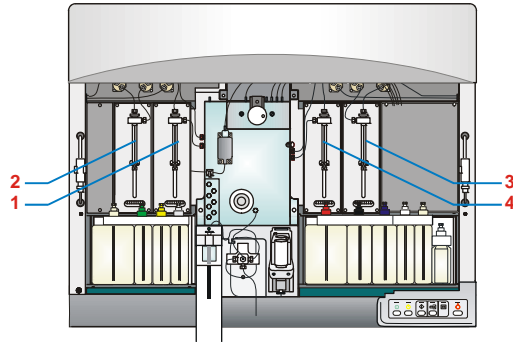
The hemoglobin reaction chamber (B) is built into the UFC assembly.

Hemoglobin concentration is calculated using baseline and sample readings taken at specific intervals during the hemoglobin sample analysis period.

These voltage readings correspond to the amount of transmitted light that passes through the reaction chamber when it contains sample mixed with reagent or rinse.

The voltage readings are then converted to a digital form by the Hgb Interface Board and sent to the analyzer CPU to calculate the optical density and derive the Hgb concentration.

### Sample, Sheath, and Diaphragm Pumps



The perox sample (1) and sheath (2) pumps are located on the left side of the analyzer.

The RBC/baso/retic sample (3) and sheath (4) pumps are located on the right side of the analyzer.

The diaphragm pumps for sheath, rinse, and wash (five in all) are located above the reagent containers.

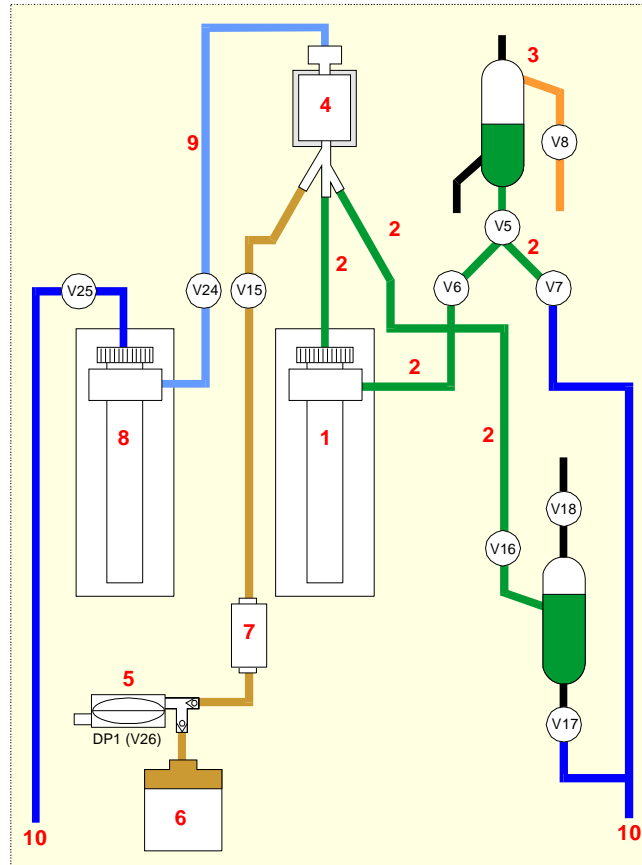


The sample pumps (1) dispense an exact amount of reacted sample (2) from the appropriate reaction chamber (3) into the flowcells (4).

The sheath diaphragm pumps (5) push the sheath (6) through the sheath filters (7) directly into the flowcells.

The sheath pumps (8) pull the PEROX SHEATH or SHEATH / RINSE and the reacted sample stream (9) through the flowcells for analysis.

The analyzed sample and sheath are sent to waste (10) and the lines, flowcells, and reaction chambers are washed and rinsed.



## Reagents, SHEATH / RINSE, Wash, and DEFOAMER

**Reagent** is mixed with a sample for cytochemical analysis and measurement.

**Sheath** is a fluid that envelops the sample stream as it passes through the optics, ensuring cell-by-cell analysis.

**Rinse** cleans the hydraulic pathways and reaction chambers after each sample to prevent carryover and ensure the integrity of the results.

**Wash** solution removes buildup in the hydraulic pathways. A system wash should be performed periodically: once a day or after a set number of samples.

**DEFOAMER** reduces foam buildup in the waste container.

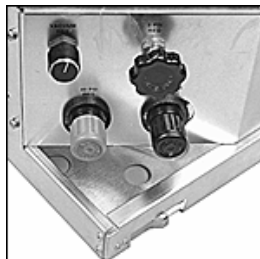
Wash, PEROX SHEATH, DEFOAMER, and all cytochemical reagents are located on the analyzer and, except for the SHEATH / RINSE and DEFOAMER, they are monitored on a cycle-by-cycle basis.

The SHEATH / RINSE is in a CUBITAINER<sup>®</sup> placed on the floor.

## Vacuum and Pressure Regulator Knobs

20 In.-Hg  
Vacuum Regulator  
Knob

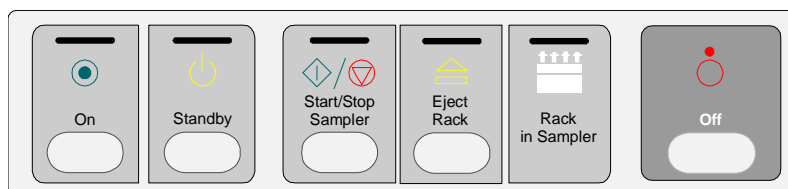
40 PSI  
Pressure Regulator  
Knob



5 PSI  
Pressure Regulator  
Knob

20 PSI  
Pressure Regulator  
Knob

## Touchpad



The touchpad, located on the lower right of the analyzer, is the means by which you operate the analyzer.

**On** – Provides power to the analyzer assemblies and power supplies. After **On** is pressed, samples through the manual open- and closed-tube samplers can be processed within 2.5 minutes, while samples through the autosampler can begin processing within four minutes.

**Standby** – Sets the analyzer to a lower power state. To exit, press **Standby**.

**Start/Stop Sampler** – Starts the autosampler operation from the Ready to Run mode or stops the autosampler. When the autosampler operation is stopped, samples underway are allowed to finish.

**Eject Rack** – Moves all racks within the autosampler into the output queue. The analysis of the last sample aspirated is completed.

**Rack in Sampler** – Lights up when a sample rack is in the autosampler, including the input queue.

**Off** – Turns off the power to all analyzer assemblies and power supplies, except the touchpad.

## Touchscreen

The touchscreen monitor makes it possible for you to perform your daily tasks directly at the monitor without using the keyboard.

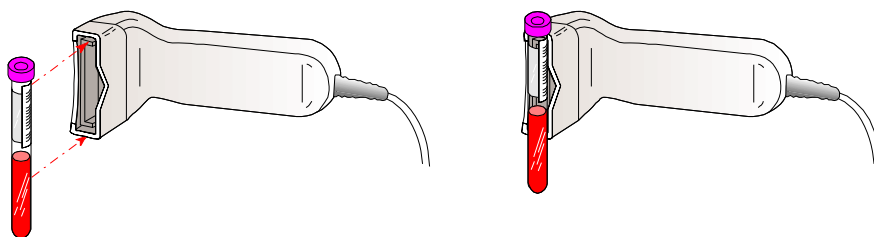
On the touchscreen monitor, you can do the following:

- Use your finger, with or without gloves, to select all window controls, including function buttons and operations in the online Help.
- Move a window by holding your finger on the title bar of the window, drag the window to the new location.

**NOTE:** The touchscreen may not respond correctly if your finger or gloves are wet.

You can clean the touchscreen monitor using a lint free paper towel dampened with 5% bleach solution. Dry the screen and your hands thoroughly.

## Manual Barcode reader

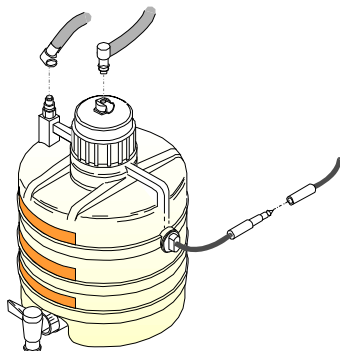


The manual barcode reader is used to enter information from labels on sample tubes, reagent containers, controls, and calibrators. As each label is correctly read, the LED on the wand will blink.

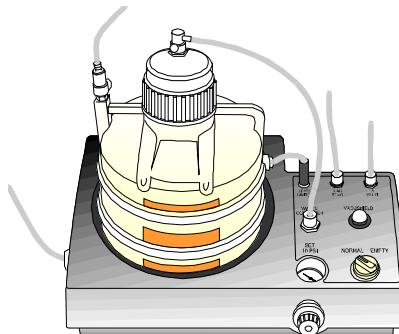
## **Waste removal system**

All analyzer waste is stored in an 11-liter waste container. This container can be a stand-alone container, which has to be emptied manually, or part of the automatic waste removal system. When the fluid level in either of the containers reaches the maximum-level line (approximately 8 liters), an error message appears on the Status line on the personal computer monitor. The analyzer will not aspirate any more samples until the waste container is emptied.

**Stand-alone waste container**



**Automatic Waste Removal**

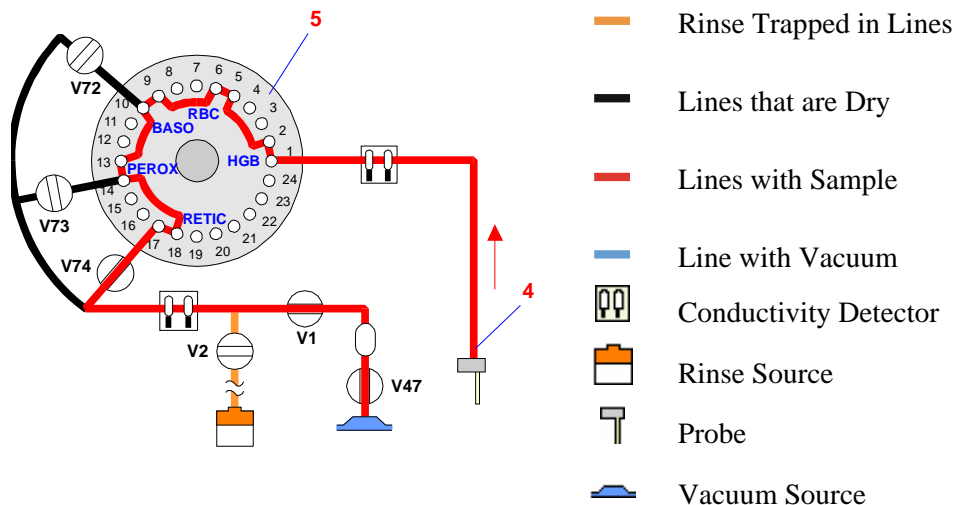


### How the ADVIA 2120/2120i Hematology System Works

Blood samples can be aspirated through the:

- Autosampler
- Manual closed-tube sampler
- Manual open-tube sampler

After a sample (4) is aspirated, it is drawn into the shear valve (5). As the shear valve rotates, it “shears” or divides the sample into aliquots for the different types of tests.



The reagents and sample segments are delivered to their respective reaction chambers for mixing and aspiration. (PEROX 2 and PEROX 3 reagents are delivered directly to the perox reaction chamber.)

Once the cytochemical reactions are complete in the reaction chambers, the sample and reagent mixtures from the perox, RBC, baso, and retic reaction chambers are sent to the flowcells for analysis.

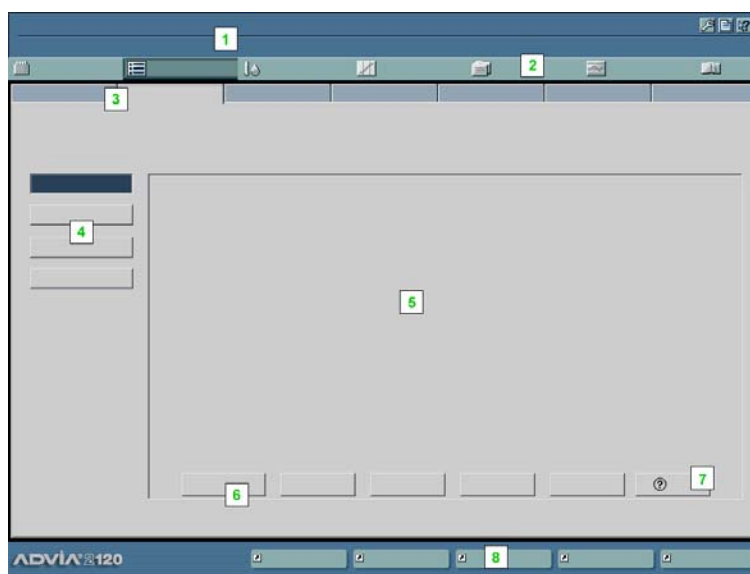
The Hgb reaction chamber serves as an optical cuvette through which the hemoglobin measurement is read.

After analysis, the sample and reagent mixture is evacuated into the waste container and the appropriate pathways and reaction chambers are rinsed.

Test results are sent to the computer to be reviewed and edited.

## How the ADVIA 2120/2120i Software Works

The ADVIA 2120/2120i system software is a special-purpose program that runs on the Windows NT operating system. You can navigate through the software and operate the system using the mouse.



- 1 Status lines
- 2 Menus
- 3 Tabs
- 4 Left-side buttons
- 5 Main display area
- 6 Bottom buttons
- 7 Help button
- 8 Shortcut keys

### Status lines

There are two status lines that display messages about the system. Both lines consist of two parts, each displaying different information.



The system saves all messages in the message log. Click the message icon to view the last 10 messages.

### First Status Line

**Left Side:** Next sample ID, sample type, and test requested

**Right Side:** Service, Notepad, Help, Printer, and Autoslide icons



**Service** appears when a scheduled service procedure is overdue.



**Notepad** appears when there is a new entry in the User Notepad.



**Gray Autoslide** indicates that communication to Autoslide is not connected.



**Green Autoslide** indicates that the Autoslide is ready.



**Yellow Autoslide** indicates that the Autoslide is busy or running utilities. This may also indicate that the Autoslide is offline and in need of attention.



**Red Autoslide** indicates that a critical Autoslide error has occurred.



**Autoslide Service** appears when a scheduled Autoslide service procedure is overdue.



To get brief (What's This) Help, click the **Help** icon, then click the item for which you want help.

### Second Status Line

**Left Side:** Current system state, for example, **Ready to Run**

**Right Side:** System messages and icons that indicate the message severity



**Information** accompanies a message that provides information only. No operator action is necessary.



**Warning** alerts you to a condition that requires some action.



**Failure** alerts you to a serious problem that requires your immediate intervention before work can continue. Most errors of this type are associated with conditions that automatically stop the system.

### Menus

Each of the buttons on the top of the screen displays a menu of system functions. The menu appears when you move the pointer over the button. When you click an item on a menu, the corresponding window opens, the button appears to be pressed, and the other functions on the menu appear as tabs arranged beneath the status lines.

**NOTE: System Setup** on the **Customize** menu contains a submenu. To display the submenu, move the pointer over **System Setup** on the menu. Click an item on the submenu to open the corresponding window.

## **Tabs**

The tabs correspond to the items on the active menu. You can switch to any one of these functions by clicking the corresponding tab. When you select an option from a different menu, the tabs change to those available from that menu.

## **Left-side buttons**

Some tabs contain more than one window. Click these buttons to open the corresponding windows within a tab.

## **Main display area**

When you select an item from a menu or click a tab, the corresponding window appears below the tabs in this area. You can usually switch from one window to another by simply opening the one you want. Some windows, however, do not close automatically and require that you click an **Exit** button before you change to a new one.

## **Bottom buttons**

These buttons activate commands or manipulate the contents of the window.

## **Help button**

When you need detailed Help that provides step-by-step instructions for operating the ADVIA 120, click the **Info** button. To get brief (What's This) Help, click the **?** icon on the status line or press the **Shift** and **F1** keys at the same time, then click the item for which you want help.

## **Shortcut keys**

Click these buttons to open frequently used software tabs without using the menus. You can choose the tabs for which there are buttons using the Shortcut Key Configuration window of the System Setup tab.

## **Wizards**

The software has wizards to help you with complicated procedures. Each wizard guides you through a process by giving you information and prompting your input along the way. You also have the option to perform these procedures without the help of a wizard.



## Printing the screen



**IMPORTANT:** You can print any screen by pressing the Print Screen key. However, pressing the Print Screen key when there is no printer attached to the system can cause the system to malfunction. Make certain that there is a printer attached before you attempt to print the screen.

## Results

The ADVIA 2120/2120i system can run five types of tests: CBC, CBC/DIFF, retic, CBC/retic, and CBC/DIFF/retic.

These tests can be selected by:

- Setting the test selectivity to default
- Requesting the test type from the Manual Sample ID tab
- Including the test type on the barcode label
- Including the test type in the workorder

You can select a test up to the time of aspiration. Once aspiration starts, the system assigns the current test selectivity to the sample.

When aspirating samples through the manual open-tube or closed-tube samplers, the test selected will remain the same until a different test is requested.

When running samples on the autosampler, the selectivity will always revert back to the default setting.

The system alerts you to questionable results and potential system conditions in three ways.

- Sample/system flags are codes displayed in the Review/Edit tab and the Run Screen. These codes are associated with a specific test parameter marked by an asterisk. Isolated instances of flags are usually sample related. However, multiple occurrences, especially for consecutive samples, can indicate an analyzer problem.
- Morphology flags are plus signs (+) displayed in the Review/Edit tab and the Run Screen. These flags, one to three plus signs, alert the operator to possible cellular conditions that may require additional laboratory attention, such as preparing a slide for microscopic examination.
- System messages are displayed on the status lines on the PC monitor. Along with the messages, color-coded icons indicate the severity level of the message.

## Specifications

### Autosampler

Sample Capacity	150 samples 15 racks of 10 tubes
Tube Sizes	10-13 mm diameter 50-100 mm height
Tube Types	Some of the allowable tube types: Standard VACUTAINER® HEMOGARD™ Center puncture Monovette® Venoject® II
Barcode reader	Reads up to 14 digits Automatic label code discrimination Codabar Interleave 2 of 5 with and without check digit Code 39 Code 128 EAN and JAN (8 and 13)

### Data Management

- Database storage capacity of 10,000 records, including graphics
- Review and edit capability
  - User-defined windows
  - User-defined reports
  - User-defined ranges based on age and sex for Normal, Rerun, Panic, and Delta Check criteria
- Bi-directional and host query communication protocols
- Quality control
  - 3D bar graph
  - Levey-Jennings plot
  - SDI graph
  - Table format

- Remote QC
- ILQC programs
- Patient moving average
- User assistance
  - Context sensitive help
  - Operator's guide
  - Procedure wizards
  - Problem solving diagnostics
  - Remote diagnostics

## Parameters

### CBC Results:

WBC, RBC, HGB, HCT, MCV, MCH, MCHC, CHCM, RDW, HDW, CH, CHDW, PLT

### Differential Results (absolute and %):

NEUT, LYMPH, MONO, EOS, BASO, LUC (Large Unstained Cells)

### Platelet Results:

PLT, MPV, PDW, PCT

### Reticulocyte Results:

% RETIC, # RETIC, MCVr, CHCMr, CHr

### Morphology Results (user definable):

WBC: Left Shift, Atypical Lymph, Blasts\*, Immature Granulocytes, Myeloperoxidase Deficiency

RBC: ANISO, MICRO, MACRO, HC VAR, HYPO, HYPER, RBC Fragments, RBC Ghosts, NRBC, Platelet Clumps, Large Platelets

### \*Blasts - Limitations

Smear review by a competent morphologist is necessary to ensure detection of significant blood cell abnormalities. Each laboratory is responsible for developing its own protocols for determining which samples require smear review and/or manual differential blood cell counts, based on automated cell count results and clinical information. The system provides morphology and quantitative flags that utilize sophisticated algorithms to assist in the identification of significantly abnormal samples. Laboratory protocols may use these flags internally in their smear review and manual differential specifications. Whenever morphology or quantitative flags are triggered, it is the responsibility of the laboratory to validate the results.

## Performance Specifications

### Analytical Ranges (Linearity)

WBC	0.02 – 400 x 10 <sup>3</sup> / μL
RBC	0.0 – 7.0 x 10 <sup>6</sup> / μL
Plt	5.0 – 3500 x 10 <sup>3</sup> / μL
Hgb	0 – 22.5 g/dL
Retic	0.2 – 24.5%

### Within Run Precision

	Mean	SD	CV
WBC	7.5	0.2	2.7
RBC	5.0	0.06	1.2
Hgb	15.0	0.14	0.93
MCV	90	0.7	0.78
Plt	300	8.8	2.93
Retic%	2.0	0.25	12.5

### Carryover

< or = to 1% for all parameters

## Personal Computer Specifications (minimum)

<b>Processor</b>	Intel Celeron 2.2 GHz with 512K Cache / 400MHz Front Side Bus Processor Hyper-Threading Disabled
<b>Hard-Drive</b>	40GB (7,200 rpm) IDE Hard Drive - Parallel ATA DiamondMax Plus 8 40GB ATA/133 HDD
<b>CD RW</b>	48x CD-RW (Read & Write) Drive NEC CD-R/RW Drive, Model NR-9300A
<b>Removable storage</b>	3.5", 1.44Mb floppy Drive. - Samsung SFD-321J / ADNR
<b>Network Cards</b>	Integrated Intel Gigabit LOM Network Interface (10/100/1000) 3COM 3C900B-TPC Combo card with BNC connector.
<b>Video controller</b>	Intel Extreme Integrated Graphics 2

<b>Modem</b>	Model Name: Broadcom BCM94212/I V.92 56K PCI Modem Model No.: BCM94212/I
<b>Memory</b>	256MB DDR SDRAM (PC333 Non-ECC) Memory (2x128MB)
<b>Sound system</b>	Integrated Sound Blaster Compatible Sound (AC97 Audio)
<b>External Ports</b>	1 x parallel 1 x serial 8 x USB
<b>Speaker</b>	Internal Dell Business Audio Speaker
<b>Operating System</b>	Microsoft Windows 2000 Professional (Service Pack 3)
<b>File System</b>	NTFS
<b>Expandability</b>	2 x PCI (for the modem and ethernet cards.)
<b>BIOS Requirements</b>	Must be configurable to meet limitations below.
<b>BIOS Limitations</b>	Power management: Suspend Mode S3 AC Power Recovery Off Low Power Mode Disabled Remote Wake Up Off
<b>Chassis</b>	Small Desktop
<b>External Diskette Bays</b>	1 x 3.5" Floppy Bay 1 x 5.25" Floppy Bay
<b>Internal Drive Bays</b>	1 (108 x 390 x 431mm)
<b>Power supply</b>	210W – Model: HP – U2106F3 Rev. H01

### Physical Specifications

Electrical Power Requirements	Voltage selectable for single-phase: 100 VAC (6 AMPS) – 240 VAC (3 AMPS) Frequency: 50/60Hz
Temperature Requirements	Operating: 18°C to 35°C      Storage: -45°C to 70°C
Relative Humidity	Operating: 15%–80% (non condensing)
Heat Generation	Less than 3000 BTU (less than 880 W)
Audible Noise Level	65 decibels
Installation Category	II
Pollution Degree	2

Waste Disposal      Azide-free reagents drain into waste container with automatic level-sensor shutoff.  
 Waste per CBC/diff/retic cycle, including rinse: 23 mL

The ADVIA 2120/2120i Hematology System is for indoor use only.

Operation of the instrument at altitudes of over 2000 meters (6000 feet) is not recommended.

<b>Analytical Module with Autosampler (including reagents)</b>			<b>Analytical Module without Autosampler (including reagents)</b>		
<b>Weight</b>	191.9 kg	422.5 lbs	<b>Weight</b>	161.9 kg	357.5 lbs
<b>Height</b>	85 cm	33.4 in	<b>Height</b>	85 cm	33.4 in
<b>Width</b>	141 cm	55.5 in	<b>Width</b>	81 cm	31.9 in
<b>Depth</b>	68 cm	26.8 in	<b>Depth</b>	68 cm	26.8 in

**Personal Computer**

	<b>CPU</b>	<b>Monitor</b>
<b>Weight</b>	10.6 cm (4.2 in)	7.0 kg (15.43 lbs)
<b>Height</b>	38.9 cm (15.3 in)	Extended in Landscape: 54.6 cm (21.50 in) Compressed in Portrait: 38.0 cm (14.96 in)
<b>Width</b>	38.9 cm (15.3 in)	37.6 cm (14.8 in)
<b>Depth</b>	9.9 kg (22 lbs)	21.3 cm (8.37 in)

**Sample mode volumes**

Automatic Closed-Tube	175 µL
Manual Closed-Tube	175 µL
Manual Open-Tube	175 µL

**Test Selectivity / Throughput**

CBC	120 Samples/hr
CBC/diff	120 Samples/hr
CBC/diff/retic	74 Samples/hr
CBC/retic	74 Samples/hr
Retic	74 Samples/hr





## Turning the System On / Off

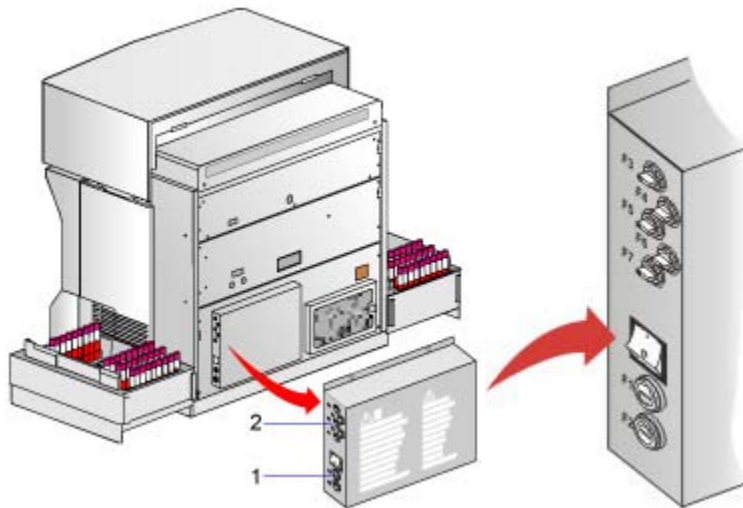
<b>OVERVIEW</b> .....	<b>2</b>
<b>TURNING THE SYSTEM ON</b> .....	<b>2</b>
<b>TURNING THE SYSTEM OFF</b> .....	<b>4</b>
TURNING THE SYSTEM OFF: IN AN EMERGENCY .....	4
TURNING THE SYSTEM OFF: ROUTINELY.....	4
EXITING THE ADVIA 2120/2120i SOFTWARE .....	4

## Overview

The ADVIA 2120/2120i Hematology System consists of two main components: the computer and the analyzer. Although there is a main power switch for the system, you must also turn each component on and off individually.

### Turning the system on

1. Check that the main power switch is set to On.



If the switch is in the Off position, switch it to On.

2. Turn on the computer.
  - a. Set the computer power switch to On.
  - b. When the computer displays the Begin Logon message, select **Ctrl**, **Alt**, and **Delete** at the same time to log on to Windows.
  - c. Enter the operator name and password in the Logon Information box. select **OK**.
  - d. Once you have logged on to Windows using an operator name and password, the computer automatically starts the ADVIA 2120/2120i software.

#### NOTE

If you log on using a supervisor name and password, the system opens the ADVIA 2120/2120i Shell.

3. Turn on the analyzer.

#### IMPORTANT

When you restart the analyzer, make sure that at least 60 seconds have passed since you turned it off.

- a. Select **On** at the analyzer touchpad.
- b. When the computer finishes loading the software, it displays the Log On / Off tab. A message on the status line indicates system preparation is

in progress. When the system preparation is complete, log on to the system.

During system preparation, the analyzer:

- Performs internal diagnostics checks
- Prepares the hydraulics
- Primes the reagent lines
- Begins the Startup process

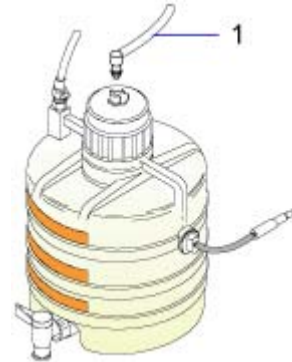
**NOTE**

If any of the internal diagnostic checks fail, the system displays an error message on the status line. Turn off the system, wait 60 seconds, and then restart it. If the error recurs, call your Service Representative.

- c. The system automatically opens the Startup tab. Review the status of the Startup process.

**IMPORTANT**

In cases when the analyzer is turned off and restarted too quickly, the compressor may not start up, causing the system initialization to fail. This is due to residual vacuum in the waste container. The operator must manually vent the container.



To manually vent either container (manual or autowaste), disconnect the waste container vacuum line (1), wait for the vacuum to dissipate, and then reconnect the line.

## Turning the system off

### **IMPORTANT**

To ensure good system performance, turn the computer off at least once a week.

You must follow the proper procedure when shutting down the ADVIA 2120/2120i Hematology System. Failure to do so can result in corruption of the database.

### **Turning the system off: In an Emergency**

1. Select **Off** at the analyzer touchpad.
2. If emergency conditions permit, select **Shut Down ADVIA** at the Log On / Off tab.
3. Set the main power switch to Off.

### **NOTE**

When you turn off the analyzer in an emergency, it is unable to drain some lines as it would normally. As a result, when you restart the system, you should perform a System Wash, using the Hydraulic Functions tab on the Utilities menu, before running samples.

### **Turning the system off: Routinely**

1. At the Routine Operations menu, select **Log On / Off**.
2. Select **Shut Down ADVIA**.  
Wait 1–2 minutes while the software shuts down.
3. Set the computer power switch to Off.

### **Exiting the ADVIA 2120/2120i software**

To exit the ADVIA 2120/2120i software without turning off the computer power

1. At the Operations menu, select **Log On / Off**.
2. Select **Shut Down ADVIA**.  
Wait 1-2 minutes while the software shuts down.
3. To restart the software, proceed with step 2 of Turning the Computer On.

## Daily Routine

<b>STARTING EACH SHIFT .....</b>	<b>2</b>
EMPTYING THE WASTE CONTAINER .....	2
EMPTYING THE OVERFLOW BOTTLE.....	4
CHECKING THE REAGENTS .....	4
OBTAINING THE BACKGROUND COUNTS .....	4
<b>PROCESSING THE SAMPLES .....</b>	<b>5</b>
CREATING THE WORKORDERS.....	5
LISTING THE PENDING WORKORDERS .....	6
RUNNING THE SAMPLES .....	6
VIEWING THE SAMPLE RUN.....	8
VALIDATING THE RESULTS.....	9
<b>ENDING EACH SHIFT .....</b>	<b>10</b>
WASHING THE SYSTEM .....	10
PERFORMING THE END OF DAY PROCEDURE .....	10
LOGGING OFF.....	11

## Starting Each Shift

### Emptying the Waste Container



#### BIOHAZARD WARNING

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended by the Clinical and Laboratory Standards Institute (formerly NCCLS) in *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline - Third Edition*. 2005. CLSI Document M29-A3. This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



**WARNING:** Local laws and regulations protect the environment and encourage resource conservation by regulating the disposal of hazardous wastes. Because some of the wastes generated by the analyzer may be classified as hazardous waste, you must be familiar with the applicable hazardous waste handling and disposal laws and regulations in your area.

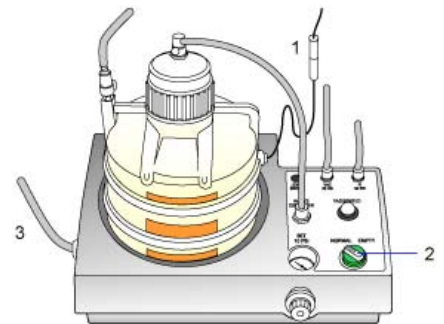
All analyzer waste is stored in an 11-liter waste container. When the fluid level in the container reaches the “Maximum Level” line (approximately 8 liters), an error message appears on the monitor and an audible alarm is sounded. The system will not aspirate any more samples until the waste container is emptied.

#### Manual Waste Removal



**CAUTION:** Make sure all cycles are completed before disconnecting the waste container. The waste container *must* be connected to the system when any system cycles are in progress, including the system startup cycle. If the waste container is not connected, fluid will back up into the UFC and damage the system.

1. Make sure that the analyzer is not sampling.
2. If a message requesting a rinse or a wash displays, select **Cancel**.
3. Disconnect the waste line (1) and the vacuum line (2). To do this, select the buttons (3) on the quick-release connectors as you pull the lines straight up.
4. Disconnect the level switch sensor connector (4) by selecting its button.



5. Replace the full container with an empty one and connect the waste and vacuum lines and level sensor to the new container.



**CAUTION:** Do not open the waste container cap! If the cap is loosened or not replaced correctly, sufficient operating vacuum cannot be reached.

6. Empty the full container by opening the spigot (5) into a drain that is capable of accommodating a flow rate of approximately five liters per minute. Total drainage time will be about two and a half minutes.
7. When the waste container is empty, close the spigot and store the container for future use.



**IMPORTANT:** Make sure that the spigot is closed securely; otherwise, sufficient operating vacuum may not be reached.

### Automatic Waste Removal



**CAUTION:** Make sure all cycles are completed before disconnecting the waste container. The waste container *must* be connected to the system when any system cycles are in progress, including the system startup cycle. If the waste container is not connected, fluid will back up into the UFC and damage the system.



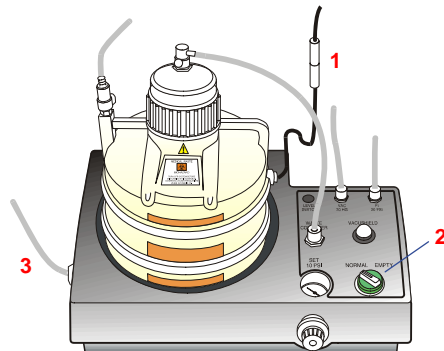
**IMPORTANT:** In order to empty the automatic waste removal system, the analyzer must be on and must *not* be in Standby mode.

1. Make sure that the analyzer is not sampling.
2. If a message requesting a rinse or a wash appears, select **Cancel**.
3. Disconnect the level-sensor switch connector (1) by selecting its button.



**CAUTION:** To prevent sample aspiration while the automatic waste removal system is draining, disconnect the level-switch sensor. Sample aspiration during waste removal may damage the analyzer.

4. At the waste removal assembly tray, turn the mode selector knob (2) from **NORMAL** to **EMPTY**.
5. The waste in the container should start to empty. It will take between two and five minutes to completely empty the container. When you see air bubbles in the discharge line (3), the container is empty.



6. Once the container is empty, reconnect the level-sensor switch (1) and turn the mode selector knob (2) back to the **NORMAL** setting.

## Emptying the Overflow Bottle



**IMPORTANT:** If liquid consistently accumulates in the overflow bottle, call your local service provider or distributor.

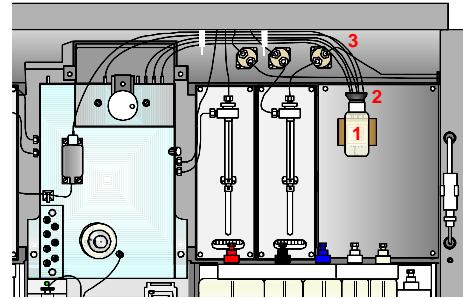


### BIOHAZARD WARNING

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended by the Clinical and Laboratory Standards Institute (formerly NCCLS) in *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline - Third Edition*. 2005. CLSI Document M29-A3. This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

1. Visually check the fluid level in the small overflow bottle (1) located to the right of the RBC sample and sheath pumps. If it has any liquid in it, empty the bottle.



2. Snap the bottle (1) out of the clip, then remove the bottle cap (2). You can allow the lines (3) with the cap to hang loosely.
3. Empty the contents of the bottle in accordance with proper laboratory practices and environmental regulations.
4. Replace the cap, then snap the bottle in place.
5. Make sure that the tubes are not pinched and have not slipped through the cap. The ends of the tubes should be at least 1.5 inches from the bottom of the bottle. Adjust if necessary.

## Checking the Reagents

1. Use the Startup tab or the Reagent Log tab to check the supply of all reagents except ADVIA 2120/2120i DEFOAMER.
2. Visually check the supply of ADVIA 2120/2120i DEFOAMER.
3. If you need to replace reagents, use the Reagent Log tab.

## Obtaining the Background Counts

Run a background count cycle to obtain a BASO WBC background count, a platelet background count, and an HGB Trans.

1. At the Operations menu, select **Startup**.
2. Select **Refresh**.



3. The background results are color-coded.

■ Green Within range

■ Red Out of range

If any result is out of range, select **Refresh** at the Startup tab to run another background count cycle. If any result is still unacceptable, perform a system wash.

## Processing the Samples

### Creating the Workorders

The Order Entry window allows you to create and manage workorders at the analyzer. You can also create workorders at the host computer.

#### Creating Workorders by SID#

1. At the Access menu, select **SID#** (sample ID number).
2. In the **SID#** box, enter the sample ID, then select **Enter** or select **OK**.
3. **Optional:** Enter sample and patient information. Use the Tab key to move from field to field.
4. Select tests.
5. Select **OK** to confirm the entries.
6. The Access dialog box appears for the next workorder.

#### Creating Workorders by Patient #

1. At the Access menu, select **Pat#**.
2. In the **Pat#** box, enter the patient number, then select **Enter** or select **OK**.  
If there is more than one workorder for this patient, they are listed.
3. Select **Create** to make a new workorder for this patient.
4. Enter sample and patient information.
5. Use the Tab key to move from field to field.  
You *must* enter a sample ID number.
6. Select tests.
7. Select **OK** to confirm the entries.  
The Access dialog box displays for the next workorder.

#### Creating Workorders by Patient Name

1. At the Access menu, select **Name**.
2. In the Name box, enter the patient name, then select **Enter** or select **OK**.  
(To view patient list, type ?, then press the Tab key.)
3. If the entered patient name already exists, you can:

Select **Create** to make a new workorder for this patient.  
Select **New Patient** to create a new patient file for this name.

4. Enter sample and patient information.
5. Use the Tab key to move from field to field.  
You *must* enter a sample ID number.
6. Select tests.
7. Select **OK** to confirm the entries.  
The Access dialog box displays for the next workorder.

### Listing the Pending Workorders

1. At the Customize menu, select **Tools View**.
2. When the tools list appears, double select **File Management**.
3. Select the **Pending** check box.
4. **Optional:** Use the To and From date boxes to restrict listing to workorders created within a specific period of time.
5. **Optional:** Choose a report format from the Format list. DEFAULT is usually sufficient.
6. Select **Display** to view the list, or select **Print** to print it.

### Running the Samples

#### Control Recommendations

- Run controls in accordance with your laboratory protocol.
- Run multilevel controls at the beginning of each shift.  
Siemens recommends the use of ADVIA TESTpoint Hematology Controls (Low, Normal, and High) and ADVIA TESTpoint Reticulocyte Control (Low and High).
- Run controls alone or at the start of the patient workload.
- Optionally, you can run a retained patient sample periodically to monitor performance trends.
- Evaluate all control results before reporting patient results.
- If control results fail to meet the laboratory's established criteria for acceptability, you must evaluate all patient test results obtained in the unacceptable run to determine if the patient results were adversely affected.
- Perform and document appropriate corrective actions, which may include recalibration and reassaying of patient samples, before reporting patient results.

**To run samples from the autosampler:**

1. Load samples in the following order:
  - Whole blood primer (primer label)
  - Controls (control label)
  - Patient samples (sample ID label)
  - a. Insert tube into rack with the barcode label visible above the rack barcode label that indicates the rack number and sample position. Do not twist tube within rack.
  - b. Load rack onto input queue with labels facing front of analyzer.
2. If the Standby indicator is lit, press Standby.
3. At the touchpad, select **Start/Stop Sampler**.  
The Start and Rack in Sampler indicators are lit.
4. Evaluate control results or validate patient results when available.

**To run samples from the manual closed-tube sampler:**

1. If the Standby indicator is lit, select **Standby**.
2. Run samples in the following order:
  - Whole blood primer (primer label)
  - Controls (control label)
  - Patient samples (sample ID label)
3. Scan the tube label or enter the sample information in the Manual Sample ID tab.



**IMPORTANT:** Make sure the correct sample ID appears on the status line before aspirating a sample using either the manual open-tube sampler or the manual closed-tube sampler. **Waiting** displays on the status line while the system searches for a matching workorder.

Make sure the correct sample selectivity appears on the status line. If you run a control with a mismatched selectivity (Example: running a CBC/Diff control with a Retic selectivity), the results will not appear in the Review /Edit tab and, in some cases, the system computer may require a restart.

4. Aspirate the sample.
  - a. Insert and push down tube containing the well-mixed sample into the manual closed-tube sampler. Hold tube parallel to the sampler well wall.
  - b. Sample is automatically aspirated – the sampling light flashes.
  - c. When the sampling light stops flashing, remove the tube.
5. Evaluate control results or validate patient results when available.

### To run samples from the manual open-tube sampler

1. If the Standby indicator is lit, select **Standby**.
2. Run samples in the following order:
  - Whole blood primer (primer label)
  - Controls (control label)
  - Patient samples (sample ID label)
3. Scan the tube label or enter the sample information in the Manual Sample ID tab.



**IMPORTANT:** Make sure the correct sample ID appears on the status line before aspirating a sample using either the manual open-tube sampler or the manual closed-tube sampler. **Waiting** appears on the status line while the system searches for a matching workorder.

Make sure the correct sample selectivity appears on the status line. If you run a control with a mismatched selectivity (Example: running a CBC/Diff control with a Retic selectivity), the results will not appear in the Review /Edit tab and, in some cases, the system computer may require a restart.

4. Aspirate the sample.
  - a. Position tube so that the sampler probe is immersed into the well-mixed sample.
  - b. Immerse the sampler probe only deep enough (approximately 0.25-in.) to ensure aspiration.
  - c. Press the aspirate plate. The sampling light flashes during aspiration.
  - d. When the sampling light stops flashing, remove the tube.
5. Evaluate control results or validate patient results when available.

### Viewing the Sample Run

1. At the Data Manager menu, select **Sample Cont. Panel**.
2. Use the database status area to work with records by sample status.
3. To get a list of samples with a specific status, select the status box, then select **File Mgt**.
4. To validate results for samples with a specific status, select the status box, and then select **Rev/Edit**.
5. The test panel area provides a test-by-test assessment of control performance and a sample listing by time of aspiration. Control color coding is as follows:
  - Green Control results for test are between target and  $\pm 2$  SD.
  - Yellow At least one control result is between  $+2$  SD and  $+3$  SD or  $-2$  SD and  $-3$  SD.
  - Red At least one control result is lower than  $-3$  SD or higher than  $+3$  SD.

## Validating the Results

1. At the Data Manager menu, select **Review / Edit**.
2. If not already done, select validation mode and access mode to determine which sample records will be reviewed.
3. Review the displayed results. Scroll to view additional results.
4. You can:
  - Go to step 5 if all results are acceptable.
  - Edit a result.
    - a. Select **C.RES** (current result) box for test.
    - b. Enter new value or comment code.
    - c. Select **End** to exit, or **Next** to edit additional results.  
You can select **Individual** to edit one result, **Successive** to access all results, or **Pending** to access only missing results.
  - Apply a disposition to an individual result.
    - a. Right-select the **D** column next to the test you want to receive the disposition.
    - b. Select the desired disposition.  
**None** cancels any previous disposition.  
**Rerun** repeats test with no dilution using the same sample ID. The letter R displays in D box.  
**Exchange** swaps information in C.RES and PREV.RUN boxes. The letter X displays in D box.  
**Accept** indicates result approved by operator. The letter A displays in D box.  
**Delete** erases the result. The letter D displays in D box.  
**Dil.Sample** repeats test with specified dilution using a different sample ID. When result is available, select **Dil.Cons** (Diluted sample - Consolidation) to enter result into original sample record.  
Only Accept and Delete are available for control samples.  
The disposition takes effect when you validate the results.
  - Apply a disposition to all results.
    - a. Select **Global Disposition**, or select the **Sample** menu and then choose **Global Disposition**.
    - b. Select the desired disposition. (See available dispositions above.)  
The disposition takes effect when you validate the results.
5. Select **OK** to validate the sample results.

**NOTE:** Be sure to complete sample validation (steps 1 through 5) before rerunning a sample. If not, the sample is rerun with the default selectivity.

## Ending Each Shift

### Washing the System

Perform the system wash procedure at the end of each shift or work period (a maximum of eight hours). After the laboratory shift with the largest number of samples, run three system wash cycles; after other shifts, you need to run only one wash cycle. In addition, if the number of samples in a shift exceeds 400, perform one system wash after the 400th sample.

1. At the Utilities menu, select **Hydraulic Functions**.
2. Select **System Wash**, select **1** for the **Number of Cycles**, and then select **Start**.

### Performing the End of Day Procedure

**To reset SIDs, and close out the QC and Moving average statistics (Tools View)**

1. At the Customize menu, select **Tools View**.
2. When the tools list displays, double-select **End Of Day**.
3. Select **Yes** to confirm that you have finished the workload. If saved, the selections from a previous End of Day operation now appear.
4. Select the **SID RESET** check box to perform a SID RESET.
5. If desired, select the **Q.C. Close Out** check box to transfer the daily QC file into the Cumulative QC file.

Use the list box to select close out for all controls or a specific control.

6. If desired, select the **MOV. AVG Close Out** check box to obtain a cumulative data point from moving average control statistics with a date earlier than the date in the Up to box.
7. Select **OK** to confirm and start.

**To also backup and purge the data files (Tools Modify)**

1. At Customize menu, select **System Setup**, and then select **Tools Modify**.
2. When the tools list displays, double-select **End Of Day**.
3. Select the **SID RESET** check box to perform a SID RESET.
4. If desired, select the **Q.C. Close Out** check box to transfer the daily QC file into the Cumulative QC file.

Use the list box to select close out for all controls or a specific control.

5. If desired, select the **MOV. AVG Close Out** check box to obtain a cumulative data point from moving average control statistics with a date earlier than the date in the Up to box.

6. If desired, select the check boxes for any files you want to back up. Verify the destination for the Q.C. file backup.
7. Select the **Purge Database** check box.
8. Note the values in Total Samples and To be purged fields. In the To be purged field, enter the number of records, if any, you want deleted from the All Complete file.
9. Select **OK** to confirm and start.
10. If you requested a backup in step 6, you will be asked to insert a formatted disk into the disk drive.

Requirements for backup disks are as follows:

- Programs: Format one or more disks with the label **PRG**.
- Dictionaries: Format one disk with the label **DICT**.
- Cumulative Quality Control: Format one disk, no label is necessary.
- Database: Four formatted disks are required for 2000 All Complete sample records. The database disks do not need to be labeled. The system will automatically label the disk(s) during the backup procedure.

When several disks are required, the internal label entered during formatting for each disk must be the same. To visually identify each disk, write a sequence number on the disk paper label only.

To format and label a disk, select the **Utilities** menu, select **Backup / Restore**, and then select **Format**.

## Logging Off

1. At the **Operations** menu, select **Log On / Off**.
2. Select **Log Off**.





## Maintaining the Analyzer

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<b>SYSTEM WASH.....</b>	<b>3</b>
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## Schedule

To maintain the operating efficiency of your analyzer, you must perform specific procedures according to the frequency listed below.

### **After 1000 samples or daily**

- Perform a system wash.

Perform the system wash procedure at the end of each shift or work period (a maximum of eight hours). After the laboratory shift with the largest number of samples, run three system wash cycles; after other shifts, you need to run only one wash cycle. In addition, if the number of samples in a shift exceeds 400, perform one system wash after the 400th sample.

### **After 2000 samples or weekly, and before recalibration**

- Perform an RBC/baso/retic flowcell wash.
- Clean shear-valve and aspiration pathways in the UFC.
- Inspect the centering collars. Clean if necessary.
- Turn off the system.
- Clean the shear valve.

### **After 16,000 samples or every two months**

- Inspect the syringes and plungers, PN 067-B506-01 and PN 067-B506-02. Clean if necessary.
- Replace the 50- $\mu$ L syringe plungers, PN 067-B506-01.
- Inspect the Perox-cap vent hole for buildup. Clean if necessary.

### **Every 6 months**

- Replace the 1000- $\mu$ L syringe plungers, PN 067-B506-02.
- Clean the air-circulation filter.
- Replace the autosampler needle and/or the manual sampler needle.

### **IMPORTANT**

In addition to these scheduled procedures, periodic inspections of the UFC pathways, vacuum shuttle, and reaction chambers are essential. If you find buildup or dirt in any of the lines or chambers, clean the line or chamber in question.

## System Wash

Time: 6.5 minutes

Analyzer mode: Ready to Run

Perform the system wash procedure at the end of each shift or work period (a maximum of eight hours). After the laboratory shift with the largest number of samples, run three system wash cycles; after other shifts, you need to run only one wash cycle. In addition, if the number of samples in a shift exceeds 400, perform one system wash after the 400th sample.

**Example 1:** Laboratory workload of 1000 samples/day

Shift 1	800 Samples	1 system wash after sample 400
		3 system washes at the end of the shift

Shift 2	100 Samples	1 system wash at the end of the shift
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Shift 3	100 Samples	1 system wash at the end of the shift
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**Example 2:** Laboratory workload of 300 samples/day

Shift 1	175 Samples	3 system washes at the end of the shift
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Shift 2	75 Samples	1 system wash at the end of the shift
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Shift 3	50 Samples	1 system wash at the end of the shift
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**Example 3:** Laboratory workload of 350 samples/day

Shift 1	350 Samples	3 system washes at the end of the shift
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### IMPORTANT

Each EZ KLEEN container (PN T01-3624-54) is sufficient for 20 system wash cycles. Please order your reagents accordingly.

### To start a system wash

1. At the Utilities menu, select **Hydraulic Functions**.
2. Select **System Wash**, select **1** for the Number of Cycles, then select **Start**.

## Cleaning the Centering Collar

Clean the centering collars and bases if there is residue buildup.

Inspect the autosampler aspirate assembly area for salt buildup. Clean if necessary.



## BIOHAZARD

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

Biohazard warning

Materials required

- Beakers (2)
- Cotton swab
- Household bleach
- Paper towels
- Stylet or thin wire
- Syringe
- Tubing, 0.020-inch ID

Time: 10 minutes per centering collar

Analyzer mode: Off

**To clean the centering collar**



## WARNING

To avoid personal injury and exposure to a potential biohazard, you must cover the needle with the red needle cover immediately after you remove the centering collar. Be careful not to bend the needle as you slip the cover over it.

1. Turn off the analyzer.
2. Remove the centering collar from the Autosampler or Manual closed-tube sampler (see specific procedures below).
3. Place the centering collar in a beaker filled with 25% solution of household bleach and water and let it soak for five minutes.
4. Using a cotton swab, scrub off any remaining residue, then rinse with water.
5. Use a stylet or a piece of thin wire to clean the three nipples and the center bore on the autosampler centering collar or the nipple and center bore on the manual closed-tube sampler centering collar.



## WARNING

The analyzer *must* be off; otherwise, personal injury from the needle may occur.

- Attach a piece of 0.030-inch ID tubing to a syringe, then flush each port on the autosampler collar or the waste port on the manual closed-tube sampler collar with water.

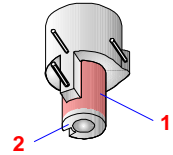
**IMPORTANT**

To prevent autosampler centering collar lock ups, apply Parker Super O-lube (or equivalent lubricant) to the barrel part (1) of the centering collar.

Do not get lubricant near the needle port or the needle base (2).

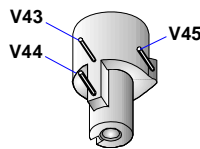
**NOTE**

The dual Autosampler has two centering collars, one for analyzer sampling and one for optional Autoslide sampling. Both Centering collars use the same cleaning method.

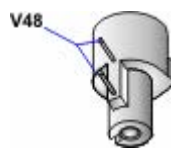


- Reconnect all the tubes, except the sample line on the autosampler, to the centering collar

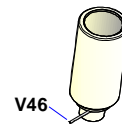
**Analyzer centering collar**



**Autoslide centering collar**



**MCTS**



- Remove the needle cover and carefully replace the collar over the needle. On the autosampler centering collar, be sure to turn the spring-loaded knob back to its original position.
- On the autosampler, reposition the autosampler aspirator assembly. Make sure that it drops firmly in place over the guide pins, then reconnect the sample line to the base of the centering collar.



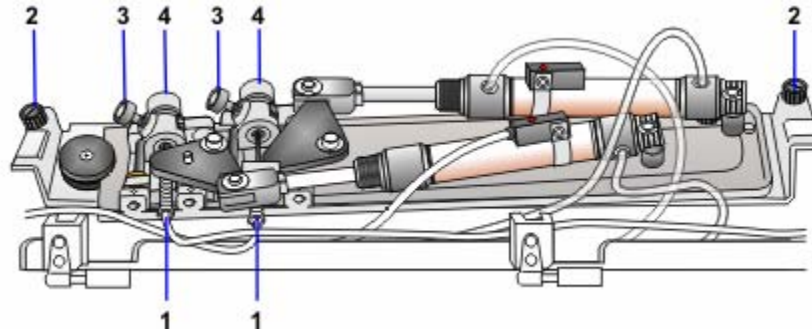
**CAUTION**

After repositioning the aspirator assembly, finger-tighten the thumb screws, being careful that they are not cross threaded. Overtightening of the screws can warp the baseplate, which will cause misalignment of the sampler. Mis-threading the thumb screws can cause needle damage.

- Place the tubes going to the autosampler centering collar into the "hook" on the side of the IDEe reader.
- Snap the manual-sampler centering collar into place.
- Close the analyzer cover.
- Turn on the analyzer power.
- Check saline background count and run whole blood primers to verify system performance.

**To remove the centering collar from the autosampler**

1. Tilt the front cover down.



2. Remove the sample line (1) from the bottom of the needle base.



You must remove the sample line before the aspirator assembly is tilted forward. If the line stays in place, it can break as the assembly is tilted.

3. Loosen the thumb screws (2) and tilt the autosampler aspirator assembly forward.
4. Pull up the spring-loaded knob (3), turn it a ¼ turn, then remove the centering collar (4) by pulling it up and out.

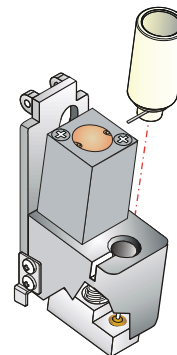
**NOTE**

If the centering collar is locked into place, squirt a little warm DI water over the collar to loosen it.

5. Place the red needle cover over the needle.
6. Remove the three tubes from the collar.

**To remove the centering collar from the manual closed-tube sampler**

1. Tilt the front cover down.
2. Pull the centering collar up.
3. Remove the tubing from the nipple.
4. Place the red needle cover over the needle.



**Cleaning the Shear Valve and Aspiration Pathways in the UFC**

Time: 15 minutes

Materials required: Beaker, household bleach, and water

Analyzer mode: Ready to Run

### To clean the shear-valve and aspiration pathways in the UFC

1. At the Utilities menu, select the **Exerciser** tab.
2. Select the **Syringe Pumps** button on the left. If the arrow on the image of the valve under Selector Valve does not point to Open, select on the image until the arrow does point to Open.
3. Select **Valves** on the left.
4. Select valve **V72** to close.
5. Select valves **V1**, **V47**, and **V74** to open.
6. Hold a beaker of household bleach under the open-tube sample probe until 5 mL is aspirated.
7. Repeat step 4 using 5 mL of water.
8. Close valve **V74** and select **V72** to open. Make sure that **V73** is closed.
9. Repeat steps 4 and 5.
10. Select **V74** and **V72** to close, and select **V73** to open.
11. Repeat steps 4 and 5.
12. Close valves **V1**, **V47**, and **V73**. Exit the Exerciser by selecting the Analyzer Status tab.



### Cleaning the Shear Valve

Materials required:

- Beaker
- Household bleach
- Paper towels
- Squirt bottle
- Ultrasonic bath (if available)

Time: Cleaning - 15 minutes

Checkout - 15 minutes

Analyzer mode: Standby

Clean the shear-valve faces before recalibrating the system.

High-volume laboratories or laboratories that handle dialysis samples or overly viscous blood, such as aged samples, may need to clean the shear-valve faces more often.



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.


**To clean the shear valve**

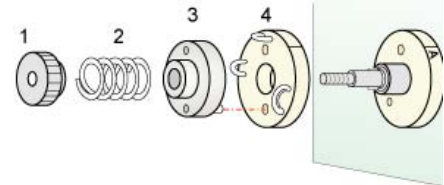
1. Take the shear valve apart
2. Clean the shear valve
3. Reassemble the shear valve
4. Check the analyzer

**Cleaning the Shear Valve: Step 1  
Taking the Shear-Valve Faces Apart**

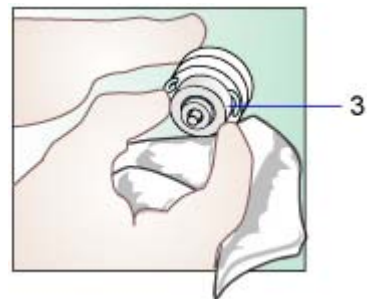
**IMPORTANT**

Place paper towels directly under the shear valve to prevent fluid from dripping down into the analyzer.

1. Remove the knurled nut (1) by turning counter clockwise , then remove the compression spring (2).



2. To remove the rotor (3), hold the shear valve with one hand and with the other hand rotate the rotor until it can be pulled forward and off the shaft.





3. To remove the front shear face (4), gently rotate the front face until it is loosened, then pull forward and remove.

The rear shear face is stationary.



To avoid damaging the seal that secures the shear valve to the acrylic layer of the UFC, do not use excessive force to remove the front shear face.

DO NOT use sharp objects, such as a screwdriver, to separate the shear faces. If you have difficulty removing the rotor or the front shear face, hold paper towels under the shear valve and squirt the valve with a stream of warm water. If the rotor is off, squirt some water into the two holes in the front of the shear face. Allow it to soak for a few minutes, then remove the rotor and/or shear face.

If you still have difficulty separating the shear faces, use the shear face removal tool (PN 067-1083-01) found in the spare parts kit. Gently wedge the sharp edge of the tool between the two faces, then remove the front shear face.

### **Cleaning the Shear Valve: Step 2 Cleaning the Shear-Valve Faces**

1. Place the front shear face in a beaker with household bleach. If the laboratory is equipped with an ultrasonic bath, follow the instructions provided by the manufacturer. Otherwise, let the shear face soak in the beaker for 10 minutes, then thoroughly rinse with water.
2. To rinse the rear shear face, use a wash bottle filled with water. Use paper towels to catch dripping water.



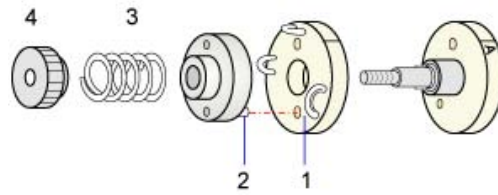
Do not wipe the shear faces with paper towels. This may leave fibers on the shear faces.

### **Cleaning the Shear Valve: Step 3 Putting the Shear Valve back Together**



You may assemble the shear valve while the faces are still wet. Never use paper towels, gauze, or cotton swabs on the shear faces. These may leave fibers on the surface that can clog the precision grooves.

1. Shake off any excess water, then install the front face on the shaft by aligning the black line on the front face with the black line and the **A** on the rear face. The smaller loops should be at the 9 and 11 o'clock positions and the large loop should be at the 5 o'clock position.
2. Install the rotor by inserting the drive pin (2) into the hole (1) on the right side of the front face.
3. Replace the spring (3), and the knurled nut (4). Hand tighten the nut.



### Cleaning the Shear Valve: Step 4 Checking Analyzer Performance

Check analyzer performance by:

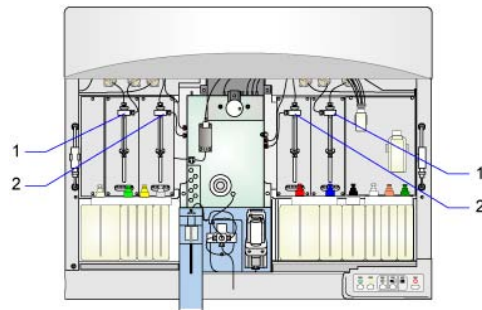
- Checking saline backgrounds
- Running a whole blood primer
- Running controls

If controls do not recover, calibrate affected channel.

### Inspecting and Cleaning the Syringe Plungers PN 067-506-01 and PN 067-506-02

Inspect the tip of the plunger during a saline prime.

The normal wear of the plunger tip (sheath 1 [1000 µL syringe] and sample 2 [50 µL syringe]) against the syringe barrel can cause small pieces to be detached. These small particles appear as a gray gel at the tip of the plunger. If this gel enters the hydraulic system, it can cause clogs in the analyzer. Clean if necessary.



Materials required:

- Lint-free tissue
- Small hex wrench

Time: 15 minutes for one plunger

Analyzer mode: Off




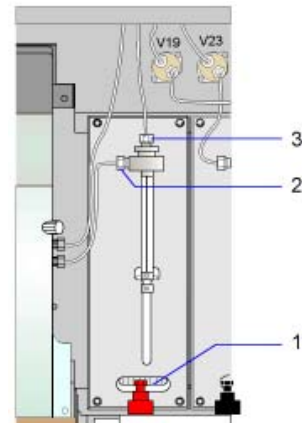
#### BIOHAZARD

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

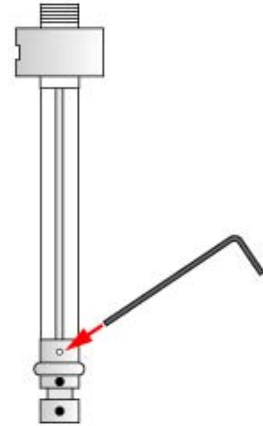
#### To clean the syringes and plungers

1. Remove the syringe.
  - a. Turn the thumb wheel (1) counterclockwise  until the plunger is lowered about ½ inch (1.27 cm).
  - b. Disconnect the input (2) and output (3) fittings from the syringe head.
  - c. Remove the nut and washer that secure the syringe at the top. Slide the syringe barrel down toward the bottom of the carriage to clear the mounting hole, then remove.



 **CAUTION**

When cleaning the 50  $\mu$ L syringe, never pull the plunger through the small plastic bushing inside the syringe. This will cause damage to the syringe plunger tip. Use a small hex wrench to pop the bushing all the way out of the syringe, then remove the plunger from the syringe with both bushings still on the plunger stem. Do not remove the plastic bushings from the 50  $\mu$ L plunger.



2. Remove the dirty plunger from the syringe. Do not remove the white bushing from the plunger or the plunger from the stainless steel barrel bushing on the bottom. Using a soft lint-free tissue, gently wipe the plunger tip. Make sure all debris is removed from the grooves.
3. Thoroughly rinse the syringe barrel with water.
4. Slide the cleaned plunger into the syringe. Use a little saline solution, if necessary. Reseat the small plastic bushing into the syringe barrel, then replace the syringe
  - a. Insert the bushing end of the syringe into the slot at the bottom of the carriage.
  - b. Make sure that the input port on the RBC/Baso/Retic channel is facing left, and on the Perox channel it is facing right.
  - c. Slide the syringe up and into the mounting hole in the pump drive frame.
  - d. Install the washer and the knurled nut and hand tighten the nut.

 **CAUTION**

Be careful not to cross-thread or overtighten the knurled nut and the input/output fittings.

- e. Reconnect all the syringe fittings.
5. Check analyzer performance by
  - Checking saline backgrounds
  - Running a whole blood primer
  - Running controls

## Replacing the Sampler Needles

There are two needles in the analyzer. One is located in the autosampler and the other is in the manual closed-tube sampler.

Materials required:

- Cotton swab
- Lens tissue
- Replacement needle, PN 113-3301-03



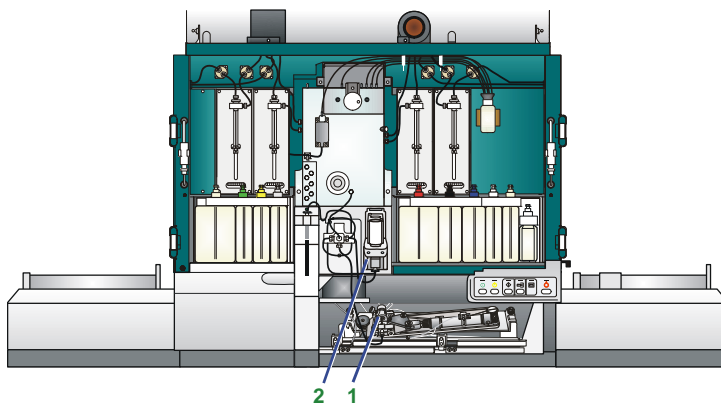
The analyzer must be off; otherwise, personal injury from the needle may occur.

Time: 5 minutes per needle

Analyzer mode: Off

### Location of the sampler needles and centering collars

- ▶ Autosampler (1)
- ▶ Manual closed-tube sampler (2)




All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

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### To replace the sampler needles

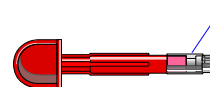
1. Turn off the analyzer.

2. Remove the centering collar from the Autosampler or the Manual closed-tube sampler. (See page 4-5 for instructions.)
3. Turn the needle cover counterclockwise  to loosen the needle.
4. Discard the needle along with its cover as biohazardous material.
5. Before installing the replacement needle, clean the needle base using a cotton swab soaked in water, then wipe with another cotton swab soaked in water.

**NOTE**

If there is extensive buildup, use a solution of 25% household bleach and water to remove residual dried blood.

6. Install the replacement needle.
  - a. Remove the clear plastic end of the needle cover (1).
  - b. With the red needle cover in place, screw the needle clockwise  into the needle base. Be careful not to cross-thread the needle.

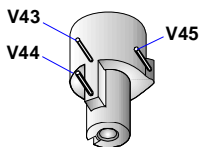


**CAUTION**

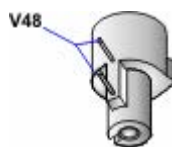
Do not use any other tools to secure the needle. Overtightening can affect needle performance.

- c. Remove the red cover from the needle and save it for use during the next needle installation.
7. Reconnect all the tubes, except the sample line on the autosampler, to the centering collar

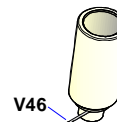
**Analyser centering collar**



**Autoslide centering collar**



**MCTS**



**NOTE**

The dual Autosampler has two centering collars, one for analyzer sampling and one for optional Autoslide sampling. Both Centering collars use the same sampling needles.

8. Carefully replace the collar over the needle. On the autosampler centering collar, be sure to turn the spring-loaded knob back to its original position.
9. On the autosampler, reposition the autosampler aspirator assembly. Make sure that it drops firmly in place over the guide pins, then reconnect the sample line to the base of the centering collar.



## CAUTION

After repositioning the aspirator assembly, finger-tighten the thumb screws, being careful that they are not cross threaded. Overtightening of the screws can warp the baseplate, which will cause misalignment of the sampler. Mis-threading the thumb screws can cause needle damage.

10. Place the tubes going to the autosampler centering collar into the "hook" on the side of the IDee reader.
11. Close the front cover.
12. Run saline and whole blood primers to verify system performance.

## Replacing the Sheath Filters

There are two sheath filters located on either side of the analyzer. The perox sheath filter is in a green housing on the left side and the RBC/baso sheath filter is in a clear housing on the right side of the instrument.

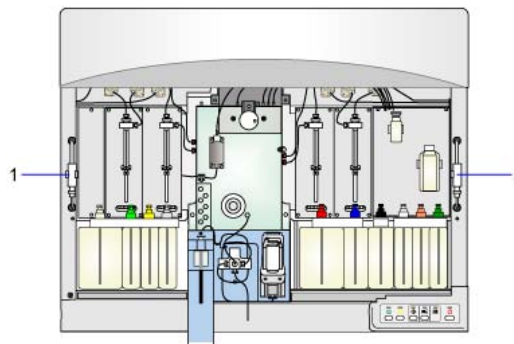
Time: 10 minutes

Materials required:

- Perox sheath filter  
PN 518-3148-05
- RBC/baso sheath filter  
PN 518-3148-06
- paper towels

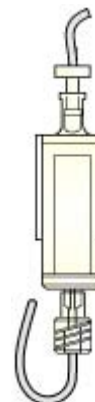
Analyzer mode: Ready to Run

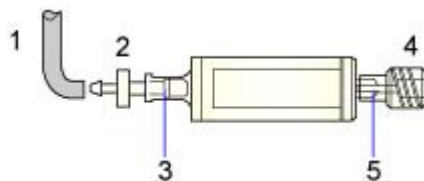
### Location of the perox (1) and the RBC/baso (2) sheath filters



### To replace the sheath filters

1. Carefully pull the filter toward you just enough to remove it from its mounting and gain access to the tubing. Place paper towels under the filter to catch any fluid that leaks out when you remove the filter.
2. Disconnect the reagent line (1) attached to the barbed fitting (2) at the input port (3) of the filter.





3. Disconnect the luer fitting (4) from the connector at the output port (5). **Do not** disconnect the line leading from the luer fitting.
4. Discard the filter according to local environmental laws and regulations.
5. Hold the replacement sheath filter by the body and attach the luer fitting to the connector. Turn the luer fitting clockwise ↻ to tighten.



The plastic barbed fitting and the luer connector are very fragile. Hold the sheath filter by its body at all times and do not use excessive force when the lines are being connected.

6. Still holding the filter by the center of the body, connect the reagent line to the barbed fitting of the input port.
7. Insert the sheath filter into the mounting clip with the input end of the filter facing up.
8. Prime the reagent lines five times.



Do not use a syringe to prime the filter. It may cause damage to the filter.

9. Look at the level of the liquid in the sheath filter. If the filter is not approximately 90% full, run two additional prime cycles.

## Replacing the 50 or 1000 $\mu\text{L}$ Syringe Plungers PN 067-506-01 and 067-506-02

Materials required:

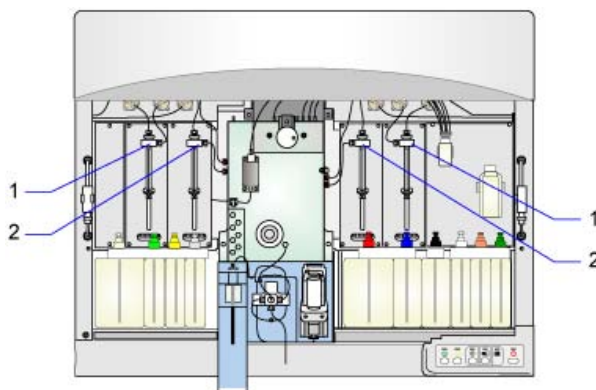
- Hex wrench, small
- Household bleach
- Sample syringe repair kit, PN 067-B506-01 (50  $\mu\text{L}$ )
- Sheath syringe repair kit, PN 067-B506-02 (1000  $\mu\text{L}$ )

Time: 15 minutes

Analyzer mode: Off

### NOTE

The sheath syringe plungers (1) will





last two to three times longer than the sample syringe plungers (2).




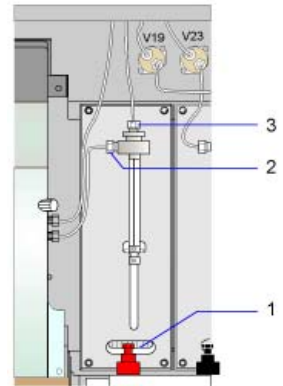
#### BIOHAZARD

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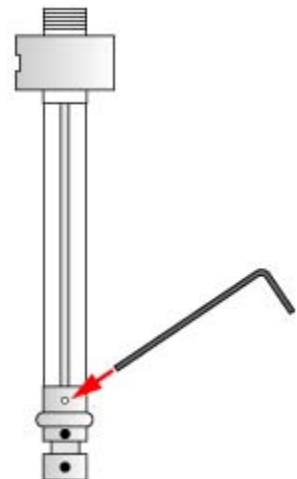
#### To replace the syringe plunger

1. Turn the thumb wheel (1) counterclockwise  until the plunger is lowered about 0.5 inch (1.27 cm).
2. Disconnect the tubing from the top fittings, then disconnect the input (2) and output (3) fittings from the syringe head.
3. Remove the nut and washer that secure the syringe at the top. Slide the syringe barrel down toward the bottom of the carriage, then remove.

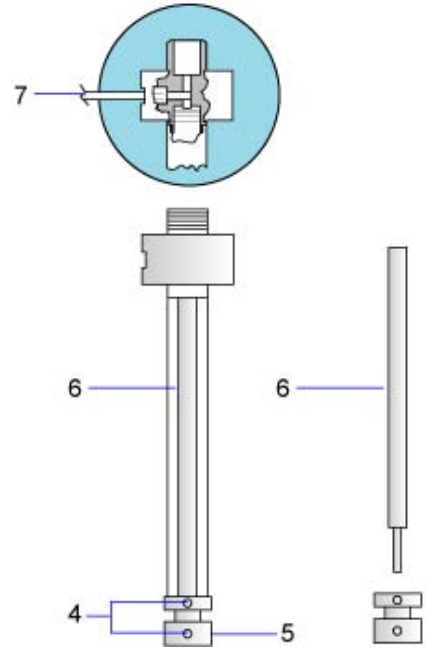


#### CAUTION

The 50- $\mu$ L syringe plunger has a small plastic bushing inside the syringe. When replacing this plunger, **never** pull the plunger through the small bushing. This action will cause damage to the plunger tip. Use a small hex wrench or a large paper clip to pop the bushing out of the syringe completely, then remove the plunger from the syringe with the bushing still on the plunger stem.



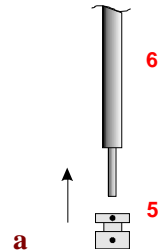
4. Use a hexagonal wrench to loosen the set screws (4) on the metal bushing (5) on the plunger stem. Remove and keep the bushing. Discard the plunger (6).
5. Inspect the syringe. If the inside surface is dirty, use a wash bottle with 25% solution of household bleach and water to clean it. Rinse thoroughly with water.
6. Install the new plunger:
  - a. Insert the pin gauge (7) from the repair kit into the input port of the syringe
  - b. Wet the plunger with saline solution and insert it into the syringe barrel. Slide the plunger up until it touches the pin gauge.



 **CAUTION**

Do not force plunger into the syringe. Forcing will distort the tip.

- c. On the 50- $\mu$ L syringe, replace the small plastic bushing into the syringe.
- d. Replace the metal bushing onto the plunger stem with the narrow collar of the bushing (5) toward the plunger (6).
- e. Push the metal bushing up against the syringe, then tighten the set screws (4).
- f. Remove the pin gauge from the input port.
7. Reinstall the sample syringe:
  - a. With the metal bushing end-first, insert the syringe plunger into the slot at the bottom of the carriage.
  - b. Slide the syringe up and into the mounting hole in the pump drive frame with the input port facing left on the RBC/baso/retic channel and facing right on the perox channel.
  - c. Install the washer and the knurled nut and hand tighten the nut.



 **CAUTION**

Be careful not to cross-thread or overtighten the knurled nut and the input/output fittings.

- d. Reconnect all the tubing to the syringe fittings.

8. Check analyzer performance by:
  - Checking saline backgrounds
  - Running a whole blood primer
  - Running controls

If controls do not recover, calibrate the affected channel.

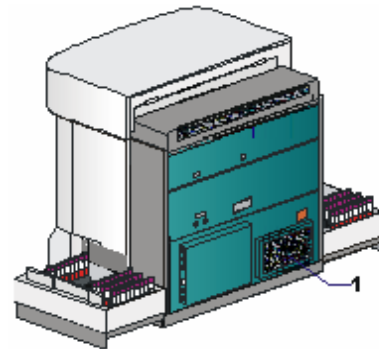
## Cleaning the Air-Circulation Filter

Time: 5 minutes

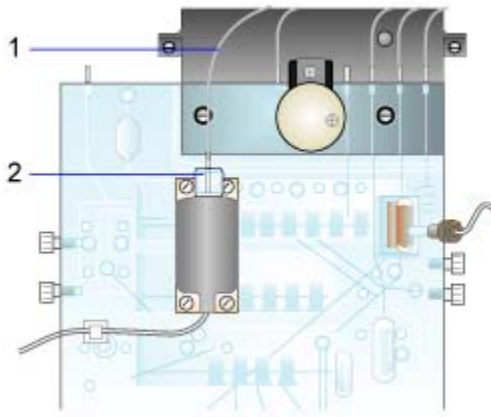
### To clean the air filter

1. Remove the filter by sliding it to the right, out of its frame.
2. Remove excess dust or lint from the filter by tapping it against a clean, hard surface or by vacuuming.
3. Flush the filter with a strong stream of water, first on one surface then on the other surface.
4. If the filter remains dirty, swish it around in a container filled with warm water and mild detergent.
5. Rinse the filter with clean water, then allow it to air dry.

Location of the air filter (1)



## Inspect the Perox-Cap Vent Hole for Buildup



1. Disconnect the overflow tube (1) from the perox vent.
2. Remove the cap (2).
3. Look at the inside of the cap and look through the vent opening. Make sure that the cap and the vent are clean, dry, and free of buildup.

4. If necessary, clean the cap and the vent opening. Use the drill bit included in the flowcell cleaning kit (PN 113-B711-01) to clean blockages in the vent opening.
5. Replace the cap and reconnect the overflow tube.

## Cleaning the Autosampler Aspirate Assembly

Clean the autosampler aspirate assembly if there is a salt buildup.



### BIOHAZARD

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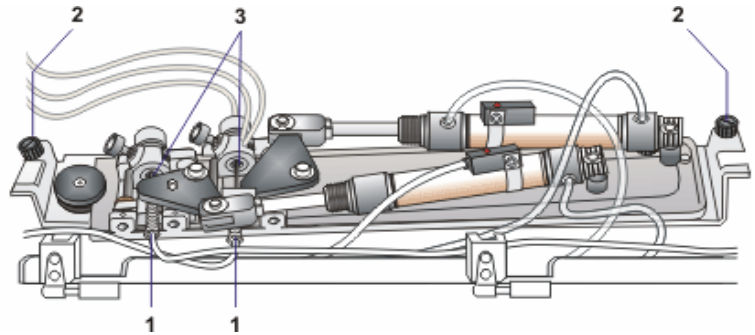
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Time: 15 minutes

Materials required:

- Cotton swab
- Deionized water
- Paper towels
- Squirt bottle

Analyzer mode: Off



### To clean the autosampler aspirate assembly

1. Turn off the analyzer.
2. Tilt the front cover down.
3. Thoroughly rinse the autosampler aspirate assembly with deionized water.

### NOTE

Single aspirate assemblies have one needle, centering collar and air cylinder.

4. Remove the sample line (1) from the bottom of the needle base.



### CAUTION

You must remove the sample line before the aspirator assembly is tilted forward. If the line stays in place, it can break as the assembly is tilted.

5. Loosen the thumb screws (2) and tilt the autosampler aspirator assembly forward, then thoroughly rinse the back side of the assembly with deionized water.
6. Clean the centering collar. Make sure that you remove all buildup at the mating surface (3) of the centering collar and the assembly.
7. Allow to stand for 5 minutes, then wipe the assembly dry with paper towels and cotton swabs. Repeat if necessary.
8. Reposition the assembly. Make sure that it drops firmly into place, then reconnect the sample line.



**CAUTION**

After repositioning the aspirator assembly, finger-tighten the thumb screws, being careful that they are not cross threaded. Overtightening of the screws can warp the baseplate, which will cause misalignment of the sampler. Mis-threading the thumb screws can cause needle damage.

9. Place the tubing going to the centering collar into the "hook" on the side of the IDEE reader.

# Troubleshooting the Analyzer

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If you are unable to correct a problem and require service assistance, please contact your local technical support provider or distributor.

## Alignments and Adjustments

### Adjusting the Hgb Baseline Value

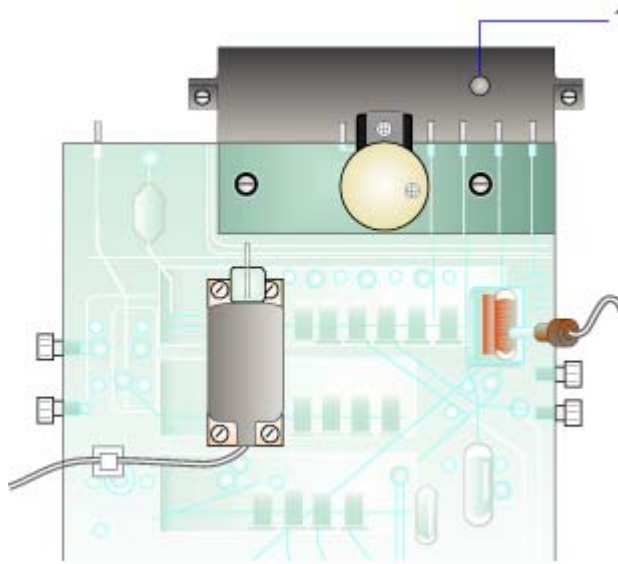
#### When to adjust the Hgb colorimeter-lamp baseline value

- After replacing the lamp.
- If the baseline value is  $>4.2$  volts.
- If indicated during troubleshooting.

#### To adjust the Hgb baseline value

1. At the Procedures menu, select the **Adjust Lamp/Temp** tab.
2. Select **Hgb Baseline**.
3. Pop out the small white plug on the colorimeter to access the potentiometer adjustment screw on the Hgb Power Supply Preamp PCB.

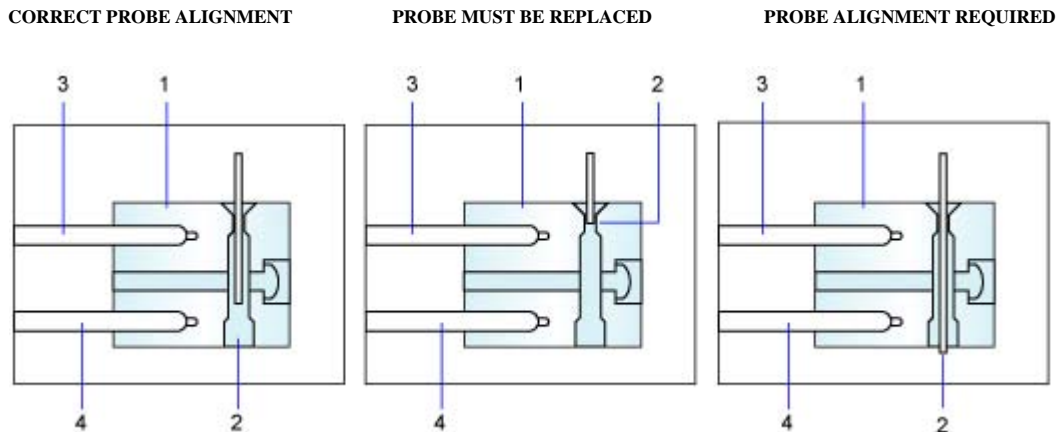
#### Potentiometer (1) on the Hgb Power Supply Preamp Board



4. Select **Start Cycle**. As the analyzer is checking the baseline value, use a small screwdriver to turn the adjustment screw so that the **Current** value is **4.1**.  
To increase the value, turn the screw clockwise.  
To decrease the value, turn the screw counterclockwise.
5. Select **Exit** and replace the plastic plug.

## Adjusting the Length of the Sample Probe

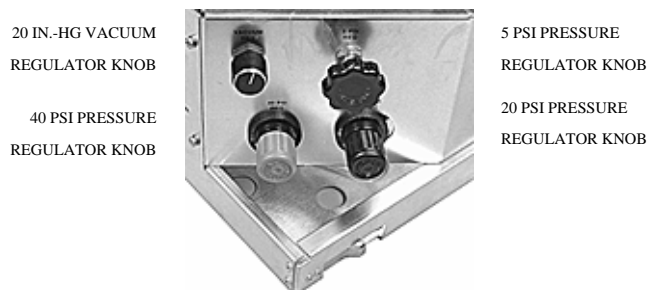
After each aspiration, the wash block (1) is lowered and the probe is washed within the block. For a proper wash, the terminal end of the probe (2) must be between the upper (3) and lower (4) ports of the wash block when the block is at its lowest position.



1. Look at the terminal end of the probe in the lowered wash block. If the probe is too short, it must be replaced.
2. If the probe is too long, remove the probe and, using a sharp scalpel or a single-edged razor blade, cleanly cut the probe to the appropriate length. Be very careful to make the cut straight without burrs. *Do not cut the probe on an angle.*
3. Replace the probe and check the length.

## Adjusting the Pneumatic Regulators

1. To gain access to the knobs, snap open the white panel on the right side of the analyzer. Using a Phillips-head screwdriver, remove the small green panel.
2. At the Utilities menu, select **Analyzer Status**.
3. Monitor the pneumatic values on the screen as you adjust the appropriate knob.



Turn knobs clockwise to increase values and counterclockwise to decrease values.



You have to first pull the 20 and 40 psi pressure regulator knobs, then turn to adjust.

<b>Regulator</b>	<b>Acceptable Reading</b>	<b>Set to</b>
20 in. Hg vacuum	20 ±1 in. Hg	20 +0.5 in. Hg
20 psi pressure	20 ±1 psi	20 +1 psi
5 psi pressure	5 ±0.5 psi	5 +0.25 psi
40 psi pressure	40 ±2 psi	40 +1 psi

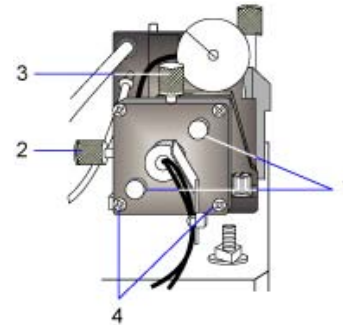
**IMPORTANT**

All pneumatic settings must be reached by turning the knobs in an **upward or clockwise direction only**. If a reading goes above the target value (see column 3 on the left), turn the knob back. Allow the analyzer to equilibrate (get a new reading every 5 seconds), then adjust upward to the correct value.

**Maximizing the Perox Lamp Output**

The analyzer should be in the **Ready to Run** mode. If it is in **Standby**, the current A/D reading will not update.

1. At the Procedures menu, select **Adjust Lamp/Temp.**
2. Select **Perox Lamp Alignment.**
3. Select **Start Cycle.**
4. Monitor the **Current A/D Reading** field.
5. Loosen the two securing screws (1). Do not loosen the four corner screws (4).



6. Perform the following procedure even if the initial maximum lamp value is greater than 1.96. Use the side alignment screw (moves the lamp in a horizontal direction) (2) and the top alignment screw (moves the lamp in a vertical direction) (3) to peak the position of the lamp. The maximum value should be between 1.96 and 4.99 volts. However, if the volts are greater than 4.90, select **Set Light Intensity** first, then return to the Perox Lamp Adjustment window, select **Start Cycles**, and repeat this procedure.
  - a. In small increments, first turn the side screw, then the top screw clockwise. If the voltage goes down, turn the screws counterclockwise.
  - b. Continue alternately turning the screws in small increments until the maximum value is achieved. The final adjustment should be in the clockwise direction. Allow 5 to 10 seconds for the screen to update between each increment.

## NOTE

Achieve the final maximum lamp value in a *clockwise direction only*. This will counteract any spring-bounce that might decrease the output level of the lamp over time.

7. Once the value is maximized, tighten the securing screws (1) to lock the lamp into position. Some minor drifting (less than 0.1 volts) is normal.
8. At the Utilities menu, select **Analyzer Status** and check the lamp intensity.
  - If the value is at least 120 but less than 255, the perox light source indicator, although displayed in red, is acceptable for reporting results. Results will not be flagged. Check the gains for the perox channel and continue normal operation.
  - If the value is less than 119, select **Set Light Intensity**. Check the gains for the Perox channel.

## Reprogramming the Manual Barcode Reader

1. Locate the **Codabar Settings** in the Opticon User's Manual.
2. Scan the **Start (Z7)** barcode with the wand. The barcode reader should be emitting a constant beeping sound, which is an indication that it is in the programming mode.
3. Scan the **Do not transmit Start/Stop (F0)** barcode. You should hear a single high-pitched beep to indicate that the scanning was successful.
4. Scan the **End (Z7)** barcode label. A continuous beeping sound indicates that the reprogramming is finished.

## Cleaning Procedures

### Backflushing the Drain Filters

If a drain filter is clogged, replace it with a new filter.

If the filter is not clogged, but you want to clean it because of heavy buildup or discoloration, use this backflush procedure.

Materials required:

- Flowcell cleaning kit, PN 113-B711-01
- Household bleach

Time: 10 minutes

Analyzer mode: Off



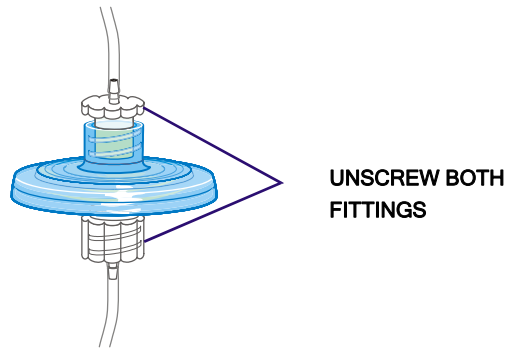
## BIOHAZARD

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### To backflush the drain filters

1. Turn the analyzer off.
2. Prepare a 10% household-bleach solution.
3. Unscrew the fittings from each end of the drain filter that you want to flush.
4. Attach the syringe to the bottom of the filter.
5. Insert the filter into the beaker of bleach solution. Gently pull the syringe plunger up, drawing fluid through the filter. Make sure the direction of flow is the opposite of the flow during normal operation.
6. Disconnect the syringe and empty it.

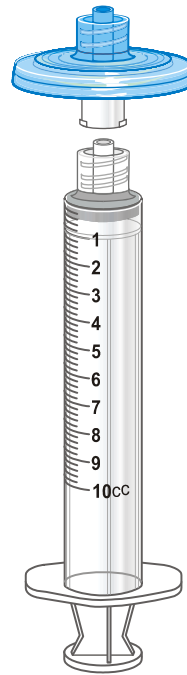




### WARNING

The debris flushed from the drain filters may contain biohazardous material and should be treated as if it is capable of transmitting infectious diseases.

7. Rinse the filter by repeating steps 4 through 6 twice, using deionized water instead of the bleach solution.
8. Visually inspect the filter and repeat the procedure if necessary.
9. Wipe the outside of the filter using a lint-free cloth or paper towel.
10. Reinstall the drain filter.
11. Clean the syringe with 10% household-bleach solution.
12. Turn the analyzer on and run samples in the manual and autosampler modes. Check to make sure that there are no leaks and that fluid passes through the filters properly. Make sure that the lines do not interfere with the autosampler aspirator motion.



DIRECTION OF FLOW

## Cleaning the Perox Chamber



### BIOHAZARD

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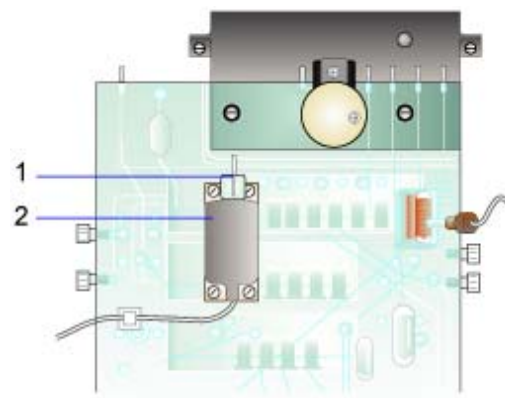
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Materials required:

- Cotton swab
- Dental mirror
- EZ KLEEN
- Flashlight
- Pipette, 2-mm ID, disposable

Time: 2 minutes

Analyzer mode: Ready to Run



**1 PEROX CHAMBER CAP**  
**2 PEROX CHAMBER**

### To clean the perox chamber

1. Remove the perox chamber cap (1).
2. Dip a clean, cotton-tipped swab into EZ KLEEN and wipe clean the inside of the perox chamber.



### CAUTION

To avoid pushing any dirt into the drain and reagent ports at the base and back wall of the chamber, always wipe the chamber by starting at the bottom of the back wall, using a circular up and outward motion.

3. Using a 2-mm disposable pipette, fill the chamber 1/3 full with EZ KLEEN.
4. Using the pipette, agitate the liquid in the chamber, then let it soak for one minute.
5. Agitate the liquid again. Then, using the pipette, remove all the liquid from the chamber.
6. Check if there are any black particles in the liquid. If yes, repeat steps 3 through 6 until the EZ KLEEN is clear when you remove it from the chamber.
7. Using the dental mirror and flashlight, check that the chamber is clean. If it is not clean, repeat steps 3 through 6.
8. Replace the perox chamber cap.
9. Perform a System Wash.

### Cleaning the Autosampler Rinse-to-Waste Line (V45 Pathway)

Materials required

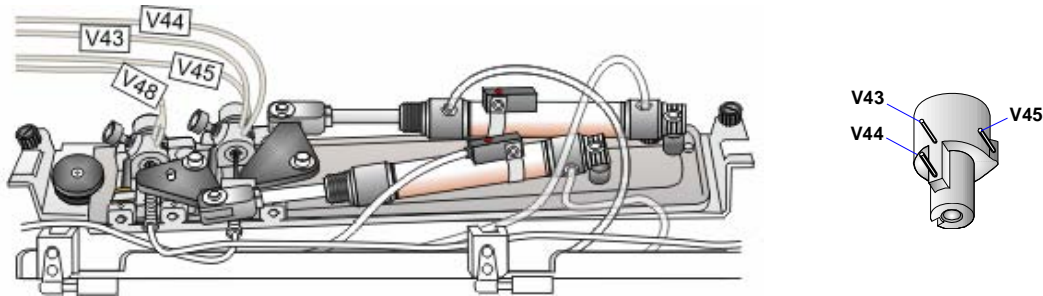
- Beaker
- Deionized water

- Household bleach

Time: 4 minutes

Analyzer mode: Ready to Run

1. Open the front cover.
2. At the Utilities menu, select the Exerciser tab, and select the **Valves** button on the left.
3. Remove the tubing from the **V45** nipple on the autosampler centering collar.



4. Place the end of the tube into a beaker of 25% solution of household bleach and water.
5. At the Exerciser, select **V45** to open the valve.
6. Aspirate 10 mL of the bleach, followed by 10 mL of deionized water
7. At the Exerciser, select **V45** to close the valve.
8. Replace the tubing on the centering collar nipple, and exit the **Exerciser** window.

### **Cleaning the Vent Lines, Vacuum Shuttle Chambers, and Reaction Chambers**

Materials required:

- Beaker
- Deionized water
- EZ KLEEN for cleaning perox-related pathways and chambers
- Household bleach for all pathways and chambers other than perox
- Tubing, 0.090, PN 116-0536-16

Time: 4 minutes

Analyzer mode: Ready to Run

## NOTE

Clean one vent line or chamber at a time.

1. Remove the tubing from the overflow bottle that leads to the vent of the pathway or chamber that you want to clean. Or, if there is no overflow tube installed, attach a 12-inch (300.5-mm), 0.081-ID piece of tubing to the vent.
2. Put the free end of the tube into a beaker of 25% solution of household bleach and water.

### IMPORTANT

You must use EZ KLEEN when cleaning the perox vacuum shuttle chamber and perox vent line.

3. Open the valve that will create a vacuum to aspirate the bleach solution from the beaker through the vent line and chamber to the main waste line at the bottom of the UFC block.

To open a valve, at the Utilities menu, select the **Exerciser** tab. Select **Valves** from the list on the left. Select the appropriate valves.

The appropriate valves are:

Baso chamber - open V13

Perox vacuum shuttle chamber - open V18 and V17

Retic chamber - open V65

RBC chamber - open V10

RBC/baso/retic vacuum shuttle chamber - open V22 and V21

Hemoglobin chamber - open V36

4. Allow alternate segments of household bleach solution and air to run through the line and the chamber until they are clean.
5. Immerse the free end of the tube into a beaker of deionized water to rinse the line and chamber.
6. Remove the tube from the beaker and close the valve.
7. Exit the **Exerciser**.
8. Replace the tube into the overflow bottle, or if it was not an overflow tube, remove it from the vent opening.
9. At the Startup window, select **Refresh**. Repeat **Refresh** until the background counts are acceptable.
10. Run controls and verify that the results are within specifications.

## Flowcell Wash

This function flushes a clogged flowcell and is available from the **Hydraulic Functions** tab.

To wash the perox flowcell, use EZ KLEEN.

To wash the RBC/baso/retic flowcell, use a 25% solution of household bleach and water.

To wash both flowcells at the same time, use EZ KLEEN.

1. Select **Flowcell Wash** to select it.
2. Select the flowcell you want to wash by clicking an option in the Flowcell Options area.
  - Perox Flowcell
  - RBC/Baso/Retic Flowcell
  - Both
3. Hold a tube of EZ KLEEN (perox flowcell) or bleach (RBC/baso/retic flowcell) under the open-tube sampler probe.

**IMPORTANT**

Do not push the aspirate plate.

4. Select **Start** to begin the flowcell wash. Continue to hold the tube under the probe until you hear a beep and the wash block starts to move down (approximately 100 seconds).

You can select Cancel to stop the flowcell wash. It will stop at the end of the current cycle.

## **Cleaning the Flowcells on the Analyzer**

This method of cleaning the flowcells bypasses the shear valve and the UFC pathways.

- Materials required
- Beaker
- Household bleach

Time: 10 minutes

Analyzer mode: Ready to Run



**BIOHAZARD**

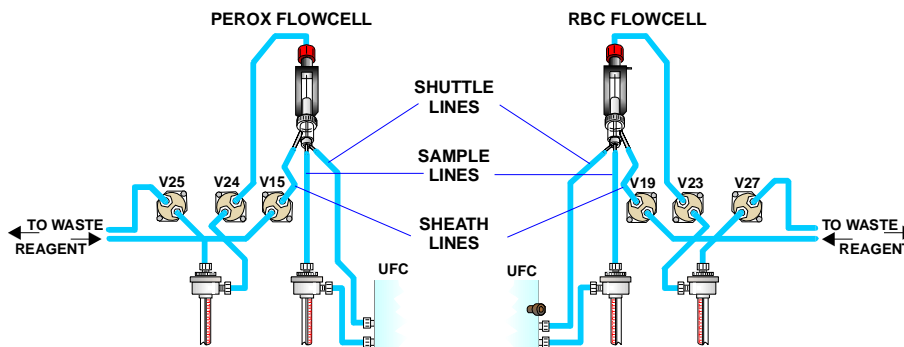
All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



## To clean the perox or RBC flowcell without removing it from the analyzer

There are three tubes associated with each flowcell. Typically, only the sample line is cleaned. The rinse and shuttle lines can be cleaned in the same way.



1. Disconnect the sample tubing from the sample syringe and place the end into a beaker of 25% solution of household bleach.
2. At the Utilities menu, select the **Exerciser** tab and select **Valves** from the list on the left.  
If you are cleaning the RBC flowcell, select **V23** and **V27**.  
If you are cleaning the perox flowcell, select **V25** and **V24**.
3. Allow alternate segments of air and bleach solution to be pulled through the sample line.
4. Put water into a beaker and flush the line clean by allowing water to be pulled through the line.
5. Replace the sample line and close all valves.
6. To clean the sheath or shuttle lines, follow the same procedure.  
When cleaning the sheath line, remove tubing from V15 for the perox sheath line or V19 for the RBC sheath line.  
When cleaning the shuttle line, remove the tubing from the UFC fitting.

## Cleaning the Flowcells off the Analyzer

Clean the flowcell:

- ▶ When there is a clog in the flowcell or in the Concentric Flow Module (CFM)
- ▶ When the flowcell windows are dirty

Materials required:

- ADVIA OPTIpoint
- ADVIA TESTpoint controls
- EZ KLEEN, PN T01-3624
- Flowcell Cleaning Kit, PN 113-B711-01

Kit includes:

- ◆ Drill bit
- ◆ Needle cleaning kit, PN 113-B911-01
  - Coupling
  - Disposable syringe
  - Luer adapter
- ◆ Pin vise
- Household bleach
- Lens tissue
- One 6 inch (15.2 cm) length of 0.020 inch (0.5 mm) ID C-Flex Tubing, PN 562-3052P02
- Spectrophotometric-grade methanol
- Two 50 mL beakers

Syringe preparation

Time: Replacement - 10 minutes  
Checkout - 30 minutes

Analyzer mode: Standby



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

#### **IMPORTANT**

An inspection scope must be available for this procedure. Do not remove the flowcells unless you are trained in how to align and focus them.

#### **To remove and clean the flowcells**

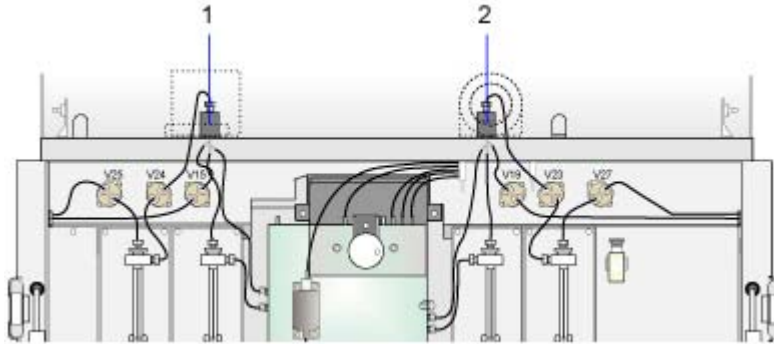
1. Remove the flowcell. There is a different procedure for each flowcell.
2. Take the flowcell apart.
3. Clean the CFM.
4. Flush the flowcell and the CFM.
5. Clean the glass windows of the flowcell.
6. Replace the flowcell.

7. Check analyzer performance.

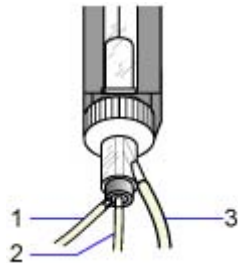
See below for detailed steps.

### **Cleaning the Flowcells off the Analyzer: Step 1 Removing the Perox Flowcell**

1. Make sure that the analyzer is in the Standby mode.
2. Open the optics cover. The perox flowcell is on the left.  
Perox flowcell (1), RBC flowcell (2)

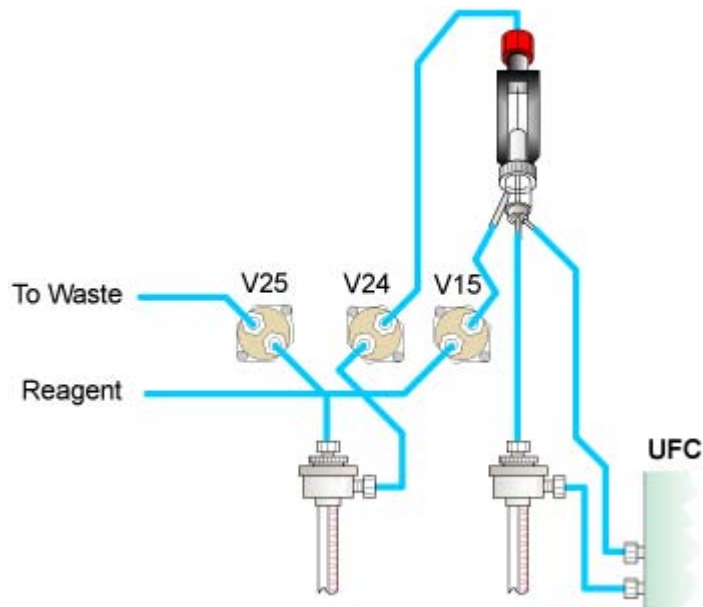


3. Disconnect the shuttle line (1), the sample-stream input line (2), and the sheath-stream input line (3) from the CFM. Allow these lines to hang freely.



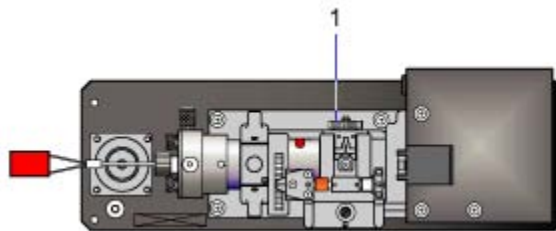
- 1 SHEATH NIPPLE
- 2 SAMPLE NIPPLE
- 3 SHUTTLE NIPPLE

4. Locate hydraulic valve # 24 Unscrew the threaded fitting from the top right side of the valve.

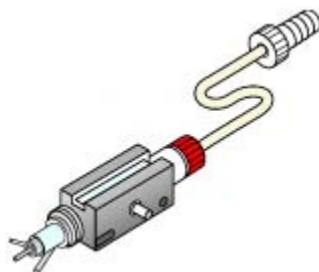


- Release the flowcell by loosening the release knob located on the right of the flowcell adjustment assembly

Flowcell release knob (1) → Front of analyzer



- Hold the flowcell by the red threaded fitting located at the top of the flowcell, then gently lift the flowcell out of the optics assembly.



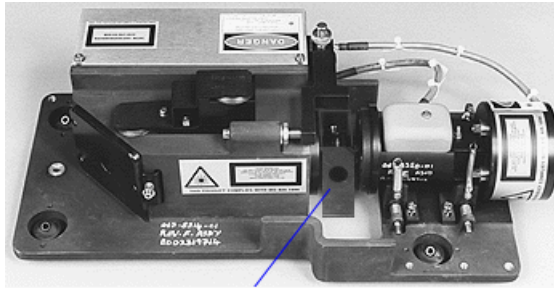
To avoid getting fingerprints on the glass windows of the flowcell, always hold the flowcell by the metal slides.

### **Cleaning the Flowcells off the Analyzer: Step 1 Removing the RBC/BASO/Retic Flowcell**

Before you begin the cleaning of the RBC/baso/retic flowcell, read all laser safety precautions.

 **WARNING**

To avoid possible injury that may occur from laser radiation, do not remove the laser safety shield. You *must not* remove the flowcell if the laser safety shield is not in place on the laser optics assembly.



**LASER SAFETY SHIELD**

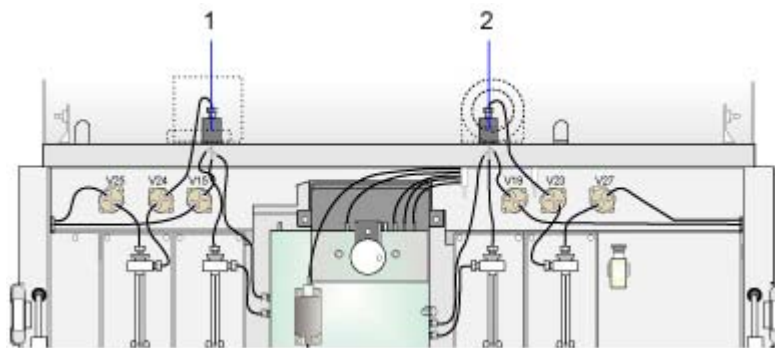
**DO NOT REMOVE!**

 **LASER WARNING**

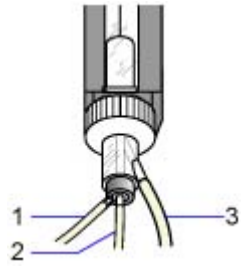
To avoid damage to the eyes, never look directly at the laser beam or at its reflection from a shiny surface. All field service procedures must be followed precisely. Only Siemens-trained field service personnel should perform procedures related to laser assemblies.

For more safety information and laser specifications, refer to **Safety Information, Protecting yourself from lasers**.

1. Make sure that the analyzer is in the Standby mode.
2. Open the optics cover. The RBC flowcell is on the left.  
Perox flowcell (1), RBC flowcell (2)

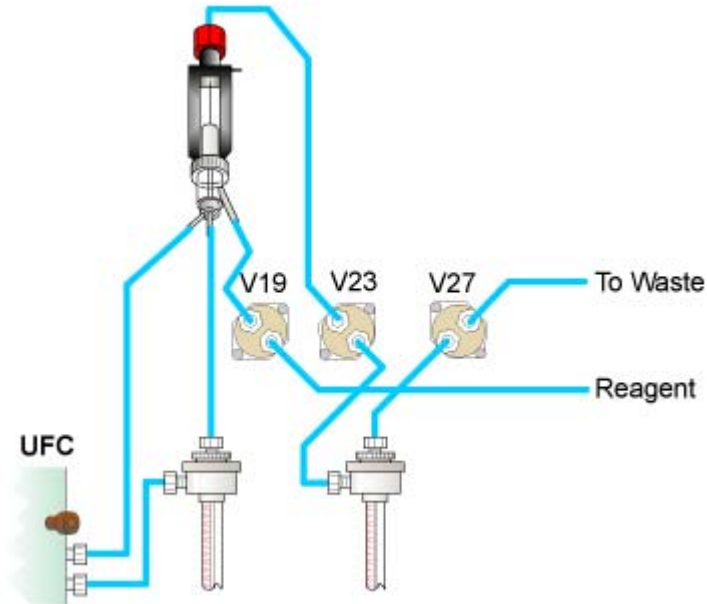


3. Disconnect the shuttle line (1), the sample-stream input line (2), and the sheath-stream input line (3) from the CFM. Allow these lines to hang freely.

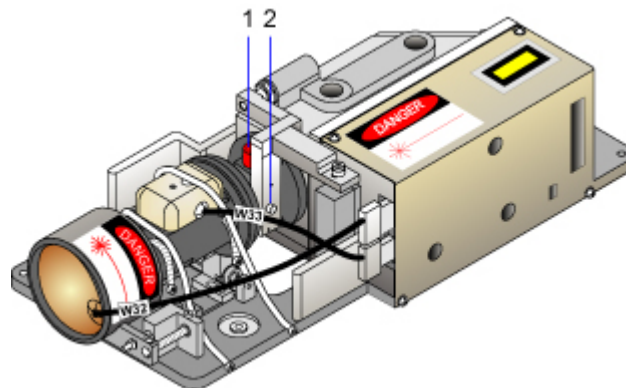


- 1 SHEATH NIPPLE
- 2 SAMPLE NIPPLE
- 3 SHUTTLE NIPPLE

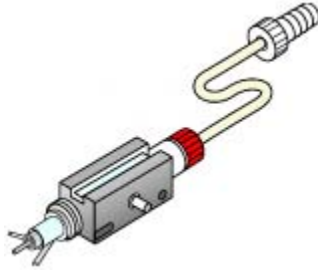
4. Locate hydraulic valve # 23. Unscrew the threaded fitting from the top left-hand side of the valve.



5. Loosen the captive flowcell release screw, then remove the flowcell.  
Flowcell (1), flowcell release screw (2)



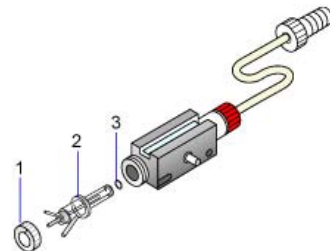
6. Hold the flowcell by the red threaded fitting when lifting the flowcell out of the optics assembly.



To avoid getting fingerprints on the glass windows of the flowcell, always hold the flowcell by the metal slides.

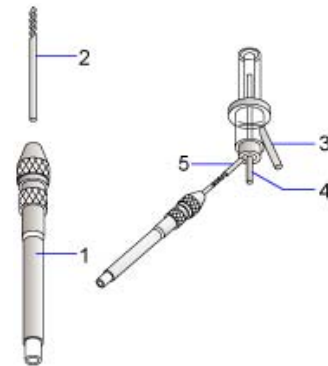
### Cleaning the Flowcells off the Analyzer: Step 2 Taking the Flowcell Apart

1. Unscrew the locking nut (1) at the input end of the flowcell assembly.
2. Using a twisting motion, remove the CFM (2) from the flowcell.
3. Be careful not to lose the O-ring seal (3).



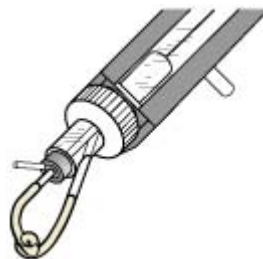
### Cleaning the Flowcells off the Analyzer: Step 3 Cleaning the CFM

1. A pin vise (1) and a 1/64-inch (0.4 mm) diameter drill bit (2) are supplied in the Flowcell Cleaning Kit. Open the pin vise, insert the drill bit approximately 1/4 inch (6.4 mm) into the vise jaws, then tighten the pin vise.
2. Insert the drill bit into the sheath nipple (3). Using a twisting motion, carefully push the drill bit through the sheath nipple. If a clog is encountered, proceed slowly while continuing to twist the drill bit.
3. Repeat step 2 for the sample input nipple (4).
4. Carefully insert the bit into the shuttle nipple (5) to a depth that just barely leaves the flutes of the bit extended beyond the end of the nipple. Twist the drill bit a few times, then remove it from the nipple.

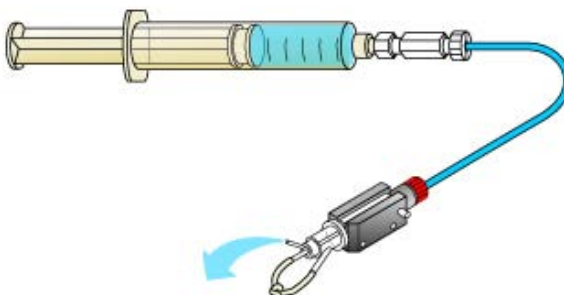


#### Cleaning the Flowcells off the Analyzer: Step 4 Flushing the Flowcell and the CFM

1. Reattach the CFM to the flowcell assembly. Do not overtighten the locking nut.
2. To flush each nipple separately, the other two nipples have to be blocked off. To do this, knot a piece of 0.020(0.5-mm) ID tubing in the middle of its length. Attach the two ends of the tubing to the nipples that are not being flushed.



3. Draw 10 mL of 25% solution of household bleach and water into the syringe. Connect the syringe and adapter to the flowcell-tube-assembly fitting.



4. Working over a sink, carefully press the plunger to push the contents of the syringe into the flowcell and out the open nipple.
5. Switch one end of the knotted tubing to the cleaned nipple.
6. Disconnect the syringe and the adapter, and draw 10 mL of the appropriate fluid into the syringe. Flush the flowcell with the fluid now exiting through the second nipple.
7. Repeat the flushing for the third nipple
8. Repeat steps 2 through 7 using water to rinse out the flowcell and the CFM.
9. Disconnect the syringe and adapter from flowcell tube assembly fitting.

#### Cleaning the Flowcells off the Analyzer: Step 5 Cleaning the Glass Windows of the Flowcell

1. Fold a piece of lens tissue so that one edge is slightly narrower than the optical glass window.



To avoid getting material from your hands onto the optical surfaces (glass windows), do not touch the area of lens paper that will come in contact with the glass windows.

2. Soak this edge of the tissue paper with methanol.

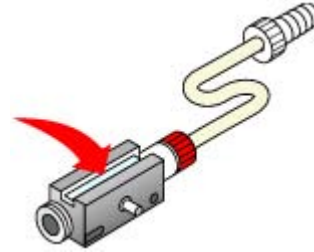




## CAUTION

Since impure methanol can leave a film on the windows, use only uncontaminated spectrophotometric-grade methanol.

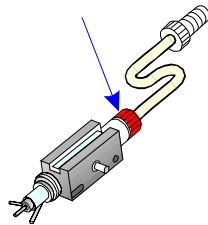
3. Gently wipe one glass surface. Discard the used piece of lens tissue. To prevent formation of a methanol film, completely dry the glass using a clean piece of lens tissue.



4. Examine the clean surface. If the window is not clean enough, repeat steps 1 through 3.
5. Repeat steps 1 through 4 for the other optical window.

## Cleaning the Flowcells off the Analyzer: Step 6 Replacing the Flowcell

1. Hold the flowcell by its red threaded fitting and place it gently into the optics assembly.



2. **Perox optical assembly**

Tighten the release knob to lock the flowcell into position.

### **RBC/baso/retic optical assembly**

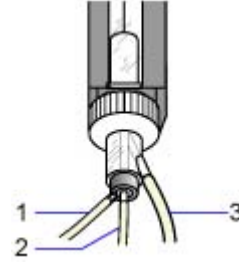
Place the flowcell onto the guide pins. Make sure that the flowcell is on both guide pins. The flowcell will be at a 4° angle. Tighten the flowcell release screw.

3. Reconnect the hydraulic lines to the CFM. Reconnect the flowcell tube assembly fitting to the appropriate hydraulic valve (V24 and V23). Hand tighten the connection enough to prevent leaks.

### **IMPORTANT**

To avoid incorrect patient data, make sure that each hydraulic line is attached to the correct CFM nipple.

- Shuttle line from UFC assembly (3)
- Sample line from syringe (2)
- Sheath line from hydraulic valve (1)
- V15 - perox or V19 - RBC



## **Cleaning the Flowcells off the Analyzer: Step 7 Checking Analyzer Performance**

### **IMPORTANT**

An inspection scope must be available for this procedure. Do not remove the flowcells unless you are trained in how to align and focus them.

1. Bring the analyzer to the **Ready to Run** mode.
2. At the Operations menu, select **Startup**, select **Refresh**, and verify the background count.
3. Check the flowcell connections for leaks.
4. Check the focus and alignment of the flowcell.
5. Check the gains.
6. Run a whole-blood primer, then run controls to verify analyzer performance.
7. If the control results are acceptable to the laboratory, no additional action is required and normal operation can be resumed.

## **Backflushing the Perox Flowcell and Shuttle and Reaction Chambers**

Materials required:

- Flowcell cleaning kit, PN 113-B711-01
- EZ KLEENBeaker
- Deionized water

Analyzer mode: Ready to Run



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

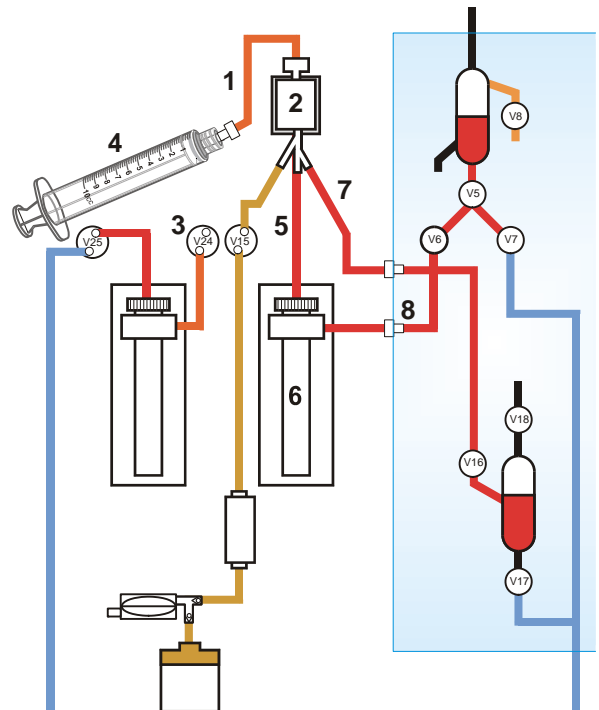
The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



## CAUTION

When performing this procedure, do not use force on the syringe at any time.

1. At the Utilities menu, select **Exerciser** to open the Exerciser tab.
2. Disconnect the waste tubing (1) that comes from the Perox flowcell (2) at V24. This is the white fitting at V24 (3).
3. Fill the cleaning syringe (4) EZ KLEEN and attach it to the white fitting. Refill the syringe EZ KLEEN as needed during the following steps.
4. Disconnect the sample tubing (5) from the top of the sample syringe (6) and place the sample tubing into a beaker to catch fluid as you backflush the flowcell
5. Gently push the plunger on the cleaning syringe to flush the EZ KLEEN through the Perox flowcell (2). Repeat with deionized water.
6. Reattach the sample tubing (5) to the top of the sample syringe (6)
7. Refill the syringe with EZ KLEEN.
8. Disconnect the shuttle line (7) from the side of the UFC (8) and place the sample tubing into a beaker to catch fluid as you backflush the flowcell.
9. Gently push the plunger on the cleaning syringe to flush the EZ KLEEN through the Perox flowcell (2). Repeat with deionized water.
10. Reattach the shuttle line (7) to the side of the UFC (8).
11. Refill the syringe with EZ KLEEN.



12. At the Valves window of the **Exerciser** tab, open V16 and V17 and then push the syringe to push EZ KLEEN through the shuttle pathway to the VSC chamber. Repeat with deionized water and then close V16 and V17.
13. Refill the syringe with EZ KLEEN.
14. At the Valves window of the Exerciser tab, open V5 and V6. Remove the cap from the Perox chamber (9) and then push the syringe to fill the chamber. When the chamber is full, open V7 to drain it. Close V7. Repeat with deionized water and then close V5, V6, and V7.
15. Remove syringe (4) from the white fitting.
16. Reattach the line to the fitting on V24 (3).
17. Select the **Analyzer Status** tab to exit the Exerciser.
18. Open the **Hydraulic Functions** tab and then perform one System Wash cycle.
19. Run controls to verify system performance.

## **Backflushing the RBC/baso/retic Flowcell and Shuttle and Reaction Chambers**

Materials required:

- Flowcell cleaning kit, PN 113-B711-01
- EZ KLEEN Beaker
- Deionized water

Analyzer mode: Ready to Run



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

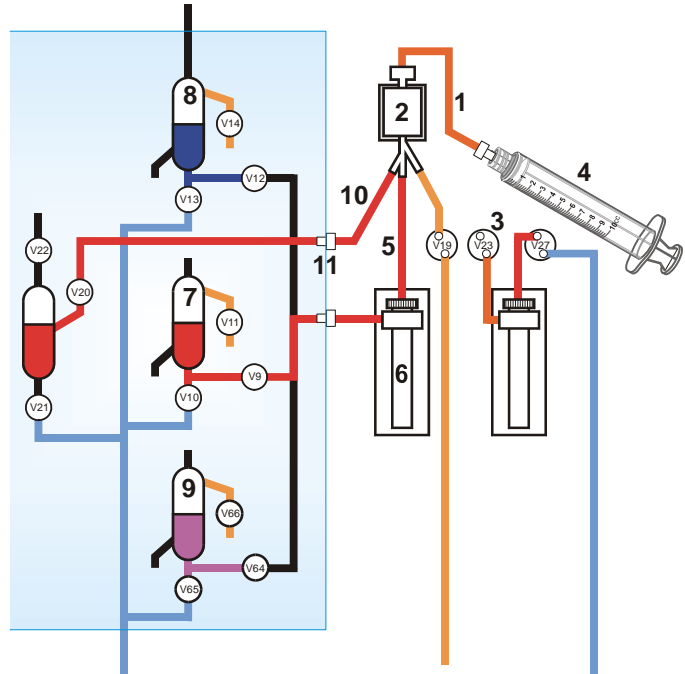
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**CAUTION**

When performing this procedure, do not use force on the syringe at any time.

1. At the Utilities menu, select **Exerciser** to open the Exerciser tab.
2. Disconnect the waste tubing (1) that comes from the RBC flowcell (2) at V23. This is the white fitting at V23 (3).
3. Fill the cleaning syringe (4) 25% household bleach solution and attach it to the white fitting. Refill the syringe with bleach solution as needed during the following steps.



4. Disconnect the sample tubing (5) from the top of the sample syringe (6) and place the sample tubing into a beaker to catch fluid as you backflush the flowcell.
5. Gently push the plunger on the cleaning syringe to flush the bleach solution through the RBC flowcell (2). Repeat with deionized water.
6. Reattach the sample tubing (5) to the top of the sample syringe (6).
7. Refill the syringe with bleach solution.
8. At the Valves window of the Exerciser tab, open V9 and then push the syringe to fill RBC chamber (7) with 25% bleach, then open V10 to drain. Close V9 and V10. Repeat with deionized water.
9. Refill the syringe with bleach solution.
10. In the **Valves** window of the **Exerciser** tab, open V12 and then push the syringe to fill Baso chamber (7) with bleach solution, then open V13 to drain. Close V12 and V13. Repeat with deionized water.
11. Refill the syringe with bleach solution.
12. At the Valves window of the Exerciser tab, open V64 and then push the syringe to fill Retic chamber (7) with bleach solution, then open V65 to drain. Close V64 and V65. Repeat with deionized water.
13. Disconnect the shuttle line (10) from the side of the UFC (11) and then place the end of the sample tubing into a beaker to catch fluid as you backflush the flowcell.
14. Refill the syringe with bleach solution.

15. Gently push plunger on the cleaning syringe to flush bleach solution through the RBC flowcell (2). Repeat with deionized water.
16. Reattach the shuttle line (10) to the side of the UFC (11).
17. Refill the syringe with bleach solution.
18. At the Valves window of the Exerciser tab, open V20 and 21 and then push the syringe to push bleach solution through the shuttle pathway to the VSC chamber. Repeat with deionized water and then close V20 and V21.
19. Remove syringe (4) from the white fitting.
20. Reattach the line to the fitting on V23 (3).
21. Select the Analyzer Status tab to exit the Exerciser.
22. Open the **Hydraulic Functions** tab and then perform one System Wash cycle.
23. Run controls to verify system performance.

## Repair and Replacement

### Replacing the Clot Filters

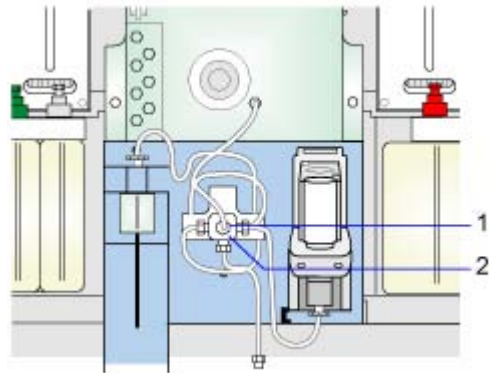
Materials required:

- Lens tissue
- Replacement clot filter, PN 113-3719-01

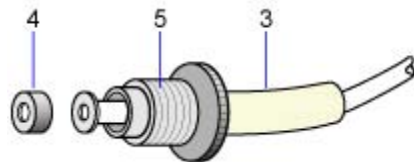
Time: Replacement - 5 minutes

Checkout - 5 minutes

Analyzer mode: Standby



1. Unscrew the fitting and tube assembly (1) from the front of the selector valve (2).



2. Gently push the silicone sleeve (3) to release the clot filter (4) from the filter adapter fitting (5).
3. Visually check the filter adapter fitting and the input port of the selector assembly for any dirt or small particles.
4. If you find some debris, use a piece of lens tissue moistened with water to remove it.

5. Wet the new clot filter with water and place it into the filter adapter fitting. Orientation of the filter is not important.
6. Reconnect the filter adapter fitting to the selector valve. Finger tighten.  
**IMPORTANT**  
Be very careful not to misthread the fitting. Misthreading could strip the valve which will prevent proper operation.
7. Run a sample and visually check for air bubbles in the sample line between the selector valve and the UFC block.
8. Check aspiration rate.
9. If air bubbles appear, check that the filter adapter fitting is screwed on correctly and that it is finger-tight, then repeat step 7. If air bubbles still appear, disconnect the filter adapter fitting and check for dust or debris in the fitting and in the port.  
If air bubbles still persist, call Siemens technical support.

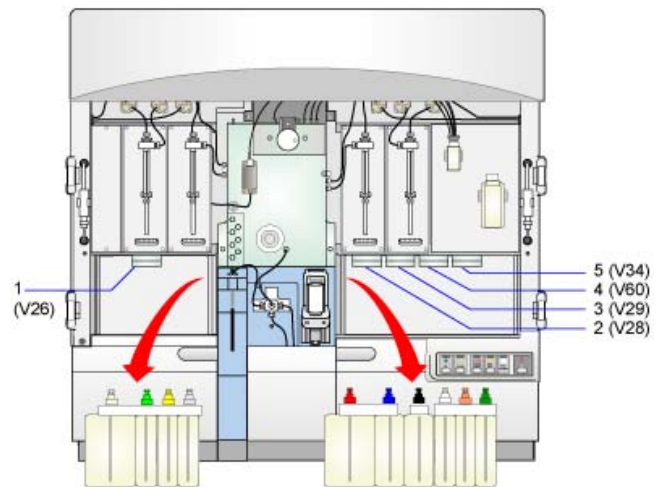
## Replacing the Diaphragm Pumps

Time: Replacement - 5 minutes  
Checkout - 15 minutes

Materials required:

- |   |   |
|---|---|
| 1 | <b>DP1 - PEROX SHEATH</b>                           |
| 2 | <b>DP2 - SHEATH /RINSE</b>                          |
| 3 | <b>DP3 - SHEATH /RINSE</b>                          |
| 4 | <b>DP4 - WASH</b><br><b>PN 067-B294-04</b>          |
| 5 | <b>DP5 - SHEATH /RINSE</b><br><b>PN 067-B294-01</b> |

Analyzer mode: Off



**REMOVE BOTTLES TO ACCESS DIAPHRAGM PUMPS**

1. Remove the reagent bottles from the side where you are replacing the diaphragm pump.
2. Pull the pump forward until it is released from its keyhole slots.
3. Remove the three tubes, then attach these tubes to the new pump.
4. Insert the raised studs on the top of the pump into the keyholes and push the pump back until it is secure.
5. Replace the reagent bottles.
6. Checkout
  - ▶ For all replaced pumps - prime reagent lines and verify that there are no leaks.

- ▶ If DP1 is replaced, run two saline primers. At the Operations menu, select the Startup tab. Select **Refresh** and verify that the WBC background count is 0.1 or less (1000 cells/ $\mu$ L).
- ▶ If DP4 is replaced, do a system wash and verify that the reaction chambers are filling up with wash solution to their normal wash levels.
- ▶ If DP5 is replaced, run two saline primers. At the Operations menu, select the Startup tab. Select **Refresh** and verify that the platelet background count is 5 or less (1000 cells/ $\mu$ L).

If required, run additional saline samples until acceptable background counts are obtained for two consecutive samples. If more than five saline samples are required, verify that the pump was installed properly.

7. Run controls to verify analyzer performance.

## Replacing the Drain Filters

If the filter is not clogged but you want to clean it because of heavy buildup or discoloration, use the backflush procedure.

Time: 10 minutes

Analyzer mode: Off



**WARNING**

The analyzer *must* be off; otherwise, personal injury from the needle may occur.



**BIOHAZARD**

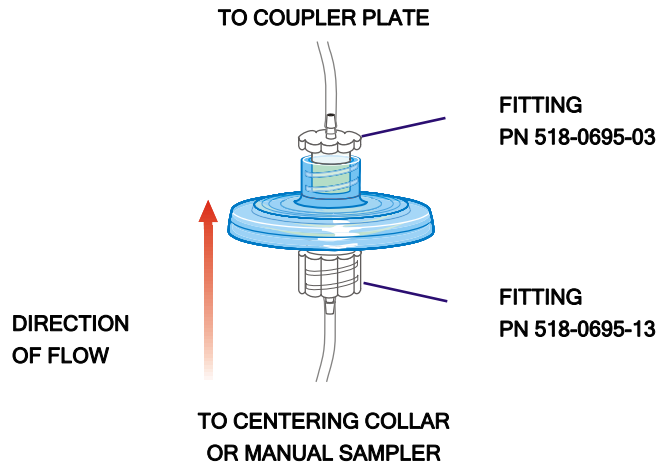
All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

1. Turn the analyzer off.
2. Unscrew the old filter from both fittings. Discard the old filter.
3. Connect the new filter to the fittings and hand tighten them to ensure they are sealed.



4. Turn the analyzer on and run samples in the manual and autosampler modes. Check to ensure that there are no leaks and that fluid passes through the filters properly. Make sure that the lines do not interfere with autosampler aspirator motion.



## Replacing a Perox Check Valve

Time: Installation and Checkout - 15 minutes

Materials required: Check valve, PN 556-1190-01

Analyzer mode: Standby

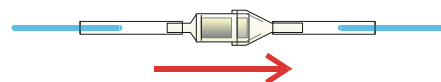


**BIOHAZARD**

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The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

1. Remove the old check valve from the Perox line.
2. Install the check valve into the line with the direction of flow toward the reagent pump and away from the reagent bottle, as shown by the red arrow in the figure to the right. Make sure not to damage the tube sleeve on the valve.



3. Prime the reagent lines. Visually verify that the lines are priming.
4. Run controls.

## Replacing the Front Shear Face or the Shear Valve Rotor

Materials required:

- ADVIA TESTpoint controls
- Calibrators (as required)
- Front shear valve face, PN 067-0558-01
- Shear-valve rotor, PN 067-0876-01
- Whole blood

Time: Replacement - 5 minutes  
Checkout - 15 minutes

Analyzer mode: Standby



## BIOHAZARD

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The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

### **To remove and replace the front shear valve face or the shear-valve rotor**

In the maintenance procedure, **Cleaning the Shear Valve**

- Go to **Step 1** to take the shear valve apart.
- Go to **Step 3** to reassemble the shear valve with the new part.

### **To check analyzer performance**

- At the Operations menu, select the **Startup** tab and verify background counts.
- Run a whole blood primer.
- Run controls. If controls do not recover, calibrate the affected channel.

## Replacing the fuses

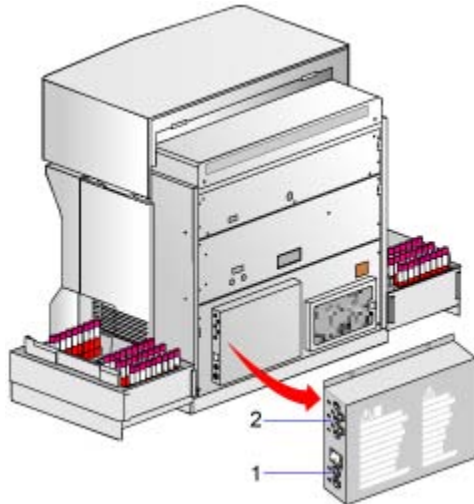
### IMPORTANT

All fuses must be replaced with same rated fuses.

Materials required: Flat-head screwdriver

Fuse ratings and part numbers:

FUSE APPLICATION			FUSE RATINGS	
FUSE NO.	DEVICE PROTECTED	TYPE	100 V	220 V
			120 V SYSTEMS	230 V 240 V SYSTEMS
F1	AC Input (L1)	3 AB	15.00A (T) 250V PN625-0073-03	8.00A (T) 250V PN625-0073-02
F2	AC Input (L2)	3 AB	15.00A (T) 250V PN625-0073-03	8.00A (T) 250V PN625-0073-02
F3	Computer/Monitor at J24 and J25	20mm	6.30A (T) 250V PN 625-0127-11	3.15A (T) 250V PN 625-0127-10
F4	Power Supply PS1 +5V	20mm	0.50A (T) 250V PN625-0127-09	0.25A (T) 250V PN 625-0127-07
F5	Power Supply PS4 +5V Perox Lamp and ±15V	20mm	2.00 A (T) 250V PN 625-0127-04	1.00A (T) 250V PN 625-0144-03
F6	Power Supply PS2 +24V	20mm	4.00A (T) 250V PN 625-0127-05	2.00A (T) 250V PN 625-0127-04
F7	Power Supply PS3 +5V and ±12V	20mm	3.15A (T) 250V PN 625-0127-10	1.60A (T) 250V PN 625-0127-06



Both main fuses, F1 and F2, must be replaced if either one is blown.

Location:

Two main fuses, F1 and F2 (1); fuses F3 through F7 (2)



Analyzer mode: Off, power cord unplugged

#### To replace the 20-mm fuses (F3 through F7)

1. Loosen the fuse holder by turning it counterclockwise.
2. Pull out the fuse holder, then remove the faulty fuse.
3. Insert the new fuse, slide the fuse holder in, and tighten it by turning it clockwise.
4. Plug in the power cord and set the power switch to **I** (on).

#### To replace main fuses (F1 and F2)

##### NOTE

Both fuses must be replaced.

1. With a screwdriver, loosen the fuse cap by turning it counterclockwise.

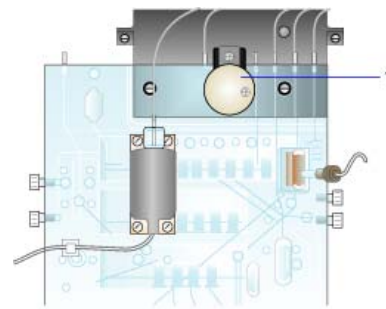


2. Remove the fuse cap and replace the fuse.
3. Install the fuse cap and tighten it by turning it clockwise.
4. Plug in the power cord and set the power switch to **I** (on).

## Replacing the Hemoglobin Colorimeter Lamp

When to replace the lamp:

- If there is an HGB-PL error.
- If it is burned out.
- If the baseline value falls below 2.5.
- If the baseline value cannot be adjusted to between 3.0 and 4.1 volts.
- If indicated during troubleshooting.



When to adjust the baseline value:

- After replacing the lamp.
- If the baseline value is  $>4.2$  volts.
- If indicated during troubleshooting.



### **WARNING**

Avoid burns. Allow enough time for the hemoglobin lamp to cool. After power is shut off, wait at least 5 minutes before removing the lamp.

Materials required:

- ADVIA TESTpoint controls
- Calibrators, as required
- Hemoglobin colorimeter lamp, PN 113-B413-01
- Hex wrench, 1/16-inch (1.6-mm)
- Phillips-head screwdriver

Time: Replacement - 15 minutes  
Checkout - 25 minutes

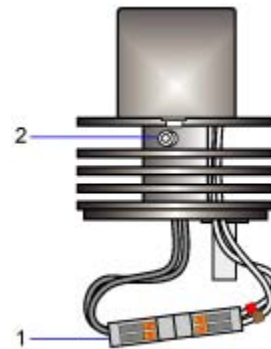
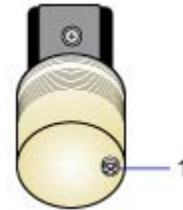


## ELECTRICAL WARNING

To avoid exposure to shock hazards and/or damage to the instrument while performing this procedure, power off the analyzer before proceeding.

Analyzer mode: Off

1. Remove the screw (1) that secures the lamp adapter cap, then remove the cap. Be careful not to lose the two washers. Keep the hardware and the cap.
2. Disconnect the cables (2).
3. Using the hex wrench, loosen the set screw (3) to release the old lamp, then remove it.
4. Gently push the new lamp into the housing as far as it will go, then secure it by tightening the set screw.
5. Reconnect the cables. Replace the lamp adapter cap and secure it with the screw.



6. Turn the analyzer power on. Check that there are no error messages on the Status line relating to hemoglobin colorimeter baseline readings.
7. At the Operations menu, select the **Startup** tab. Select **Refresh** and check the Hgb baseline transmission value (Hgb Trans). If the baseline value is not acceptable, adjust it to 4.1.
8. Run controls to verify analyzer performance. If controls are not acceptable, then recalibrate the hemoglobin channel.

## Replacing the Hydraulic Valves

There are six hydraulic valves: three are located below the perox flowcell, and three are below the RBC/baso/retic flowcell.

Materials required:

- Flat-head screwdriver, small
- Hydraulic valve, PN 067-1024-01

Time: Replacement - 10 minutes  
Checkout - 15 minutes

Analyzer mode: Off



### **ELECTRICAL WARNING**

To avoid exposure to shock hazards and/or damage to the instrument while performing this procedure, power off the analyzer before proceeding.



### **BIOHAZARD**

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The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS).

This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

1. Remove the tubing from the ports on the valve fitting, then carefully unscrew the fittings.
2. Remove the two mounting screws. Pull the valve forward until the connector is exposed, then disconnect the cable.
3. Connect the cable of the new valve assembly to the exposed connector on the analyzer.
4. Tuck the cable back into the opening. Mount the new valve, using the two screws saved in step **2**.
5. Replace the fittings. Make sure that they are threaded correctly. Fingers tighten.

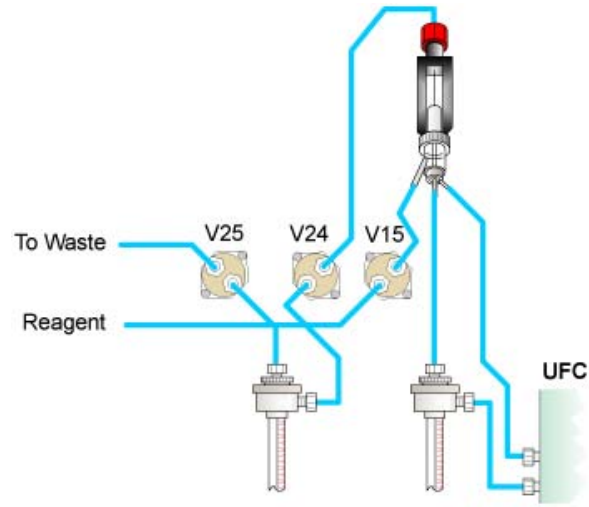


### **CAUTION**

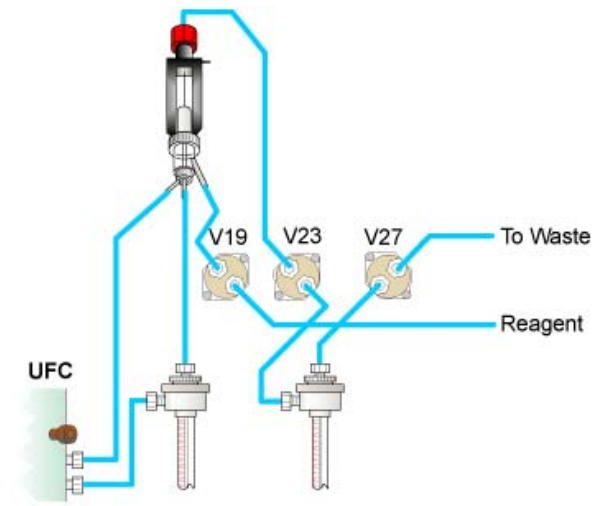
Do not overtighten, or you may cause damage to valve or fittings.

6. Connect tubing.





**Perox flowcell connections**



**RBC flowcell connections**

7. Run controls. Check for leaks and verify system performance.

## Replacing the Open-Tube Sampler Probe

Materials required:

- Sample probe assembly, PN 113-B646-01
- Scalpel or single-edge razor

Time: Replacement - 10 minutes  
Checkout - 15 minutes

Analyzer mode: Off

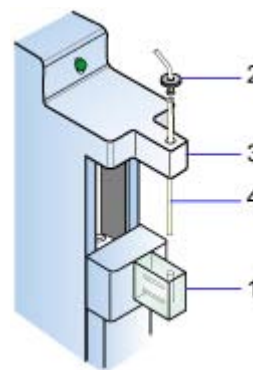


**BIOHAZARD**

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1. Carefully push the wash block (1) down to its fully lowered position.
2. Remove the threaded fitting (2) from the probe mount (3) by turning it counterclockwise.
3. Carefully slide the probe (4) up and out of the probe mount.
4. Discard the probe.
5. Remove the plastic ring and spacer from the replacement probe and discard. Carefully insert the probe through the opening of the probe mount (3) and into the opening of the wash block.



Replace the threaded fitting and finger tighten by rotating it clockwise

6. Check the length of the sample probe and adjust if necessary. (See page 5-3 for instructions.)
7. Before starting to run patient samples again, check operation as follows:
  - a. Run several saline primers to verify that there are no leaks, then run a whole-blood primer to verify that the probe is being properly washed after aspiration.

- b. Visually check for bubbles in the open-tube sample line.
- c. Run enough controls to verify analyzer performance. If control results are not acceptable, check that the probe has been properly installed. If no problem is found, recalibrate the affected channel.

## Replacing the Perox Lamp



### WARNING

To prevent injury to eyes from shattered glass, wear safety glasses when handling tungsten-halogen lamps.

To avoid severe burns, allow sufficient time for the lamp to cool. After the analyzer is turned off, wait at least 10 minutes.



### CAUTION

Fingerprints on the lamp could cause severe degradation in lamp performance.

DO NOT touch the lamp with your fingers.

Material required: Replacement lamp, PN 065-B075-01

Time: Replacement - 20 minutes  
Adjustment and checkout - 20 minutes

Analyzer mode: Off, wait at least 10 minutes.



### ELECTRICAL WARNING

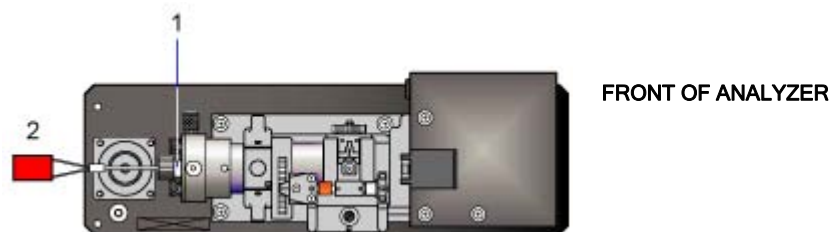
To avoid exposure to shock hazards and/or damage to the instrument while performing this procedure, power off the analyzer before proceeding.

To replace the perox lamp (1)

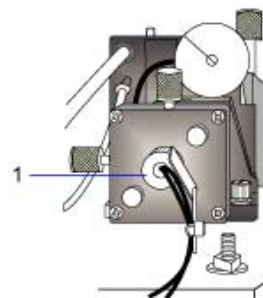
### IMPORTANT

Make sure that the power is off before disconnecting the lamp.

1. Disconnect the lamp power connector (2) in the back of the perox optics assembly by squeezing the sides of the red connector and pulling it apart.



2. Unscrew the securing cap to which the power cable (2) is attached. Carefully pull the lamp assembly out of the optics lamp housing. The lamp assembly includes the lamp, the power cable, and the securing cap. Discard the entire assembly.



VIEW FROM  
BACK OF PEROX  
OPTICS ASSEMBLY

3. Insert the replacement lamp assembly.



#### CAUTION

Do not touch the glass bulb. If necessary, clean with lens paper and methyl alcohol.

4. Replace the securing cap, then connect the red power connector.
5. Turn the analyzer on and align the lamp to maximize its output. (See page 5-4 for instructions.)

## Replacing the perox flowcell

Time: Installation - 15 minutes  
Checkout - 15 minutes

Analyzer mode: Standby



#### BIOHAZARD

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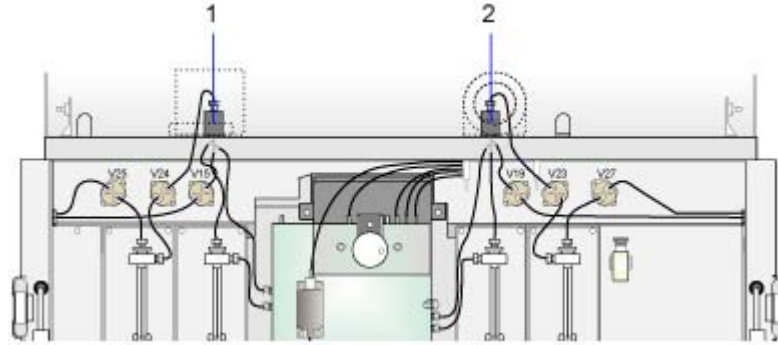
#### IMPORTANT

An inspection scope must be available for this procedure. Do not remove the flowcells unless you are trained in how to align and focus them.

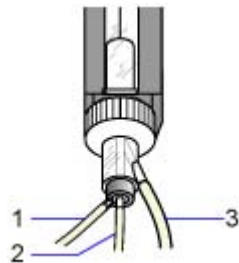
#### To remove the flowcell

1. Make sure that the analyzer is in the Standby mode.

- Open the optics cover. The perox flowcell is on the left.  
Perox flowcell (1), RBC flowcell (2)

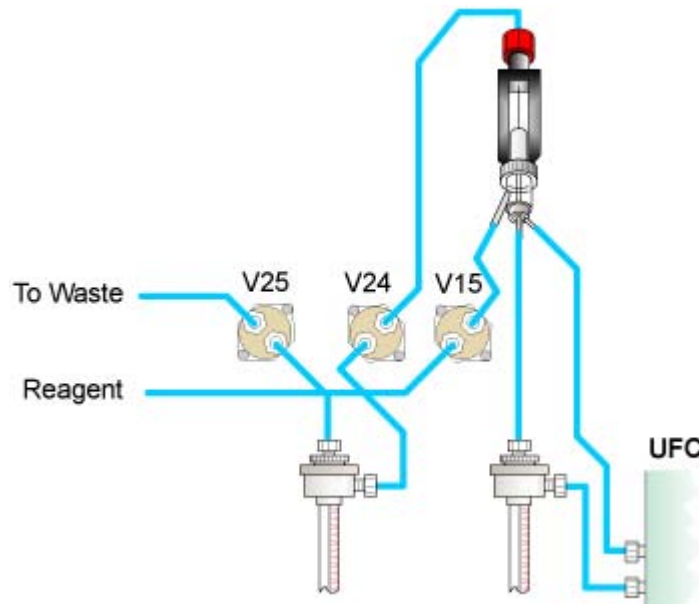


- Disconnect the shuttle line (1), the sample-stream input line (2), and the sheath-stream input line (3) from the CFM. Allow these lines to hang freely.



- 1 SHEATH NIPPLE
- 2 SAMPLE NIPPLE
- 3 SHUTTLE NIPPLE

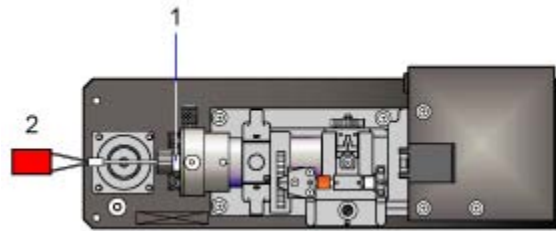
- Locate hydraulic valve # 24, Unscrew the threaded fitting from the top right side of the valve.



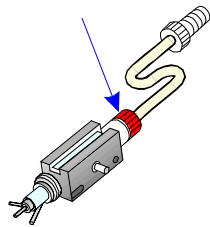
- Release the flowcell by loosening the release knob located on the right of the flowcell adjustment assembly

Flowcell release knob (1)

→ Front of analyzer



6. Hold the flowcell by the red threaded fitting located at the top of the flowcell, then gently lift the flowcell out of the optics assembly.



**CAUTION**

To avoid getting fingerprints on the glass windows of the flowcell, always hold the flowcell by the metal slides.

#### To install the flowcell

1. Hold the flowcell by its red threaded fitting and place it gently into the optics assembly.
2. Tighten the release knob to lock the flowcell into position.
3. Reconnect the hydraulic lines to the CFM. Reconnect the flowcell tube assembly fitting to the appropriate hydraulic valve, V24. Hand tighten the connection enough to prevent leaks.

#### IMPORTANT

To avoid incorrect patient data, make sure that each hydraulic line is attached to the correct CFM nipple.

#### To check analyzer performance

1. Bring the analyzer to the Ready to Run mode, then run a saline primer.
2. Check the flowcell connections for leaks and verify saline background on the Startup tab.
3. At the Procedures menu, select the **Align Optics** tab.
4. Select the Info button for help.
5. At the Logs menu, select **Cal/Gain Logs** and check gain factors. Adjust gains if necessary.

6. Run a whole-blood primer, and then run controls to verify analyzer performance.
7. If the control results are acceptable to the laboratory, no additional action is required and normal operation can be resumed.

## Replacing the RBC/baso/retic flowcell

Before you remove the RBC/baso/retic flowcell, read all laser safety precautions.

Time: Installation - 15 minutes

Checkout - 15 minutes

Analyzer mode: Standby



**BIOHAZARD**

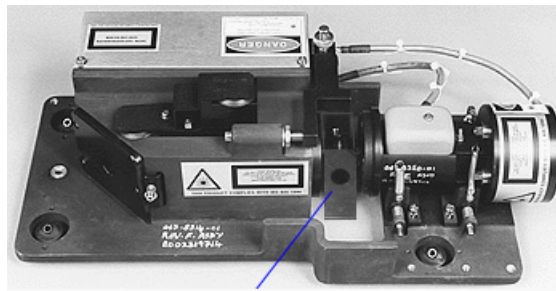
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The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



**WARNING**

To avoid possible injury that may occur from laser radiation, do not remove the laser safety shield. You *must not* remove the flowcell if the laser safety shield is not in place on the laser optics assembly.



**LASER SAFETY SHIELD**

**DO NOT REMOVE!**

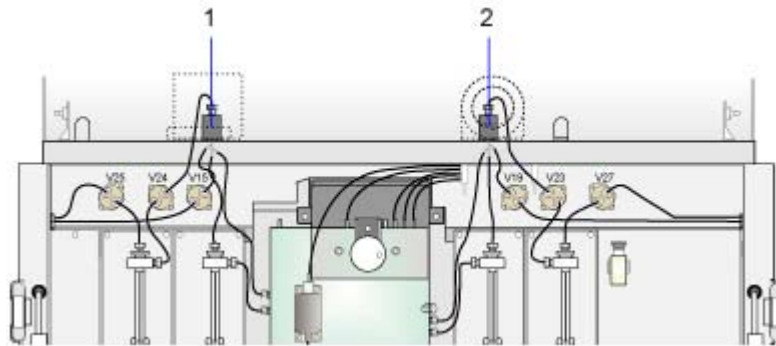


## LASER WARNING

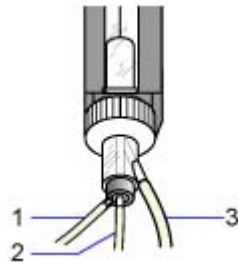
To avoid damage to the eyes, never look directly at the laser beam or at its reflection from a shiny surface. All field service procedures must be followed precisely. Only Siemens-trained field service personnel should perform procedures related to laser assemblies.

For more safety information and laser specifications, refer to **Safety Information, Protecting yourself from lasers**.

1. Make sure that the analyzer is in the Standby mode.
2. Open the optics cover. The RBC flowcell is on the left.  
Perox flowcell (1), RBC flowcell (2)



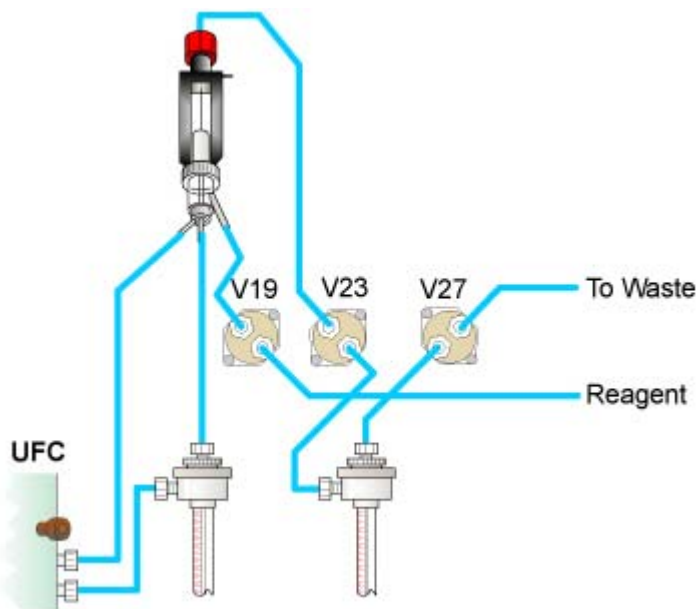
3. Disconnect the shuttle line (1), the sample-stream input line (2), and the sheath-stream input line (3) from the CFM. Allow these lines to hang freely.



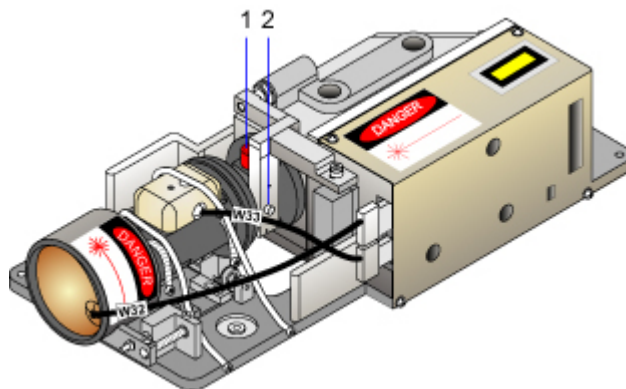
- 1 SHUTTLE NIPPLE
- 2 SAMPLE NIPPLE
- 3 SHEATH NIPPLE

4. Locate hydraulic valve # 23. Unscrew the threaded fitting from the top left-hand side of the valve.

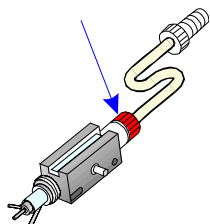




- Loosen the captive flowcell release screw, then remove the flowcell.  
Flowcell (1), flowcell release screw (2)



- Hold the flowcell by the red threaded fitting when lifting the flowcell out of the optics assembly.



To avoid getting fingerprints on the glass windows of the flowcell, always hold the flowcell by the metal slides.

### **To install the flowcell**

1. Hold the flowcell by its red threaded fitting and place it gently into the optics assembly.
2. Place the flowcell onto the guide pins. Make sure that it is resting on both pins. The flowcell will be at a 4° angle. Tighten the captive flowcell release screw to lock the flowcell into position.
3. Reconnect the hydraulic lines to the CFM. Reconnect the flowcell tube assembly fitting to the appropriate hydraulic valve, V234. Hand tighten the connection enough to prevent leaks.

### **IMPORTANT**

To avoid incorrect patient data, make sure that each hydraulic line is attached to the correct CFM nipple.

### **To check analyzer performance**

1. Bring the analyzer to the Ready to Run mode, then run a saline primer.
2. Check the flowcell connections for leaks and verify saline background on the Startup tab.
3. At the Procedures menu, select the **Align Optics** tab.
4. Select the Info button for help.
5. At the Logs menu, select **Cal/Gain Logs** and check gain factors. Adjust gains if necessary.
6. Run a whole-blood primer, and then run controls to verify analyzer performance.
7. If the control results are acceptable to the laboratory, no additional action is required and normal operation can be resumed.

### **Replacing the syringes**

To remove and replace one of the syringes, follow instructions in the Maintenance section, replacing the Syringe Plungers.

### **Replacing the vacuum pump filter (vacushield)**

The vacuum filter traps liquid that would otherwise enter and damage the vacuum pump. Replace this filter if it becomes saturated with liquid.

Materials required:

- Flat-head screwdriver, large
- Paper towels
- Vacushield filter  
PN 518-3146-01

Time:

Replacement - 10 minutes

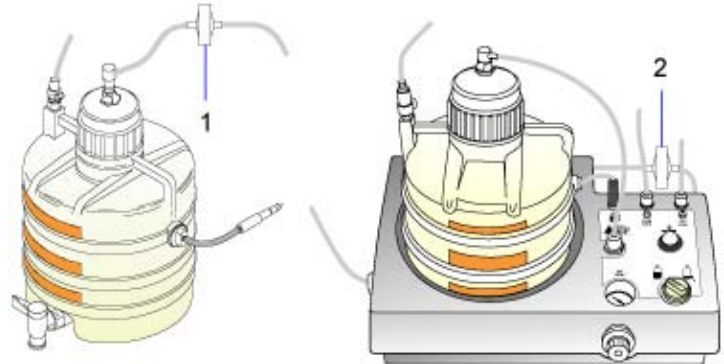
Checkout - 10 minutes

Analyzer mode: Off

The words **FLUID SIDE** are imprinted on each filter.

Location of the filters:

manual (1) and automatic (2) waste containers



#### BIOHAZARD

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

#### To replace the filter

1. Place paper towels under the filter.
2. Disconnect and discard the filter.
3. Install the new filter.

#### IMPORTANT

The direction of the filter is important. Look for the words **FLUID SIDE** on the filters and orient the filters in the lines as shown in the figure above.

4. Discard the paper towels.
5. Turn the analyzer power on.



#### CAUTION

To avoid serious damage to the analyzer, you must never turn on the analyzer without the vacushield filter in place.

6. For the manual waste removal, at the Utilities menu select the **Analyzer Status** tab. At the Vacuum and Pressure area, check that the 20 in. Hg reading is between 19 and 21. If required, adjust the 20 in. Hg vacuum regulator knob.

**IMPORTANT**

All pneumatic settings must be reached by turning the knobs in an upward or clockwise direction only. If a reading goes above the target value, turn the knob back and allow the analyzer to equilibrate. The analyzer displays a new reading every five seconds. Adjust upward to the correct value.

For systems with automatic waste removal, also verify the 20 psi reading. If necessary, adjust the pressure regulator knob.

7. If a 19 to 21 reading cannot be reached, check that the lines to the filter are secure. If you are still having difficulty, call Siemens technical support.

## Replacing the wash block

Time: Replacement - 5 minutes  
Checkout - 15 minutes

Analyzer mode: Standby



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2nd edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

1. Remove the sample probe. (See page 5-37 for instructions.)
2. Wait for about two minutes until the vacuum is released from the wash block. Gently move the push-to-aspirate paddle and wash-block assembly down approximately 1 inch (25.4 mm).
3. Support the push-to-aspirate paddle with one hand. With the fingers of your other hand grab the top and bottom of the wash block and gently push down on the block until it slides down about ¼ inch (6.5 mm). Align the tabs on the wash block with the openings on the paddle assembly. Remove the block by gently pulling it straight out.

4. Mark the tubes with tape (the top line is rinse and the bottom line is vacuum), then remove the lines. Be careful not to allow the tubes to fall behind the aspirate paddle assembly. If necessary, use hemostats to hold the tubing outside the assembly.
5. Connect the lines to the new block.
6. Install the block onto the aspirator assembly by aligning the tabs with the appropriate slots. Push the block into the assembly and gently slide the block upward until it clicks into place. Be careful that you do not pinch the wash or vacuum line during the installation process.
7. Check the length of the probe. (See page 5-3 for instructions.)
8. Run several saline samples and verify that there are no leaks or bubbles in the sample line.
9. Run a whole blood primer to verify that the probe is being properly washed and dried after aspiration.
10. Run controls to verify analyzer performance.

## Troubleshooting Tips

### Autosampler Troubleshooting Tips

**“Eject rack” or “Rack in sampler” status line error messages appear when the analyzer is powered off then turned on again.**

To avoid autosampler errors, you should wait for the following two status-line messages to appear before you turn the power on again:

“Communication error with analyzer.”

“Analyzer/computer not connected.”

**There is leakage at the sample fitting on the centering collar.**

Finger-tighten the fitting about 1½ turns, then use a 7/32-inch (6-mm) open-end wrench to tighten the fitting another 1/8 turn.

**The error message “Input queue gate open” appears occasionally when starting the autosampler.**

This error appears sometimes when a rack is waiting in the input shuttle area. Move the rack back to the first position in the tray and start the autosampler again.

### Cannot Find Videos

**"Cannot find the videos\_op\videos\_op.hlp Help file. Check to see that the file exists on your disk. If it doesn't, you need to reinstall it."**

If you get this message when trying to view the videos and you have recently installed a Zip drive, the letter assigned to your CD-ROM drive may have changed.

Reinstall the Operator's Guide. The installation process will reset the correct path to the videos.

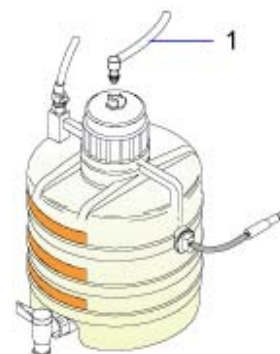
### Checking Drain Filters for Clogs

See Replacing the Drain Filters on page 5-27.

### Compressor Does Not Start

In cases when the analyzer is turned off and restarted too quickly, the compressor may not start up, causing the system initialization to fail. This is due to residual vacuum in the waste container. The operator must manually vent the container.

To manually vent either container (manual or autowaste), disconnect the waste container vacuum line (1), wait for the vacuum to dissipate, and then reconnect the line.



## Data Manager and LIS

### At the host computer, how can I tell controls apart?

In the SID that is sent to the host, the first two digits after the C identify the control as follows:

<u>Control Type</u>	<u>First Digit</u>	<u>Second Digit</u>
CBC/DIFF	1	1, 4, or 7 = Low 2, 5, or 8 = Normal 3, 6, or 9 = High
RETIC	2	1, 3, or 5 = Low 2, 4, or 6 = High

### How many 3.5" floppy disks does it take to back up 10,000 All Complete samples?

It takes approximately 14 disks and 1.5 hours. To save time, you should do an All Complete backup every day. During an All Complete, the system will back up only those records that were added since the last backup. The system warns you when it is almost full. The default warning appears at 9800 samples and can be changed in Customer Parameters. Since the system cannot operate with more than 10,000 records in the database, once the database nears 9000 records you should purge the oldest 500 or 1000 records every day. This will make room for the next day's samples. In Customer Parameters, you also have the option to set All Complete file size to trigger purge, which will automatically purge records when you perform the End of Day procedure.

### Why does the LIS link indicator on the Sample Cont. Panel remain green when the host-computer cable is disconnected from my PC?

The bi-directional protocol communication link sensor is time-delayed. After you disconnect the cable, it takes from 30 to 60 seconds for the LIS link indicator to turn red. If, however, you attempt to send information to the host computer before this time has elapsed, the indicator will turn red immediately.

If your system is set up for monodirectional protocol, the LIS link indicator works differently. After you turn on the host communication, the indicator stays red until you send the first sample. Once you send the sample, the indicator turns green and stays green even after you disconnect the host computer cable from your PC.

### No Sound When Viewing Videos

If there is no sound when you are viewing a video, adjust the sound on your monitor. Refer to the instructions in the manual shipped with the monitor you are using.

There is no sound with animations.

## **Perox Chamber**

**PEROX 3 reagent is used up before PEROX 2 reagent bottle is empty.**

### **Perox reaction chamber overflows**

- Check for blockage in the perox reaction chamber cap. Clear any blockage using a drill bit or a paper clip.
- Check for blockage or crimps in the perox overflow tube.
- Make sure that the ends of the tubes do not touch the bottom of the overflow bottle nor are they submerged in liquid.

### **NOTE**

If the opening on overflow-bottle cap is not large enough and pinches the tubes, cut the rubber cap from the outside edge to the inner opening to relieve some of the pressure on the tubes.



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## Morphology Flags

### Summary

Laboratory personnel are alerted to suspected sample abnormalities through the combined use of morphology and quantitative flags (high and low). ADVIA 2120/2120i morphology flags are derived from a series of complex algorithms. These algorithms are based on the identification of conditions surrounding the presence of abnormalities.

For a description of result rounding, please see Calculation of Results in the Regulatory Information Section of this manual.

The ADVIA 2120/2120i system does not enumerate abnormal cells. Despite a high degree of sensitivity and specificity in detecting conditions consistent with the presence of abnormal cells, test results produced by the ADVIA 2120/2120i system are intended for laboratory use only. Whenever morphology or quantitative flags are triggered, the laboratory, before reporting patient results, must validate the results and take the appropriate action in accordance with established standard operating procedures.

Morphology flags appear on the Run Screen and the Review / Edit tab.

The following table identifies the morphology flags and that can be triggered for each test selectivity. The two-letter codes in parentheses appear on the Run Screen.

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
ANISO	RDW $\geq$ 16%	✓	✓	✓	✓	
ATYP	%LUC $\geq$ 4.5 and %LUC $\geq$ (%BLAST + 1.5)		✓	✓		
BLASTS	1. %BLASTS 1.5% to 5.0% and %LUC $\geq$ 4.5% or 2. %BLASTS > 5.0% WBCB or 3. %BASO + %BASO Susp + %BASO Sat $\geq$ 10%		✓	✓		
HCVAR	HDW $\geq$ 3.4 g/dL	✓	✓	✓	✓	
HYPER	%HYPER $\geq$ 4%	✓	✓	✓	✓	
HYPO	%HYPO $\geq$ 4%	✓	✓	✓	✓	
IG	[(%NEUT + %EOS) - %PMN] $\geq$ 5.0%		✓	✓		

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
LPLT	%LPLT > 10% PLT	✓	✓	✓	✓	
LS	BASO d/D < 0.15 and %NEUT ≥ 30%		✓	✓		
MACRO	%MACRO ≥ 2.5%	✓	✓	✓	✓	
MICRO	%MICRO ≥ 2.5%	✓	✓	✓	✓	
MPO-D (MO)	[%PMN – (%NEUT + %EOS)] ≥ 25, no NRBC flag and a valid MN-PMN valley (d/D ≥ 0.15)		✓	✓		
NRBC	1. WBCu ≥ to 3000 cells / μL and % nRBC ≥ 2.0% (# nRBC / 100WBC) or 2. # nRBC ≥ 200 cells / μL		✓	✓		
PLT-CLM (NW)	Clumps Count > 150		✓	✓		
RBCF	RBCF > 100,000 cells/μL	✓	✓	✓	✓	
RBCG	RBCG > 100,000 cells/μL	✓	✓	✓	✓	

## Anisocytosis (ANISO)

### Definition

The Anisocytosis flag is triggered if variation in RBC volume (RDW) is equal to or greater than 16%. The Red Cell Distribution Width (RDW) parameter is the coefficient of variation of the cell volume distribution on the RBC volume histogram.

Default trigger values for the three severity levels are:

- + RDW = 16.0% to 17.9%
- ++ RDW = 18.0% to 22.0%
- +++ RDW > 22.0%

## Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- Microcytic anemia
- Macrocytic anemia
- Iron-deficiency anemia response to iron therapy
- Transfusion

### System Related

1. Check the RBC reagents.
2. Check the RBC hydraulics.
3. Check the RBC gain
4. Check the laser flowcell alignment

## Atypical Lymphocytes (ATYP)

### Definition

The presence of atypical lymphocytes is suspected.

An elevated %LUC value on the Perox cytogram may be due to the presence of large atypical lymphocytes, blasts, and/or other large abnormal cells that are peroxidase-negative. Large lymphocytes are defined as those that are larger than the typical lymph population.

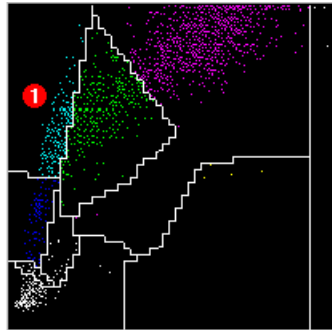
Blasts are classified independently on the Baso cytogram. When the %BLASTS is subtracted from the elevated %LUC value, the remaining percentage is due to atypical lymphocytes.

This flag is triggered if %LUC is 4.5 or greater, and the %LUC is greater than the %BLAST by 1.5 or more.

Default trigger values for the three severity levels are:

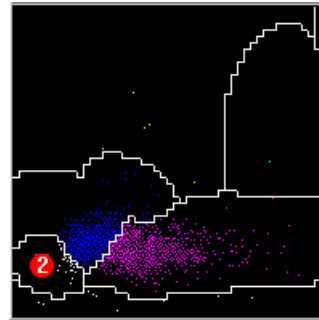
- + %LUC = 4.5% to 7.4%
- ++ %LUC = 7.5% to 10.0%
- +++ %LUC > 10.0%

Perox Cytogram (ATYP +++)



1 LUC area

Baso Cytogram



2 BLASTS area

### Results Flagged

none

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Viral infections
- Lymphoproliferative disorders
- RBC nonlysis

#### System Related

1. Check the perox reagents.
2. Check the delivery of SHEATH/RINSE.
3. Check the perox hydraulics and sample delivery.
4. Check the perox reaction chamber temperature
5. Check the perox flowcell alignment.
6. Check the perox gains.

### Blasts (BLASTS)

#### Definition

The presence of blasts is suspected. Blasts are detected in the Blasts area on the Baso cytogram and in the LUC area of the Perox cytogram.

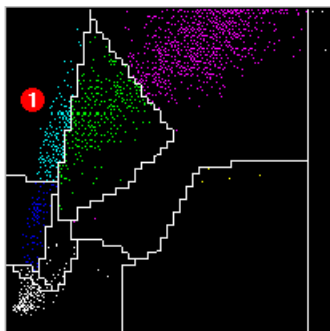
The triggering conditions for this flag are:

- %BLASTS 1.5% to 5.0% and %LUC  $\geq$  4.5%, or
- %BLASTS > 5.0% of the total WBCB, or
- %BASO + %BASO Susp + %BASO Sat  $\geq$  10%

Default trigger values for the three severity levels are:

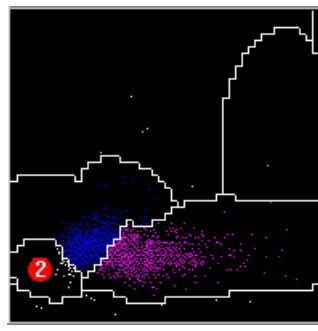
- + %BLASTS 1.5% to 5.0%
- ++ %BLASTS > 5.0% to 10.0%
- +++ %BLASTS > 10.0%

Perox Cytogram



1 LUC area

Baso Cytogram



2 BLASTS area

The %BLASTS value is intended for flagging and laboratory purposes only. The %BLASTS value is not to be reported as a patient result.

### Results Flagged

none

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Acute leukemias
- Chronic leukemias
- Lymphomas
- Myelofibrosis
- Refractory anemia with excess blasts (RAEB)
- Neonatal samples

#### System Related

1. Check the perox and baso reagents
2. Check the delivery of SHEATH/RINSE.
3. Check the perox hydraulics.
4. Check baso hydraulics.
5. Check the perox flowcell alignment.
6. Check the laser flowcell alignment.
7. Check the pressure and vacuum readings.
8. Check the baso and perox gains.

## HGB Concentration Variance (HCVAR)

### Definition

The Hgb Concentration Variance flag is triggered if the variation in cell hemoglobin concentration (HDW) is equal to or greater than 3.4 g/dL.

The Hemoglobin Distribution Width (HDW) parameter is the standard deviation of the cellular hemoglobin concentration distribution on the RBC HC histogram.

Default trigger values for the three severity levels are:

- + HDW% = 3.4 g/dL to 3.9 g/dL
- ++ HDW% = 4.0 g/dL to 4.6 g/dL
- +++ HDW% > 4.6 g/dL

### Results Flagged

none

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Sick cell anemia
- Iron deficiency anemia
- Hemolytic anemia
- Transfusion

#### System Related

1. Check RBC reagents.
2. Check RBC hydraulics.
3. Check RBC gains.
4. Check laser flowcell alignment.

## Hyperchromia (HYPER)

### Definition

The Hyperchromia flag is triggered if the percentage of cells with high (> 41g/dL) cellular hemoglobin concentration (%HYPER) is equal to or greater than 4.0%.

The %HYPER parameter indicates the percent of cells that have a cellular hemoglobin concentration greater than 41 g/dL and is derived from the RBC HC histogram.

Default trigger values for the three severity levels are:

- + %HYPER = 4.0% to 7.9%
- ++ %HYPER = 8.0% to 12.0%
- +++ %HYPER > 12.0%



The %HYPER value is intended for flagging and laboratory purposes only.

### Results Flagged

none

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Hereditary spherocytosis
- Sickle cell anemia
- Hemolytic uremic syndrome

#### System Related

1. Check RBC reagents.
2. Check the laser sample delivery.
3. Check the RBC gains.
4. Check the laser flowcell alignment

## Hypochromia (HYPO)

### Definition

The Hypochromia flag is triggered if the percentage of cells with low cellular hemoglobin concentration (%HYPO) is equal to or greater than 4.0%.

The %HYPO parameter indicates the percent of cells that have a cellular hemoglobin concentration less than 28 g/dL and is derived from the RBC HC histogram.

Default trigger values for the three severity levels are:

- + %HYPO = 4.0% to 7.9%
- ++ %HYPO = 8.0% to 12.0%
- +++ %HYPO% > 12.0%

The %HYPO value is intended for flagging and laboratory purposes only.

### Results Flagged

none

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- Iron deficiency anemia
- Chronic inflammatory diseases
- Thalassemia
- Sideroblastic anemias

### System Related

1. Check RBC reagents.
2. Check the laser sample delivery.
3. Check the RBC gains.
4. Check the laser flowcell alignment.

## Immature Granulocytes (IG)

### Definition

The presence of immature granulocytes is suspected.

The Immature Granulocytes flag is triggered if  $[(\%NEUT + \%EOS) - \%PMN] \geq 5.0\%$ .

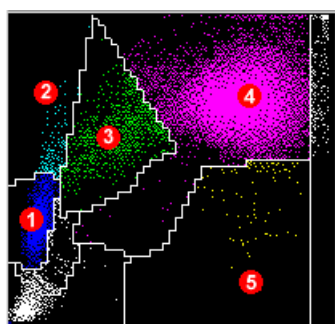
If present, Immature Granulocytes appear in the neutrophil and eosinophil areas on the Perox cytogram and in the mononuclear (MN) area on the Baso cytogram.

On the BASO cytogram, the eosinophils and neutrophils reside within the Polymorphonuclear (PMN) area. Subtracting the %PMN from the sum of the %NEUT and %EOS provides an estimate of the %Immature Granulocytes.

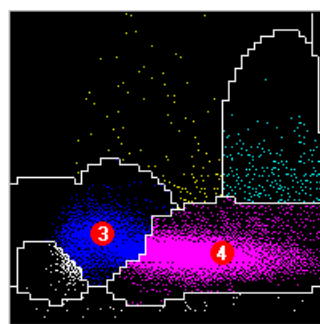
Default trigger values for the three severity levels are:

- +  $[(\%NEUT + \%EOS) - \%PMN] = 5.0\%$  to  $7.4\%$
- ++  $[(\%NEUT + \%EOS) - \%PMN] = 7.5\%$  to  $10.0\%$
- +++  $[(\%NEUT + \%EOS) - \%PMN] > 10.0\%$

Perox Cytogram



Baso Cytogram



1 Lymph 2 LUC 3 Mono 4 Neut 5 Eos 6 MN 7 PMN

MN (6) = Lymphs (1) + LUCs (2) + Monos (3)

PMN (7) = Neut (4) + Eos (5)

## Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- Myelocytic leukemia
- Chronic infections
- Neonatal samples

### System Related

1. Troubleshoot the baso channel.
2. Troubleshoot the perox channel.
3. Check the baso and perox gains.

## Large Platelets (LPLT)

### Definition

The Large Platelets flag is triggered if the percentage of large platelets (%LPLT) is greater than 10% of the platelet count.

The %LPLT parameter indicates the percent of platelets with volumes greater than 20 fL. This parameter is derived from the Platelet Volume histogram based on Integrated Analysis.

Default trigger values for the three severity levels are:

- + %LPLT = 10.0% to 11.9%
- ++ %LPLT = 12.0% to 14.0%
- +++ %LPLT > 14.0%

The %LPLT value is intended for flagging and laboratory purposes only.

## Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- CML
- Bone marrow transplant
- Chemotherapy

### System Related

1. Check the RBC reagents.
2. Check the RBC hydraulics.
3. Check the RBC and PLT gains.
4. Check the laser flowcell alignment

## Left Shift (LS)

### Definition

The presence of nonsegmented neutrophils (bands) is suspected.

The Left Shift flag is triggered if bands obstruct the MN/PMN valley. The flag is not triggered if %NEUT is less than 30%

For normal samples, the valley separating the MN and PMN populations is well defined, as determined by its relative depth ( $d/D$ ). If this valley becomes too shallow ( $d/D < 0.15$ ), the MN and PMN populations cannot be separated.

The + LS flag is triggered if BASO  $d/D$  is less than 0.15.

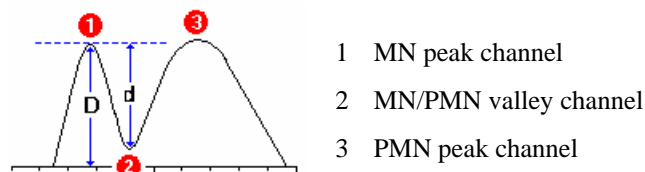
The Lobularity Index (LI) is used to set the severity levels for this flag.

The LI is the PMN peak channel number on the Baso X histogram divided by 14, and it is greater than 1.9 for normal samples. Values lower than 1.9 are usually indicative of sample abnormality.

In samples where a bimodal distribution is not present, only PMN populations with PMN peaks greater than channel 20 will be considered as valid PMN populations. Below channel 20 the software will interpret the peak as a MN population and the LI value will be blanked. Whenever a PMN peak is identified, the LI result will be reported.

### NOTE

If there is no value for MNx, there is also no value for the Lobularity Index (LI).



Default trigger values for the three Left Shift severity levels are:

- + LI > 1.9
- ++ LI = 1.7 to 1.9
- +++ LI < 1.7

## Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- Aged samples
- Chronic infections
- Myeloproliferative disorders
- Neonatal samples

### System Related

1. Troubleshoot the baso channel.
2. Troubleshoot the perox channel.

## Macrocytosis (MACRO)

### Definition

The Macrocytosis flag is triggered if the percentage of red blood cells with higher than normal cell volumes (%MACRO) is equal to or greater than 2.5%

The %MACRO parameter indicates the percent of red blood cells that have a volume equal to or greater than 120 fL and is derived from the RBC volume histogram.

Default trigger values for the three severity levels are:

- + %MACRO = 2.5% to 6.4%
- ++ %MACRO = 6.5% to 10.5%
- +++ %MACRO > 10.5%

The %MACRO value is intended for flagging and laboratory purposes only.

## Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

**Sample Related**

- Macrocytic anemia
- Alcoholism
- Hemolytic anemia
- Myelodysplastic anemia
- Neonatal samples

**System Related**

1. Check the RBC reagents.
2. Check the RBC hydraulics.
3. Check the RBC gains.
4. Check the laser flowcell alignment.

**Microcytosis (MICRO)****Definition**

The Microcytosis flag is triggered if the percentage of red blood cells with lower than normal cell volumes (%MICRO) is equal to or greater than 2.5%.

The %MICRO parameter indicates the percent of red blood cells that have a volume equal to or lower than 60 fL and is derived from the RBC volume histogram.

Default trigger values for the three severity levels are:

- + %MICRO = 2.5% to 6.4%
- ++ %MICRO = 6.5% to 10.5%
- +++ %MICRO > 10.5%

The %MICRO value is intended for flagging and laboratory purposes only.

**Results Flagged**

none

**Possible Causes**

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

**Sample Related**

- Iron deficiency anemia
- Hemoglobinopathies
- Hemolytic anemias

**System Related**

1. Check the RBC reagents.
2. Check the RBC hydraulics.
3. Check the RBC gains.
4. Check the laser flowcell alignment.

## Myeloperoxidase Deficiency (MPO-D, MO)

### Definition

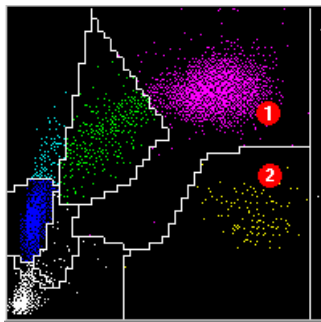
Sample is a weak peroxidase stainer.

This flag is triggered if  $[\%PMN - (\%NEUT + \%EOS)] \geq 25$ , the NRBC flag was not triggered, and there is a valid MN-PMN valley ( $d/D \geq 0.15$ ).

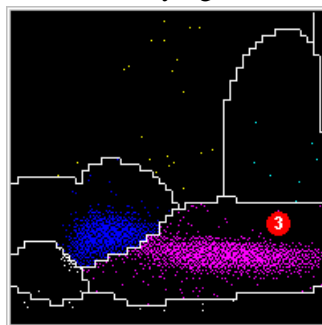
You must perform a manual differential on samples that trigger the Myeloperoxidase Deficiency flag.

Normal Peroxidase Staining

Perox Cytogram



Baso Cytogram

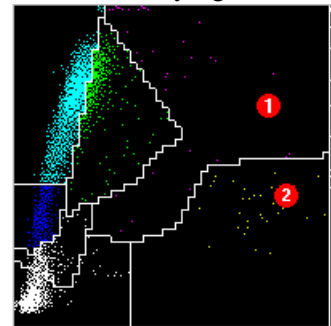


Because  $\%PMN - (\%NEUT + \%EOS)$  is close to 0, there is no flag.

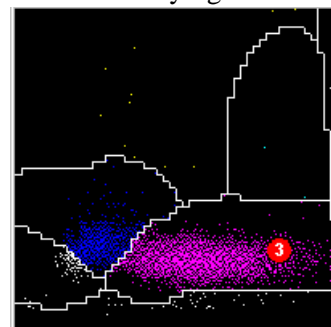
By inspection, the sum of the events in the NEUT (1) and EOS (2) areas appears approximately equal to the count in the PMN area (3).

Weak Peroxidase Staining (MPO flag)

Perox Cytogram



Baso Cytogram



Because  $\%PMN - (\%NEUT + \%EOS)$  is greater than 25, the flag is triggered.

By inspection, the sum of the events in the NEUT (1) and EOS (2) areas is much less than the count in the PMN area (3).

### Results Flagged

$\%NEUT$ ,  $\#NEUT$ ,  $\%LYMPH$ ,  $\#LYMPH$ ,  $\%MONO$ ,  $\#MONO$ ,  $\%EOS$ ,  $\#EOS$ ,  $\%BASO$ ,  $\#BASO$ ,  $\%LUC$ , and  $\#LUC$

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Myeloperoxidase deficiency

#### System Related

1. Troubleshoot the perox channel.
2. Check the perox reagents.
3. Check peroxidase hydraulics.
4. Check the perox reaction chamber temperature.

### Nucleated Red Blood Cells (NRBC)

#### Definition

The detection of nucleated red blood cells, or the occurrence of either the Suspect Cellular Interference (NRCELL) flag or the Suspect Large Platelets (NRLPLT) flag will trigger the NRBC Morphology flag.

There is no severity level associated with this flag.

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

#### Sample Related

- Neonatal samples
- Hemoglobinopathies
- Hemolytic anemia
- Myelodysplastic syndromes

#### System Related

1. Check perox reagents.
2. Check the perox reaction chamber temperature.
3. Check peroxidase hydraulics and sample delivery.
4. Check perox gains.



## Platelet Clumps (PLT-CLM, NW)

### Definition

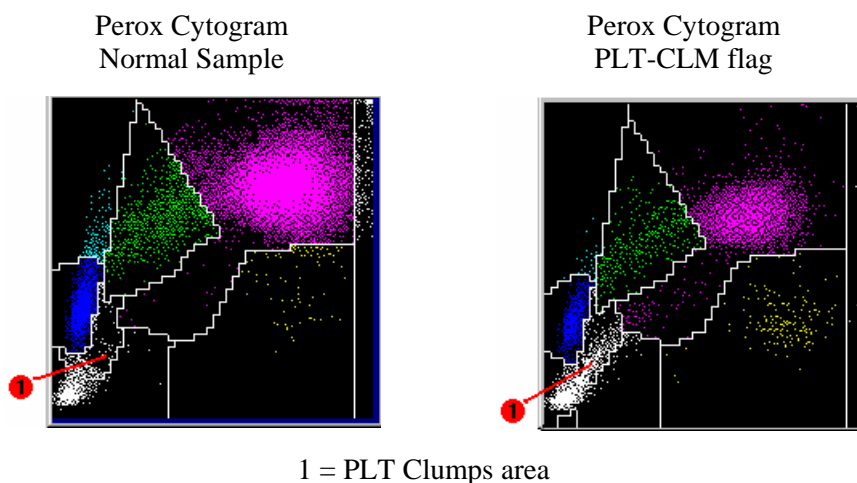
Presence of clumped platelets is suspected.

The Platelet Clumps flag is triggered if the Clumps Count in the PLT Clumps region of the Perox cytogram is greater than 150. The PLT count is flagged to alert the user that the platelet count may not be accurate due to the presence of platelet clumps.

The PLT Clump area of the Perox cytogram originates in the Noise area and extends upward to the right of the lymphocyte population. The number of events obtained from this area is called the Clumps Count.

The Clumps Count is excluded from the WBCP and differential results.

There is no severity level associated with this flag.



### Results Flagged

WBCP, PLT, PCT, MPV, and PDW

### Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### Sample Related

- Traumatic venipuncture
- Anticoagulants
- Autoimmune platelet disorders
- Lipemia

## RBC Fragments (RBCF)

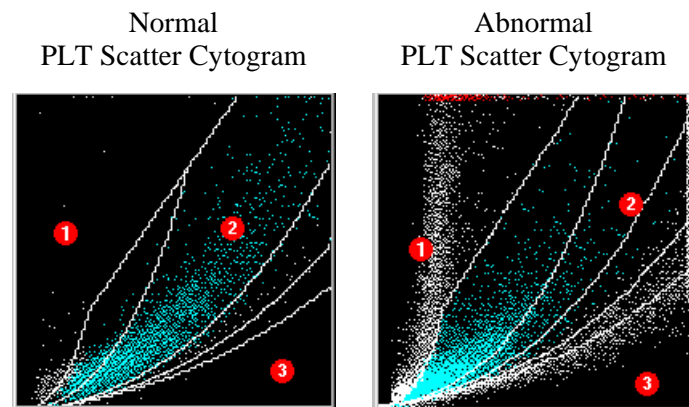
### Definition

The presence of RBC fragments is suspected.

This flag is triggered if the number of events in the RBC Fragment area of the PLT Scatter cytogram is greater than 100,000 cells/ $\mu$ L. The event count in this area includes red blood cell fragments with volumes less than 30fL and refractive indexes greater than 1.400.

RBC fragments are excluded from the PLT count and the RBC count.

There are no severity levels associated with this flag.



- 1 RBC Ghost area
- 2 Platelet area
- 3 RBC Fragment area

### NOTE

Whenever the ratio of RBC fragments to platelets exceeds 0.25, the system uses the log normal fit calculation to determine the platelet count, and the log normal fit curve appears on the Platelet Volume histogram.

The RBC Fragment value is intended for flagging and laboratory purposes only.

### Results Flagged

none

## Possible Causes

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

## Sample Related

- Hemolytic anemia
- Prosthetic heart valves
- Severe burns
- Sickle Cell Anemia

## RBC Ghosts (RBCG)

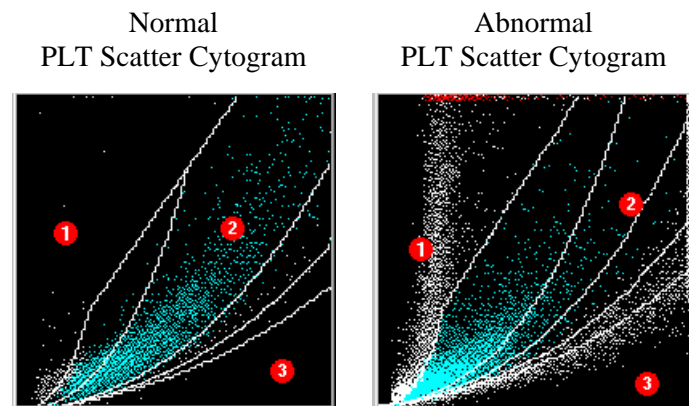
### Definition

The presence of RBC ghosts is suspected.

This flag occurs if the number of events in the RBC Ghost area of the PLT Scatter cytogram is greater than 100,000 cells/ $\mu$ L. The events counted in this area have refractive indexes lower than 1.350.

RBC ghosts are excluded from the PLT count and the RBC count.

There are no severity levels associated with this flag.



- 1 RBC Ghost area
- 2 Platelet area
- 3 RBC Fragment area

The RBC Ghost value is intended for flagging and laboratory purposes only.

## Results Flagged

none

### **Possible Causes**

The following list of sample-related causes may not contain all conditions that could cause this flag.

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

### **Sample Related**

- Hemolysis
- Cryoglobulins
- Chylomicrons
- Pyropoikilocytosis
- Lipemia

## Sample/System Flags

### Summary

Through the use of complex flagging algorithms, laboratory personnel are alerted to suspected abnormal sample and/or system conditions.

Sample/system flags appear on the Run Screen and the Review / Edit tab.

Whenever such flags are triggered, the user should review the results and take the action recommended. The following table identifies the sample/system flags that could be triggered for each test selectivity. The two-letter codes in parentheses appear on the Sample/System Flag Analysis panel of the Run Screen.

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
B-SUSP (BC)	Events above the upper MN/PMN threshold on y axis and in channels 0 to 49 on x axis $\geq 5\%$		✓	✓		
BIFR (BR)	Baso Flatness > 2.5	✓	✓	✓	✓	
B-NO (NB)	Baso % Noise > 10	✓	✓	✓	✓	
B-NV (VB)	1. (BASO d/D) < 0.15 2. Flag is not set if there is WBC agreement (no WBC-CE flag) and [(%NEUT + %EOS) - %PMN] is between 0 and 7.5.	✓	✓	✓	✓	
B-SAT (BS)	1. Baso % Saturation > 2.5 2. Flag is not set if there is WBC agreement (no WBC-CE flag).	✓	✓	✓	✓	
BTO (TB)	1. Baso chamber temperature is not between 31.9°C and 34.1°C. 2. Flag is not set if there is WBC agreement (no WBC-CE flag) and [(%NEUT + %EOS) - %PMN] is between 0 and 7.5.	✓	✓	✓	✓	
CHCMCE (CC)	(MCHC - CHCM) > 1.9	✓	✓	✓	✓	

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
HGBIFR (HR)	HGB Sample Flatness > 1000	✓	✓	✓	✓	
HGB-PL (PH)	HGB baseline is not between 2.5 and 4.1	✓	✓	✓	✓	
LAS-PL(PL)	Laser light intensity < 150	✓	✓	✓	✓	✓
NRCELL (NC)	WBCP / WBCB > 1.1			✓	✓	
NR-LPD (NL)	1. BASO % Noise > 2 2. BASO % Noise x WBCB > 10			✓	✓	
NRLPLT (NP)	LPLT > 40 x 10 <sup>3</sup> /μL			✓	✓	
NRPXNV	No valley between the NRBC and lymphocyte populations and a reportable NRBC count.			✓	✓	
PLT-NO (NT)	1. LPLT and ANISO flags are triggered (any severity level 2. LPLT and MICRO flags are triggered (any severity level).	✓	✓	✓	✓	
PLTORN (OT)	Events in the Platelet Origin Noise area are > 2% of the total events the PLT cytogram	✓	✓	✓	✓	
PX-NV (VX)	1. (PEROX d/D) < 0.15 2. Flag is not set if there is WBC agreement (no WBC-CE flag) and [(%NEUT + %EOS) - %PMN] is between 0 and 7.5.		✓	✓		
PXIFR (XR)	Perox Flatness > 3.2		✓	✓		

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
PX-NO (NX)	1. Perox % Noise > 60%  2. Flag is not set if there is WBC agreement (no WBC-CE flag) and [(%NEUT + %EOS) - %PMN] is between 0 and 7.5.		✓	✓		
PX-PL (PX)	Perox light intensity < 90		✓	✓		
PX-SAT (XS)	1. Perox % Saturation > 10  2. Flag is not set if there is WBC agreement (no WBC-CE flag).		✓	✓		
PXTO (TX)	1. Perox chamber temperature is not between 58°C and 72.1°C  2. Flag is not set if there is WBC agreement (no WBC-CE flag) and [(%NEUT + %EOS) - %PMN] is between 0 and 7.5.		✓	✓		
RBCIFR (RR)	RBC Flatness > 3.2	✓	✓	✓	✓	
RTCint (CT)	Platelet threshold below channel 5			✓	✓	✓
RTCADA (CA)	1. Absorption mode for Gaussian fit is not between channels 6 and 30  2. SD of RETIC Abs histogram over 80% of height > 1.4  3. Measured mean absorption minus the theoretical absorption > 30%			✓	✓	✓
RTCIFR (CR)	Retic Flatness > 3.2			✓	✓	✓

Flag	Triggering Criteria	CBC	CBC / DIFF	CBC / DIFF / RETIC	CBC / RETIC	RETIC
RTC-FS (FC)	1. Difference between mean and mode RETIC Abs Histogram > 15% 2. Chi-square error for the Gaussian fit > 80,000			✓	✓	✓
RTC-NO (NO)	Noise Origin > 10% of gated cells			✓	✓	✓
RTC-L (CL)	Cells analyzed < 10,000			✓	✓	✓
RTC-FL (RF)	CV for RETIC Abs Flatness histogram > 3.6			✓	✓	✓
RTCSAT (CS)	Saturation cells > 10% of gated cells			✓	✓	✓
RTC-SE (SE)	Slope of negative cell population on absorption axis > 0.2			✓	✓	✓
WBC-CE (WC)	1. $(WBCB - WBCP) \geq 1.0 \times 10^3 / \mu L$ when $WBCB \geq 2.0 \times 10^3 / \mu L$ and $\leq 10.0 \times 10^3 / \mu L$ 2. $(WBCB - WBCP) \geq 10\%$ of WBCB when $WBCB \geq 10.0 \times 10^3 / \mu L$ 3. $(WBCB - WBCP) > 20\%$ WBCB when $WBCB \leq 2.0 \times 10^3 / \mu L$ 4. WBCB count is not flagged if the PX-NV or PX-NO flags are set.		✓	✓		
WBCSUB (WS)	If WBCB is flagged but WBCP is not, the WBCP value is reported.  If both WBCB and WBCP are flagged, WBCB is reported.  If $WBCB < 1000 \text{ cells}/\mu L$ , WBCB is reported with an asterisk.		✓	✓		



## Baso Count Suspect (B-SUSP, BC)

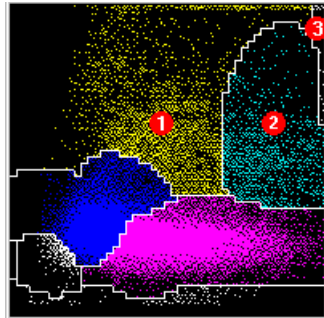
### Definition

The Baso Count Suspect flag is triggered if the percentage of events acquired in the region of the Baso cytogram located above the upper MN/PMN threshold and between channels 0 and 49 on the x axis exceeds 5.0%.

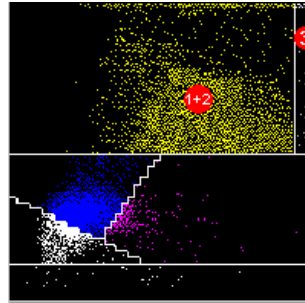
When cluster analysis is applied, the Baso Count Suspect region of the Baso cytogram is located above the upper MN/PMN threshold. Events in this region are not classified as basophils and are excluded from the basophil count. The %BASO Suspect parameter is calculated from the Baso Count Suspect region and is available in the Baso Parameter group on the Run Screen.

When histogram analysis is applied, the Baso Count Suspect region is located above channel 21 on the y axis and in channels 0 and 49 on the x axis.

Baso Cytogram  
(cluster analysis)



Baso Cytogram  
(histogram analysis)



- 1 Basophils
- 2 BASO Suspect
- 3 Baso Saturation

### Results Flagged

%BASO, #BASO, %LYMPH, #LYMPH, %LUC, #LUC

A four-part WBC differential (basophils excluded) is reported with the measured BASO values displayed and flagged, and with the LYMPH and LUC values also flagged.

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### System Related

1. Check baso reagents.
2. Check the baso reaction chamber temperature.
3. Check baso hydraulics.
4. Check baso gains
5. Check the RBC/Baso/Retic flowcell alignment.

### Sample Related

- High WBC Count
- Leukemia
- High Baso count
- Aged Blood
- Treated CLL

## Baso Irregular Flow Rate (BIFR, BR)

### Definition

The Baso Irregular Flow Rate flag is triggered when the cell counting rate is erratic because of a hydraulic disturbance in the baso channel.

Baso flow rate is evaluated in terms of the cell counting rate:

$$\text{Flow Uniformity} = \sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$$

The flag is triggered if this value is greater than 2.5.

The BASO Rate Histogram displays the arrival rate of cells in the baso channel.

Normal BASO Rate Histogram



BIFR BASO Rate Histogram



### Results Flagged

WBC, WBCB, %BASO, #BASO

### Corrective Action

1. Check baso reagents.
2. Check baso hydraulics.
3. Check sheath delivery.

A partially clogged RBC/baso/retic sheath filter can produce a distinctive “ski slope” effect on the RBC, Baso, and Retic flow rate histograms. Replace the sheath filter.

RBC Rate



Baso Rate



Retic Rate



## Baso Noise (B-NO, NB)

### Definition

The Baso Noise flag is triggered if the events counted in the Noise area of the Baso cytogram are more than 10% of the baso signals.

The B-NO (NB) flag may cause a substitution of the WBC count.

The following rules determine if the WBCB or WBCP count is reported for a CBC/Diff sample:

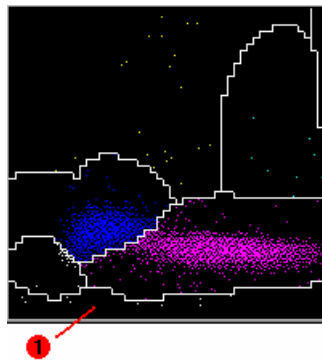
- WBCB is the primary WBC count.
- If B-NO or B-SAT flags are triggered, the WBCP count is reported if valid.
- If a B-NO flag and a PX-NO or PX-SAT flag are triggered, the WBCB count is reported with a sample/system flag.
- WBCB is reported as the WBC count for samples with a WBC lower than  $1.0 \times 10^3 / \mu\text{L}$ .

The Noise area (1) of the Baso cytogram is determined by cluster analysis.

If histogram analysis is applied, the Noise area (2) is located between channels 0 and 8 on the y axis.

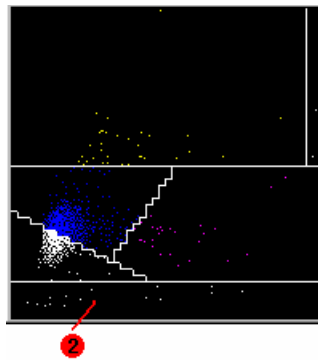
Cluster Analysis

1 noise cluster



Histogram Analysis

2 noise area



### Results Flagged

WBC, WBCB, %BASO, #BASO

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### System Related

1. Check baso reagents.
2. Check baso hydraulics.
3. Check the pressure and vacuum readings.
4. Check sheath delivery.
5. Check the baso reaction chamber temperature.
6. Check RBC/Baso/Retic flowcell alignment.

### Sample Related

- Lipemia
- High WBC count
- Extreme eosinophilia
- Malaria parasites
- Aged Blood

## Baso No Valley (B-NV, VB)

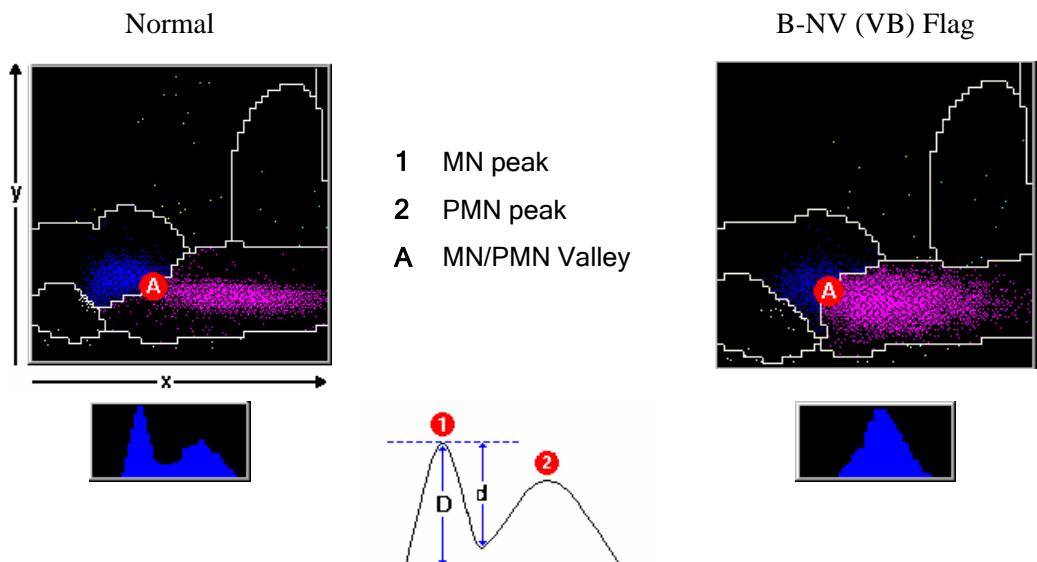
### Definition

The Baso No Valley flag is triggered if there is no valid separation between the mononuclear (MN) and polymorphonuclear (PMN) populations in the Baso cytogram. The B-NV (VB) flag is not triggered if agreement between the baso and perox results is indicated by both the following conditions:

- WBCB and WBCP agree within specified limits (No WBC-CE flag)
- $[(\%NEUT + \%EOS) - \%PMN]$  is between 0 and 7.5

Separation of the MN and PMN populations along the x axis of the Baso cytogram is evaluated by the relative depth of the valley between the two populations.

In normal samples, the relative Baso d/D is greater than 0.15. The B-NV flag is triggered if the relative depth is less than 0.15 and there is no agreement between perox and baso results.



## Results Flagged

LI

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

#### System Related

1. Check baso reagents.
2. Check baso hydraulics.
3. Check the baso reaction chamber temperature.
4. Check sheath delivery.
5. Check RBC/Baso/Retic flowcell alignment.

#### Sample Related

- Aged blood
- Absolute lymphocytosis
- Immature granulocytes
- Unsegmented neutrophils (bands)

## Baso Saturation (B-SAT, BS)

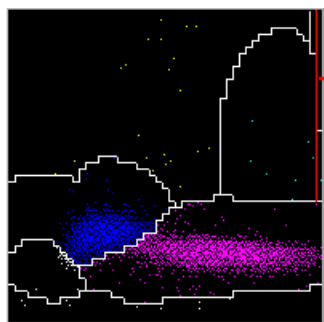
### Definition

The Baso Saturation flag is triggered if the number of events in the Saturation area of the Baso cytogram is greater than 2.5% of the baso signals.

This flag is not triggered if WBCB and WBCP agree within specified limits (no WBC-CE flag).

The Saturation area of the Baso cytogram is located to the right of the fixed threshold at channel 46 above the upper MN/PMN threshold (1). This area can contain air bubbles, unlysed cells, and cell clumps.

Baso Cytogram



1 Baso Saturation area

The B-SAT (BS) flag may cause a substitution of the WBC count.

The following rules determine if the WBCB or WBCP count is reported for a CBC/Diff sample:

- WBCB is the primary WBC count.
- If B-NO or B-SAT flags are triggered, the WBCP count is reported if valid.
- If a B-NO flag and a PX-NO or PX-SAT flag are triggered, the WBCB count is reported with a sample/system flag.
- WBCB is reported as the WBC count for samples with a WBC lower than  $1.0 \times 10^3 / \mu\text{L}$ .

### Results Flagged

WBCB

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

#### System Related

1. Check baso reagents.
2. Check the pressure and vacuum readings.
3. Check sheath delivery.
4. Check baso hydraulics.
5. Check RBC/Baso/Retic flowcell alignment.

#### Sample Related

- Leukemia (high WBC)
- Fungal infections
- Cell clumps

### Baso Temperature out of Range (BTO, TB)

#### Definition

The Baso Temperature Out of Range flag is triggered if the baso reaction chamber temperature is not between 31.9°C and 34.1°C.

The BTO (TB) flag is not triggered if agreement between the baso and perox results is indicated by both the following conditions:

- WBCB and WBCP agree within specified limits (No WBC-CE flag)
- $[(\% \text{NEUT} + \% \text{EOS}) - \% \text{PMN}]$  is between 0 and 7.5

## Results Flagged

WBC, WBCB, %BASO, #BASO, %LYMPH, #LYMPH

A four-part WBC differential (basophils excluded) is reported with the measured BASO values displayed and flagged, and with the LYMPH and LUC values also flagged.

## Corrective Action

1. Check the baso reaction chamber temperature.
2. Check the reaction chamber temperature controller, including the electrical connection.

## Comparison Error MCHC / CHCM (CHCMCE, CC)

### Definition

The Comparison Error MCHC/CHCM flag is triggered if the difference between the MCHC and CHCM values is greater than 1.9.

### Results Flagged

MCHC, CHCM, RBC, MCV, HGB, HCT, MCH, RDW, HDW, CH, CHDW

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### System Related

1. If another flag appears along with the comparison error, troubleshoot that error first.
2. To determine the faulty channel, run the same normal whole blood sample five times to check precision of the RBC, MCV, and HGB values. Then, run a normal-level control to check accuracy.
  - a. If all results are acceptable, calibrate RBC, MCV, CHCM, and HGB parameters.
  - b. If the HGB results are faulty, troubleshoot the hemoglobin channel.
  - c. If RBC or MCV results are faulty, troubleshoot the RBC channel.

### Sample Related

- Lipemia
- Leukemia (high WBC)
- Neonatal (NRBCs)
- Hemolytic anemias
- Cold agglutinins

## Comparison Error WBCB/WBCP (WBC-CE, WC)

### Definition

The Comparison Error WBCB/WBCP flag is triggered if the difference in the WBC counts obtained from the baso and perox channels exceeds a preset limit.

The WBC count for each sample is independently determined in the baso channel (WBCB) and the perox channel (WBCP).

The flag is triggered if:

- $(WBCB - WBCP) \geq 1.0 \times 10^3 / \mu\text{L}$  when  $WBCB \geq 2.0 \times 10^3 / \mu\text{L}$  and  $\geq 10.0 \times 10^3 / \mu\text{L}$
- $(WBCB - WBCP) \geq 10\%$  of WBCB when  $WBCB \geq 10.0 \times 10^3 / \mu\text{L}$
- $(WBCB - WBCP) \geq 20\%$  of WBCB when  $WBCB \geq 2.0 \times 10^3 / \mu\text{L}$

### Results Flagged

WBC, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %BASO, #BASO, %LUC, #LUC

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

#### System Related

1. If the Perox Noise (PX-NO) and/or No Valley Perox (PX-NV) sample/system flags are triggered, troubleshoot the perox channel.
2. If there are no perox flags, troubleshoot the baso channel.

#### Sample Related

- Incomplete red cell lysis
- Nucleated red blood cells
- Malaria parasites

## Hgb Irregular Flow Rate (HGBIFR, HR)

### Definition

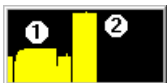
The HGB Irregular Flow Rate flag is triggered if HGB baseline or sample transmission is erratic.

For each sample, the difference between the maximum and minimum transmittance is obtained for the baseline and sample transmittance.

The flag is triggered if the baseline or sample value is greater than 1000.



### HGB Trans Histogram



- 1 Sample transmittance
- 2 Baseline transmittance

### Results Flagged

HGB, MCH and MCHC

### Corrective Action

1. Check HGB reagents.
2. Check Hgb hydraulics and sample delivery.
3. Check delivery of SHEATH/RINSE.
4. Check the pressure and vacuum readings.

### Hgb Power Low (HGB-PL, PH)

#### Definition

The Hgb Power Low flag is triggered if the HGB baseline transmission is less than 2.5 or greater than 4.1.

### Results Flagged

HGB, MCH, and MCHC

### Corrective Action

1. Adjust the Hgb baseline.
2. Perform the rinse reagent check.
3. Replace the Hgb lamp.

### Laser Power Low (LAS-PL, PL)

#### Definition

The Laser Power Low flag is triggered if the laser light intensity in the RBC/Baso/Retic channel is less than 150.

### Results Flagged

RBC, HCT, MCV, MCH, MCHC, CH, CHDW, CHCM, RDW, HDW, PLT, MPV, PDW, WBCB, WBC, %BASO, #BASO, #RETIC, %RETIC, CHg, CHr, CHCMg, CHCMr, CHDWr, CHDWg, MCVg, MCVr, RDWg, RDWr

### Corrective Action

1. Flush the RBC/Baso/Retic flowcell
2. Perform the sheath reagent check.
3. Remove and clean the RBC/Baso/Retic flowcell.
4. Replace the laser diode.

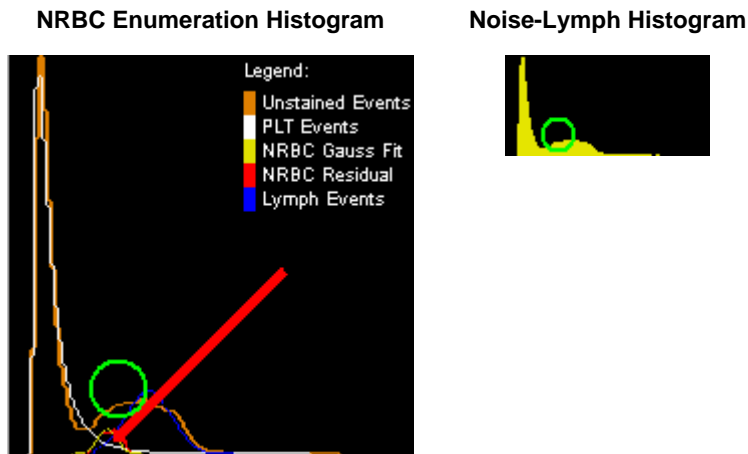
### No Perox NRBC / Lymph Valley (NRPXNV, NV)

The No Perox NRBC / Lymph Valley flag is triggered if there is no valley between the nRBC and lymphocyte populations when the system reports an NRBC count.

#### Results Flagged

#NRBC, %NRBC, WBC, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %BASO, #BASO, %LUC, #LUC

The green circles in both the NRBC Enumeration histogram and Noise-lymph histogram below show no valley separating lymphocyte events from the nRBC population. The red arrow identifies the nRBC events.



### Perox Irregular Flow Rate (PXIFR, XR)

#### Definition

The Perox Irregular Flow rate flag is triggered if the cell counting rate is erratic because of a hydraulic disturbance in the perox channel.

Perox flow rate is evaluated in terms of the cell counting rate:

$$\text{Flow Uniformity} = \sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$$

The flag is triggered if this value is greater than 3.2.

The Perox Rate Histogram displays the arrival rate of the cells in the perox channel.

Normal Perox Rate Histogram



PXIFR Perox Rate Histogram



**Results Flagged**

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

**Corrective Action**

1. Check perox reagents.
2. Check perox hydraulics and sample delivery.
3. Check sheath delivery.
4. Check the pressure and vacuum readings.

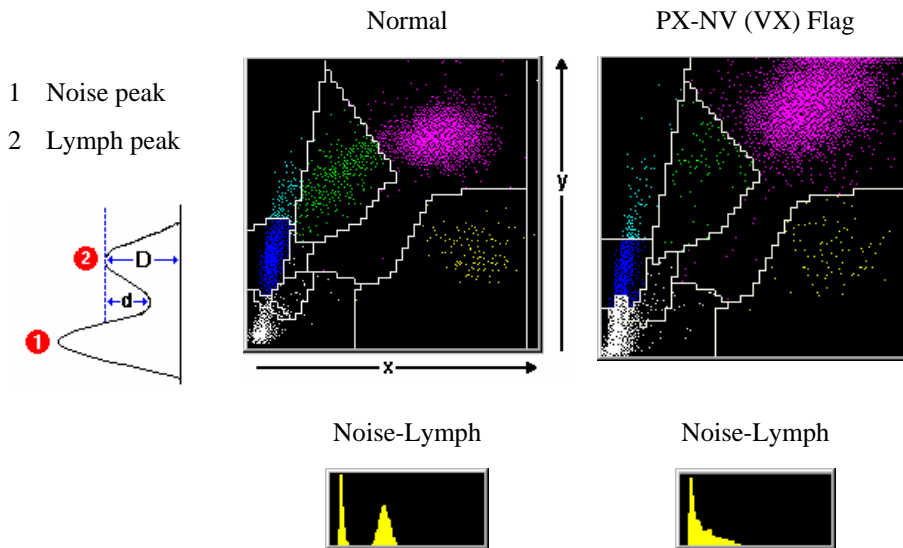
**Perox No Valley (PX-NV, VX)**

**Definition**

The Perox No Valley flag is triggered if there is no valid separation between the noise and lymphocyte populations in the Perox cytogram.

The separation of the noise and lymphocyte populations along the y axis of the Perox cytogram is evaluated by the relative depth of the valley (PEROX d/D) between the two populations.

In normal samples, PEROX d/D is greater than 0.15. This flag is triggered if PEROX d/D is less than 0.15.



The PX-NV (VX) flag is not triggered if agreement between the baso and perox results is indicated by both the following conditions:

- WBCB and WBCP agree within specified limits (No WBC-CE flag)
- $[(\%NEUT + \%EOS) - \%PMN]$  is between 0 and 7.5

**Results Flagged**

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

**Corrective Action**

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

**System Related**

1. Check perox reagents.
2. Check peroxidase hydraulics and sample delivery.
3. Check delivery of SHEATH/RINSE.
4. Check PEROX SHEATH delivery.
5. Check the pressure and vacuum readings.
6. Check the perox reaction chamber temperature.
7. Check perox flowcell alignment.
8. Check perox gains.

**Sample Related**

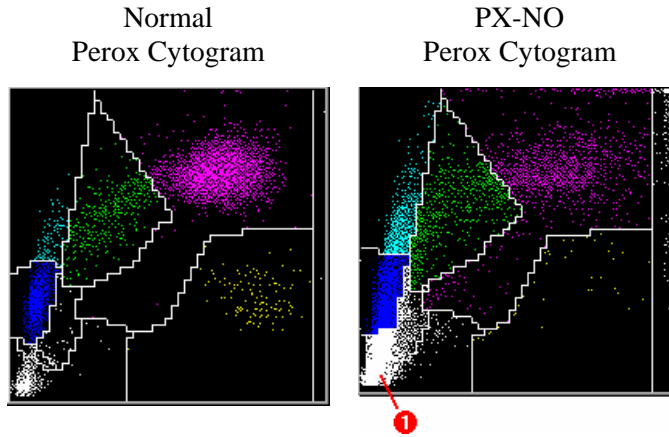
- Neonatal samples
- Aged blood sample
- Malaria parasites

**Perox Noise (PX-NO, NX)**

**Definition**

The Perox Noise flag is triggered if 60% or more of the perox signals come from the Noise area of the Perox cytogram.

This flag is triggered if 60% or more of the PEROX events are counted in the Noise area.



**1 Noise area**

The PX-NO (NX) flag is not triggered if agreement between the baso and perox results is indicated by both the following conditions:

- WBCB and WBCP agree within specified limits (No WBC-CE flag)
  - $[(\%NEUT + \%EOS) - \%PMN]$  is between 0 and 7.5
- The Noise area is located in the lower left corner of the Perox cytogram (1).

**Results Flagged**

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

**Corrective Action**

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### **System Related**

1. Check perox reagents.
2. Check peroxidase hydraulics and sample delivery.
3. Check delivery of SHEATH/RINSE.
4. Check PEROX SHEATH delivery.
5. Check the pressure and vacuum readings.
6. Check the perox reaction chamber temperature.
7. Check perox flowcell alignment.
8. Check perox gains.

### **Sample Related**

- Neonatal samples
- Aged blood sample
- Malaria parasites
- Lyse-resistant RBCs

## **Perox Power Low (PX-PL, PX)**

### **Definition**

The Perox Power Low flag is triggered if the tungsten-halogen light intensity in the Perox channel is less than 90.

### **Results Flagged**

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

### **Corrective Action**

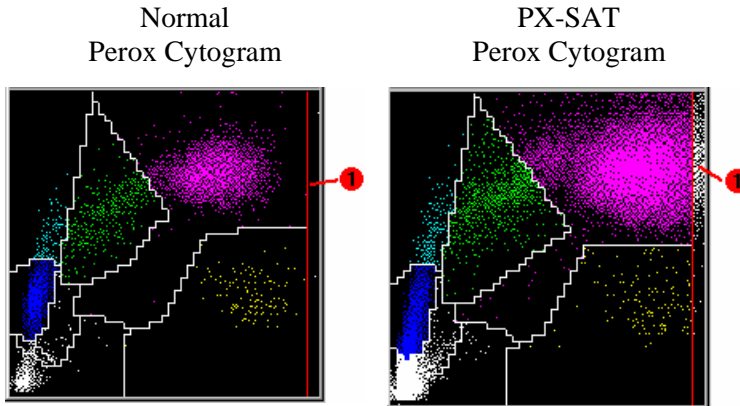
1. Perform the sheath reagent check.
2. Check perox lamp alignment.
3. Replace the tungsten-halogen lamp.

## **Perox Saturation (PX-SAT, XS)**

### **Definition**

The Perox Saturation flag is triggered if the events counted in the Saturation area are more than 10% of Perox signals

The Saturation area of the Perox cytogram is located in channels 97 through 99 on the x axis.



### 1 Saturation area

The PX-SAT (XS) flag is not triggered if WBCB and WBCP agree within specified limits (no WBC-CE flag).

The WBCP count does not include events from the Saturation area.

#### Results Flagged

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

#### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

#### System Related

1. Check perox reagents.
2. Check peroxidase hydraulics and sample delivery.
3. Check delivery of SHEATH/RINSE.
4. Check PEROX SHEATH delivery.
5. Check the pressure and vacuum readings.
6. Check the perox reaction chamber temperature.
7. Check perox flowcell alignment.
8. Check perox gains.

#### Sample Related

- Immature granulocytes
- Severe toxic granulation
- Promyelocytic leukemia

## Perox Temperature out of Range (PXTO, TX)

### Definition

The Perox Temperature Out of range flag is triggered if the Peroxidase reaction chamber temperature is not between 58°C and 72.1°C.

The PXTO (TX) flag is not triggered if agreement between the baso and perox results is indicated by both the following conditions:

- WBCB and WBCP agree within specified limits (No WBC-CE flag)
- $[(\%NEUT + \%EOS) - \%PMN]$  is between 0 and 7.5

### Results Flagged

WBCP, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %LUC, and #LUC

### Corrective Action

1. Check the perox reaction chamber temperature.
2. Check the reaction chamber temperature controller, including the electrical connection.

## Platelet Noise (PLT-NO, NT)

### Definition

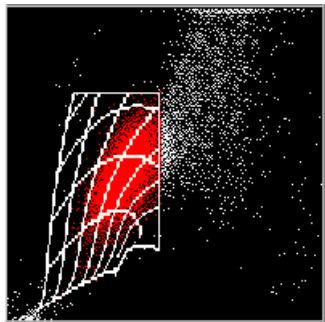
The PLT-NO flag indicates the presence of sample interferences such as microcytes or RBC fragments that could be counted as large platelets

The PLT-NO flag is triggered under either of the following conditions:

- LPLT and ANISO flags are triggered (any severity level).
- LPLT and MICRO flags are triggered (any severity level).

Normal Sample

RBC Scatter

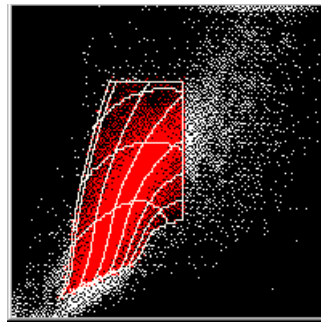


Platelet Vol

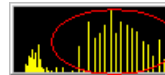


PLT-NO Flag

RBC Scatter



Platelet Vol





### Results Flagged

PLT, PCT, MPV, and PDW

### Corrective Action

The following conditions may not be the only ones that could cause this flag.

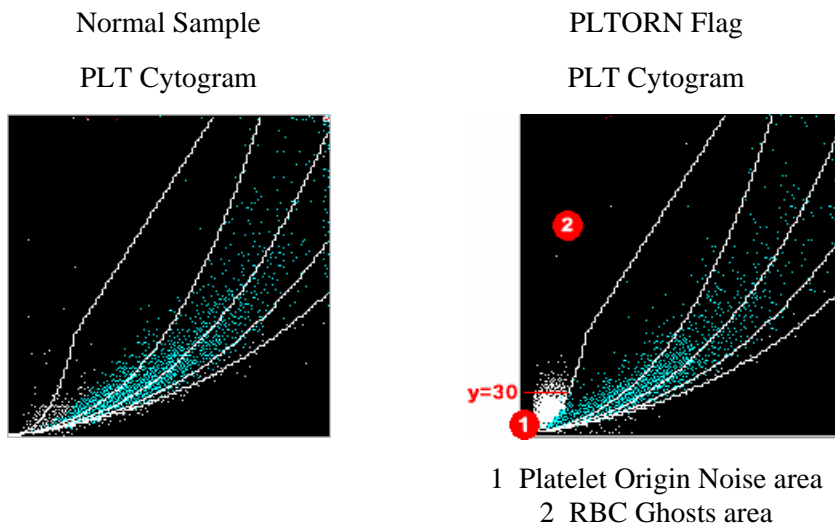
- Pronounced microcytosis
- Increased RBC fragments (RBCF)

### Platelet Origin Noise (PLTORN, OT)

#### Definition

The Platelet Origin Noise flag indicates the occurrence of system induced noise that might affect RBC and PLT results.

The PLTORN flag is triggered when the number of events in the Platelet Origin Noise area of the PLT cytogram exceeds 2% of the total number of events.



### Results Flagged

RBC, MCV, HCT, MCH, MCHC, CH, CHCM, CHDW, RDW, HDW, PLT, PCT, MPV, and PDW

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem.

- Check RBC/PLT reagents
- Contact your Siemens Field Service Representative.

### RBC Irregular Flow Rate (RBCIFR, RR)

#### Definition

The RBC Irregular Flow Rate flag is triggered if the cell counting rate is erratic because of a hydraulic disturbance in the RBC/PLT channel.

RBC flow rate is evaluated in terms of the cell counting rate:

$$\text{Flow Uniformity} = \sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$$

The flag is triggered if this value is greater than 3.2. The RBC Rate Histogram displays the arrival rate of cells in the RBC channel.

Normal RBC Rate Histogram      RBCIFR RBC Rate Histogram



### Results Flagged

RBC, HCT, MCV, MCH, MCHC, CHCM, CH, CHDW, RDW, HDW, PLT, MPV, PDW

### Corrective Action

1. Check RBC reagents.
2. Check RBC hydraulics.
3. Check sheath delivery.
4. Check the pressure and vacuum readings.

A partially clogged RBC/baso/retic sheath filter can produce a distinctive “ski slope” effect on the RBC, Baso, and Retic flow rate histograms. Replace the sheath filter.

RBC Rate



Baso Rate



Retic Rate



### Retic – Plt Interference Error (RTCint, CT)

#### Definition

The RTCint flag is triggered if the platelet threshold is set below scatter channel 5. If the flag is triggered, platelets may be counted in the gated mature RBC population.

#### Results Flagged

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWg, CHDWr, MCVg, MCVr, RDWg, RDWr

#### Corrective Action

1. Check retic reagents.

2. Flush the flowcell.

## Retic Absorption Distribution Abnormal (RTCADA, CA)

### Definition

The RTCADA flag is triggered if the absorption distribution for the gated cell population is abnormal.

The absorption distribution of the histogram is sufficiently abnormal that the reticulocyte population may not be gated correctly.

The flag is triggered if:

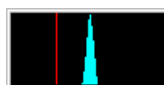
The mode of the calculated Gaussian fit for the absorption histogram is below channel 6.

Retic Abs



The mode of the calculated Gaussian fit for the absorption histogram is above channel 30.

Retic Abs



The SD of the absorption histogram above 80% of the original histogram height is greater than 1.4.

Retic Abs



The measured mean absorption minus the theoretical absorption is greater than 30%.

Retic Abs F



### Results Flagged

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWr, CHDWg, MCVg, MCVr, RDWg, RDWr

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

#### System Related

#### Sample Related

- |  |                         |
|--|-------------------------|
| 1. Check retic reagents.                   | • Aged blood            |
| 2. Check RBC/Baso/Retic hydraulics.        | • Transfusion           |
| 3. Check retic hydraulics.                 | • Sickle cell anemia    |
| 4. Check sheath delivery.                  | • High numbers of NRBCs |
| 5. Check the pressure and vacuum readings. |                         |

## Retic Absorption Flatness (RTC-FL, RF)

### Definition

The Retic Absorption Flatness flag is triggered when the CV (coefficient of variation) for the RETIC ABS Flatness histogram is greater than 3.6.

### Results Flagged

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDW<sub>r</sub>, CHDW<sub>g</sub>, MCV<sub>g</sub>, MCV<sub>r</sub>, RDW<sub>g</sub>, RDW<sub>r</sub>

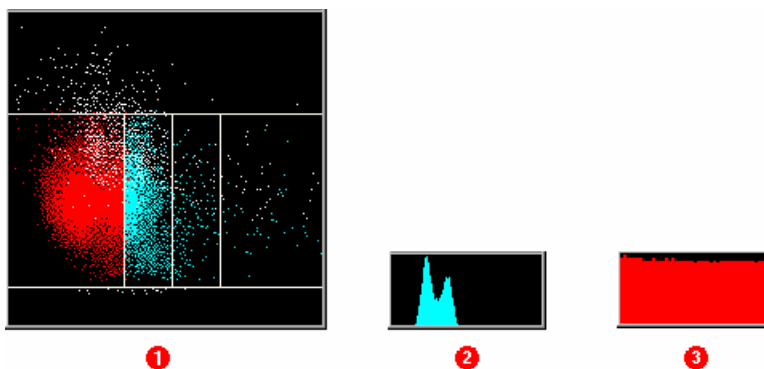
### Corrective Action

Laser oscillation (mode hopping)

Laser oscillation (also called mode hopping) is defined as a change in the laser output frequency during the analysis. Typically, this condition triggers three sample/system flags.

- RETIC Fit Suspect flag (RTC-FS) is triggered due to the bimodal absorption populations that appear on the RETIC Scatter Absorption cytogram (1) and the RETIC Absorption histogram (2).
- RETIC Absorption Distribution Abnormal flag (RTCADA) is due to the bimodal absorption populations that appear on the RETIC Absorption histogram (2).
- RETIC Absorption Flatness flag (RTC-FL) is triggered due to the large variation in absorption signals that appears on the RETIC ABS Flatness histogram (3).

In such cases, the operator must rerun the sample.



## Retic Fit Suspect (RTC-FS, FC)

### Definition

The Retic Fit Suspect flag is triggered if:

- There is more than a 15% difference between the mean and the mode of the Gaussian fit of the RETIC Absorption Histogram.
- The chi-square error for the Gaussian fit exceeds 80,000.

### Results Flagged

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWg, CHDWr, MCVg, MCVr, RDWg, RDWr

### Corrective Action

The following list may not contain all conditions that could cause this flag, nor is there any intention to associate the flag with specific diagnoses.

- Transfusion
- Sickle cell anemia
- Excessive NRBCs

## Retic Irregular Flow Rate (RTCIFR, CR)

### Definition

The Retic Irregular Flow Rate flag is triggered if the cell counting rate is erratic due to a hydraulic disturbance in the retic channel.

Retic flow rate is evaluated in terms of the cell counting rate:

$$\text{Flow Uniformity} = \sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$$

The flag is triggered if this value is greater than 3.2.

The Retic Rate histogram displays the arrival rate of cells in the retic channel.

Normal Retic Rate Histogram



RTCIFR Retic Rate Histogram



### Results Flagged

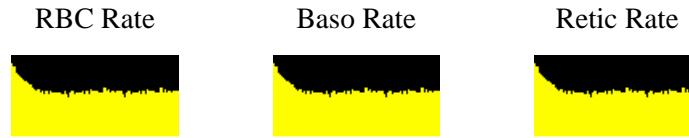
%RETIC, #RETIC

### Corrective Action

1. Check retic reagents.
2. Check laser sample delivery.
3. Check retic hydraulics.

4. Check sheath delivery.
5. Check the pressure and vacuum readings.

A partially clogged RBC/baso/retic sheath filter can produce a distinctive “ski slope” effect on the RBC, Baso, and Retic flow rate histograms. Replace the sheath filter.



## Retic Noise Origin (RTC-NO, NO)

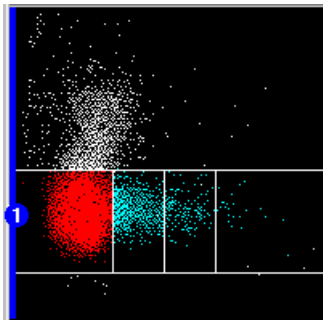
### Definition

The Retic Noise Origin flag is triggered if more than 10% of the gated cell signals come from the Noise Origin area of the RETIC Scatter Absorption cytogram.

The Origin Noise area of the Retic Scatter Abs cytogram is located in absorption channels 1 through 3.

Typically, an excessive number of events detected in this area is due to unsphered cells or improperly set gains.

Normal Retic Scatter  
Abs Cytogram



1 Noise Origin area

### Results Flagged

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWr, CHDWg, MCVg, MCVr, RDWg, RDWr

### Corrective Action

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### **System Related**

1. Check delivery of the sheath reagent.
2. Check delivery of SHEATH/RINSE.
3. Check the RBC/Baso/Retic hydraulics, including the reaction chamber.
4. Check the retic hydraulics.
5. Check retic gains.

### **Sample Related**

- High platelet count
- RBC fragments
- Aged blood
- Sickle cell anemia

## **Retic RBC Count Low (RTC-L, CL)**

### **Definition**

The Retic RBC Count Low flag is triggered if the number of cells analyzed is less than 10,000.

### **Results Flagged**

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDW<sub>r</sub>, CHDW<sub>g</sub>, MCV<sub>g</sub>, MCV<sub>r</sub>, RDW<sub>g</sub>, RDW<sub>r</sub>

### **Corrective Action**

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

### **System Related**

1. Insufficient sample
2. Incorrect open-tube sampler probe length
3. Replace the clot filter
4. Check the retic hydraulics.

### **Sample Related**

- Anemia

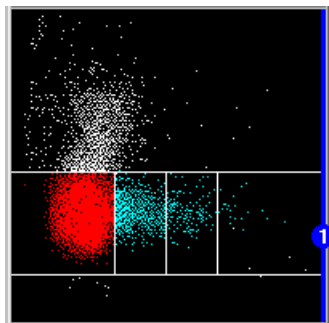
## **Retic Saturation (RTCSAT, CS)**

### **Definition**

The Retic Saturation flag is triggered if the events counted in the Saturation Cell area of the Retic Scatter Absorption cytogram are more than 10% of the gated cell signals.

The Saturated Cells area of the Retic Scatter Absorption cytogram is located in absorption channels 94 through 100.

Normal  
Retic Scatter Abs cytogram



1 Saturation area

**Results Flagged**

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWr, CHDWg, MCVg, MCVr, RDWg, RDWr

**Corrective Action**

Multiple occurrences of this flag, especially for consecutive samples, can indicate a system problem. However, isolated instances of this flag are usually sample related.

The following list of sample-related causes may not contain all conditions that could cause this flag. There is no intention to associate the flag with specific diagnoses.

**System Related**

1. Check delivery of the sheath reagent.
2. Check delivery of SHEATH/RINSE.
3. Check the RBC/Baso/Retic hydraulics.
4. Check the retic hydraulics.
5. Check retic gains.

**Sample Related**

- Immature reticulocytes or neonatal (NRBCs)
- High WBCs

**Retic Slope Error (RTC-SE, SE)**

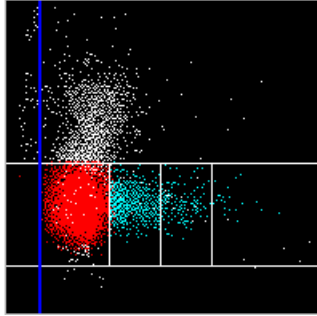
**Definition**

The Retic Slope Error flag is triggered if the slope of the negative cell population on the absorption axis is greater than 0.2 before the slope correction is applied.

The negative cell population should appear parallel to the y axis on the RETIC Scatter Absorption cytogram. Signals will not gate properly if they exhibit a backward or forward tilt.



Normal  
Retic Scatter Abs Cytogram



**Results Flagged**

%RETIC, #RETIC, CHg, CHr, CHCMg, CHCMr, CHDWr, CHDWg, MCVg, MCVr, RDWg, RDWr

**Corrective Action**

The following list may not contain all conditions that could cause this flag, nor is there any intention to associate the flag with specific diagnoses.

- Aged blood
- Sickle cell anemia

**Suspect Cellular Interference (NRCELL, NC)**

**Definition**

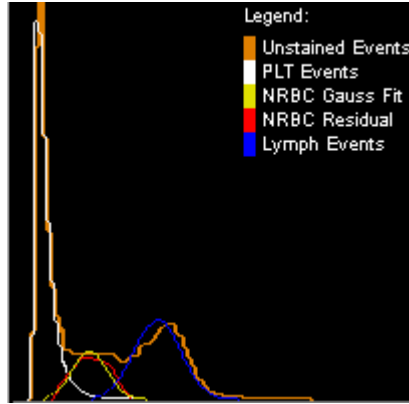
The Suspect Cellular Interference flag is triggered by of the possible presence of unlysed red blood cells. The flag is raised when the Peroxidase channel WBC count (WBCP) is greater than the Basophil/Lobularity WBC count (WBCB) by more than the specified limit.

**Results Flagged**

#NRBC, %NRBC, WBC, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %BASO, #BASO, %LUC, #LUC

Both the NRBC Enumeration histogram and Noise-lymph histogram often show no valley separating Noise events from the nRBC population or the nRBCs from lymphocytes.

**NRBC Enumeration Histogram**



**Noise-Lymph Histogram**



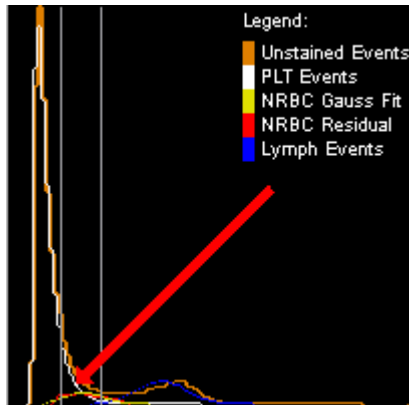
**Suspect Large Plt Interference (NRLPLT, NP)**

The Suspect Large Plt Interference flag is triggered if the system counts more than 40,000 large platelets / $\mu$ L in the RBC/PLT channel.

**Results Flagged**

#NRBC, %NRBC, WBC, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %BASO, #BASO, %LUC, #LUC

**NRBC Enumeration Histogram**



Large platelets may obscure the nRBC population as shown to the left.

**Suspect Lipid Interference (NR-LPD, NL)**

**Definition**

The Suspect Lipid Interference flag is triggered if the number of signals in the noise region of the Basophil/Lobularity Channel exceeds a specified limit when the system reports an NRBC count.

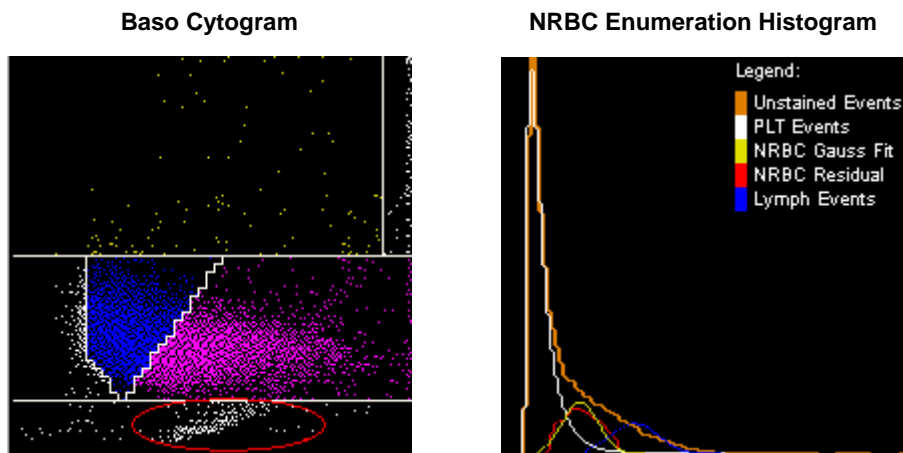
The NR-LPD flag is triggered when both of the following conditions occur:

- BASO % Noise > 2
- BASO % Noise x WBCB > 10

## Results Flagged

#NRBC, %NRBC, WBC, %NEUT, #NEUT, %LYMPH, #LYMPH, %MONO, #MONO, %EOS, #EOS, %BASO, #BASO, %LUC, #LUC

The Baso cytogram and NRBC Enumeration Histogram below illustrate the NR-LPD flag. The circled area of the Baso cytogram identifies the lipid pattern.



## WBC Substitution (WBCSUB, WS)

The WBC substitution rules for CBC / DIFF samples are as follows:

- WBCB is reported as the WBC count if there is no BASO Noise (B-NO) or BASO Saturation (B-SAT) flag.
- If WBCB is flagged with NB or BSAT, then WBCP is substituted as the WBC count if the WBCP is not flagged with:
  - ◆ No Valley Perox (PX-NV),
  - ◆ Perox Saturation (PX-SAT)
  - ◆ Noise Perox (PX-NO)
- If both WBCB and WBCP are flagged, then WBCB is flagged and reported as the WBC count.
- If WBCB is less than 1000 cells/ $\mu$ L, the WBCP count is not substituted as the WBC count. The WBCB count is reported as the WBC count and is flagged.

## Status-Line Messages

% .....	3
2 .....	3
4 .....	4
5 .....	6
8 .....	6
9 .....	6
A .....	7
B .....	39
C .....	42
D .....	46
E .....	47
F .....	49
G .....	49
H .....	50
J .....	58
K .....	58
L .....	58
M .....	59
N .....	60
O .....	66
P .....	67
Q .....	79
R .....	79
S .....	87

<b>T</b> .....	<b>93</b>
<b>U</b> .....	<b>94</b>
<b>V</b> .....	<b>96</b>
<b>W</b> .....	<b>98</b>
<b>X</b> .....	<b>99</b>
<b>Y</b> .....	<b>99</b>
<b>Z</b> .....	<b>99</b>

%

### **% Disk Space Used - Alarm**

Disk space used has risen to the level specified as an alarm criterion, indicating available disk space is low.

#### **Corrective Action**

Increase available disk space by deleting data from any of these files:

- Raw Data files
- Export files
- Sample Results (use Customize, System Setup, Tools Modify, End of Day)
- Logs: Message Log, Service Log, User Notepad, Reagent Log, Workload Log

#### **IMPORTANT**

Deleting files permanently erases data. If you need an electronic copy of the data, back up or export the files before deleting.

### **% Disk Space Used - Stop**

Disk space used has risen to the level specified as the stop criterion, and the autosampler has halted. If stop/alarm criteria are not configured, the default level value is set to 98%.

#### **Corrective Action**

Increase available disk space by deleting data from any of these files:

- Raw Data files
- Export files
- Sample Results (use Customize, System Setup, Tools Modify, End of Day)
- Logs: Message Log, Service Log, User Notepad, Reagent Log, Workload Log

#### **IMPORTANT**

Deleting files permanently erases data. If you need an electronic copy of the data, back up or export the files before deleting.

2

### **20 PSI Out of Range**

System pressure is out of range.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> PSI pressure gauge is out of range	Check the 20 PSI gauge and adjust the regulator if necessary. Setpoint: 20 PSI ± 1.
<b>2</b> Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

### **20 PSI Out of Range - Stop**

System pressure is out of range. The system has stopped because the pressure has reached a critical level that may affect the integrity of sample results and damage the system.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> PSI pressure gauge is out of range	Check the 20 PSI gauge and adjust the regulator if necessary. Setpoint: 20 PSI ± 1.
<b>2</b> Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

### **IMPORTANT**

If problems persist, Call Siemens Service for assistance. Further corrective action must be taken by Siemens service personnel only.

## **4**

### **4 Key Not Found**

The Control Dictionary or the Alarm Dictionary is empty. If the Alarm Dictionary is empty, sample/system flags will appear as exclamation points (!).

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> The Data Manager received a sample that is identified as a control but that has not been set up in the <b>Control Dictionary</b> .	Do not use control ID labels on samples, or set up the control in the <b>Control Dictionary</b> .
<b>2</b> The <b>Alarm Dictionary</b> is empty or missing the Delta Check alarm. The Delta Check alarm must be in the <b>Alarm Dictionary</b> even if you do not use delta checking.	Enter alarms in the <b>Alarm Dictionary</b> .

#### 4 Key Not Found - TestDic.dat - ReadTestCode\_08

Some samples in the database contain a test that has been deleted from the Test Dictionary.

##### Corrective Action

In the Order Entry window, delete these samples to avoid this error. Do not modify the Test Dictionary while samples remain in the database.

#### 40 PSI Out of Range

System pressure is out of range.

Possible Cause	Corrective Action
1 40 PSI pressure gauge is out of range	Check the 40 PSI gauge and adjust the regulator if necessary. Setpoint: 40 PSI $\pm$ 2.
2 Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

#### 40 PSI Out of Range -Stop

System pressure is out of range. The system has stopped because the pressure has reached a critical level that may affect the integrity of sample results and damage the system.

Possible Cause	Corrective Action
1 40 PSI pressure gauge is out of range	Check the 40 PSI gauge and adjust the regulator if necessary. Setpoint: 40 PSI $\pm$ 2.
2 Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

##### IMPORTANT

If problems persist, Call Siemens Service for assistance. Further corrective action must be taken by Siemens service personnel only.



## 5

### 5 PSI Out of Range

System pressure is out of range.

Possible Cause	Corrective Action
1 5 PSI pressure gauge is out of range	Check the 5 PSI gauge and adjust the regulator if necessary. Setpoint: 5 PSI $\pm$ 0.5
2 Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

### 5 PSI Out of Range - Stop

System pressure is out of range. The system has stopped because the pressure has reached a critical level that may affect the integrity of sample results and damage the system.

Possible Cause	Corrective Action
1 5 PSI pressure gauge is out of range	Check the 5 PSI gauge and adjust the regulator if necessary. Setpoint: 5 PSI $\pm$ 0.5
2 Pressure leak	Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.

### IMPORTANT

If problems persist, Call Siemens Service for assistance. Further corrective action must be taken by Siemens service personnel only.

## 8

### 80 Conflict

A conflict has occurred on a sample that was accessed by two different tasks (for example, Review and Edit and Host Communication), or you attempted to access a sample at the same time the Data Manager was attempting to access the sample.

#### Corrective Action

Wait and access the sample again a few seconds later.

## 9

### 9 End of File

The Control Dictionary is empty. Quality Control cannot be operated.

### **Corrective Action**

Define at least one QC file in the Control Dictionary window.

## **A**

### **A Defined File in Prg.par Is Not Found for Backup**

A file is missing that has been defined in the list of programs to be saved when running the Program backup through the End of Day functions.

### **Corrective Action**

Call Siemens Service for assistance.

### **Analyzer Connected**

The computer has connected with the analyzer.

### **Analyzer Not Connected**

The computer has not connected with the analyzer.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> The analyzer is not on.	Select <b>On</b> at the analyzer touchpad.
<b>2</b> Faulty or disconnected Ethernet cable (from the analyzer - J2 Workstation connection to the computer).	Verify that the Ethernet cable connection is secure. Replace if necessary.
<b>3</b> Faulty analyzer CPU board or network interface PC board.	Call Siemens Service for assistance.

### **Analyzer Not Ready**

The analyzer cannot start sample aspiration or hydraulic cycles.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> The SHEATH/	Replace the SHEATH/RINSE reagent.

RINSE reagent container is empty.

- 2** The waste container is full. Empty the waste container.
- 3** Pressure or vacuum levels are out of range.
  - a** Verify that the vacuum and pressure readings are within range. Adjust as necessary.
  - b** After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.
    - i** Select **Shut Down ADVIA** at the Log On/Off window.
    - ii** Select **Off** at the analyzer touchpad.
    - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
    - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

### Analyzer Reset Required

A critical system failure has occurred and an analyzer reset is required.

Possible Cause	Corrective Action
Potential hardware failure associated with at least one of these components: Motor node, pressure node, parallel node, switch indicator, or selector valve	<ol style="list-style-type: none"><li><b>1</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b>.</li><li><b>2</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.<ol style="list-style-type: none"><li><b>a</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window.</li><li><b>b</b> Select <b>Off</b> on the analyzer touchpad.</li><li><b>c</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software.</li><li><b>d</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.</li></ol></li></ol>

### Analyzer/Computer Not Connected

Communications between the analyzer and the computer have been interrupted.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Power failure at the analyzer.	Select <b>Off</b> on the analyzer touchpad and verify that the power plug is connected and secure. Reconnect if necessary and select <b>On</b> at the analyzer touchpad.
<b>2</b> Faulty or disconnected Ethernet cable (from the analyzer - J2 Workstation connection to the computer).	Verify that the Ethernet cable connection is secure. Replace if necessary.
<b>3</b> The computer networking configuration has been corrupted.	<p>Follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer, and then restart:</p> <ul style="list-style-type: none"> <li><b>a</b> Select <b>Shut Down ADVIA</b> in the Log On/Off window.</li> <li><b>b</b> Select <b>Off</b> at the analyzer touchpad.</li> <li><b>c</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software.</li> <li><b>d</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>

### **Anisocytosis - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Anisocytosis - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Aspiration Failed - Probe Clog - Alarm**

Conductivity detectors did not detect a sample within the 20 seconds of aspiration. The number of consecutive occurrences of this condition has met the criterion set for an alarm message.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Clogged sample.	Check for sample clots.
<b>2</b> Insufficient sample volume. Sample tube may have been removed before aspiration was complete.	Re-aspirate sample.
<b>3</b> Insufficient vacuum.	Check vacuum gauge and adjust if necessary.
<b>4</b> Clogged clot filter.	Remove clot filter and discard as biohazardous material. Replace clot filter.
<b>5</b> Loose connection in sample line.	Check connections and tighten if necessary.
<b>6</b> Clog in needle.	Perform a needle rinse. Select <b>Utilities</b> menu, <b>Hydraulic Functions</b> tab, <b>Needle Rinse</b> .
<b>7</b> Bent or damaged needle.	Replace the needle. Follow the steps in Replacing the Sampler Needles.
<b>8</b> Faulty Conductivity Detector	Contact your Siemens Field Service representative for assistance.

### **Aspiration Failed - Probe Clog - Stop**

Conductivity detectors did not detect a sample within the 20 seconds of aspiration. The number of consecutive occurrences of this condition has met the criterion set for a stop message.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Clogged sample.	Check for sample clots.
<b>2</b> Insufficient sample volume. Sample tube may have been removed before aspiration was complete.	Re-aspirate sample.
<b>3</b> Insufficient vacuum.	Check vacuum gauge and adjust if necessary.

- |          |                                  |   |
|----------|----------------------------------|---|
| <b>4</b> | Clogged clot filter.             | Remove clot filter and discard as biohazardous material. Replace clot filter.                               |
| <b>5</b> | Loose connection in sample line. | Check connections and tighten if necessary.   |
| <b>6</b> | Clog in needle.                  | Perform a needle rinse. Select <b>Utilities</b> menu, <b>Hydraulic Functions</b> tab, <b>Needle Rinse</b> . |
| <b>7</b> | Bent or damaged needle.          | Replace the needle. Follow the steps in <b>Replacing the Sampler Needles</b> .                              |
| <b>8</b> | Faulty Conductivity Detector     | Contact your Siemens Field Service representative for assistance.   |

### Aspiration Paused

The analyzer is unable to perform a sample aspiration or to start a hydraulic cycle when certain menus or tabs are open or when certain error messages are triggered. Also the green ready-to-aspirate light is off.

#### Possible Cause

#### Corrective Action

- |          |   |  |
|----------|---|--|
| <b>1</b> | Aspiration is paused while the following menus or tabs are selected: <b>Reagent Installation, Backup/Restore, System Setup, Tools Modify</b> , or with the triggering of some error messages. | Select any tab or menu button other than the ones identified at left under Possible Cause. |
| <b>2</b> | Critical system error occurred, transferring the current system state to "Aspiration Paused."   | Refer to the associated error message for appropriate corrective action steps.             |

### Atypical Lymphocytes - Alarm

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

**Atypical Lymphocytes - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

**Auto Rinse - Started**

The Auto Rinse started on schedule.

**Auto Rinse Canceled**

The System canceled the scheduled Auto Rinse in accordance with user cancellation.

**Auto Rinse Missed**

The scheduled Auto Rinse was missed and did not occur while the Exerciser or System Setup tab was open.

**Auto Standby - Started**

The Auto Standby started on schedule.

**Auto Standby Canceled**

The System canceled the scheduled Auto Standby in accordance with user cancellation.

**Auto Standby Missed**

The scheduled Auto Standby was missed and did not occur while the Exerciser or System Setup tab was open.

**Auto Startup - Exiting Standby**

The System moved from Standby to Ready-to-Run, enabling the scheduled Auto Startup.

**Auto Startup - Started**

Auto Startup has begun on schedule.

**Auto Startup Canceled**

The System canceled the scheduled Auto Startup in accordance with user cancellation.

**Auto Startup is Due - Will Start at End of Run**

The scheduled Auto Startup will begin at the end of sample processing or hydraulic cycles.

**Auto Startup Missed**

The scheduled Auto Startup was missed and did not occur while the Exerciser or System Setup tab was open.

**Auto System Wash - Exiting Standby**

The System moved from Standby to Ready-to-Run, enabling the scheduled Auto System Wash.

**Auto System Wash Canceled**

The System canceled the scheduled Auto System Wash in accordance with user cancellation.

**Auto Wash - Started**

The Auto System Wash started on schedule.

**Auto Wash is Due - Will Start at End of Run**

The scheduled Auto System Wash will begin at the end of sample processing or hydraulic cycles.

**Auto Wash Missed**

The scheduled Auto System Wash was missed and did not occur while the Exerciser or System Setup tab was open.



### **autoRETIC Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **autoRETIC Reagent Expired**

Present date is beyond the autoRETIC reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **autoRETIC Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **Autosampler - Access Door Open**

The autosampler access door is open (24V interlock switch is open).

#### **Corrective Action**

- 1** Close the autosampler access door. The autosampler resets.
- 2** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Autosampler is Already Running**

The autosampler received a command to start or eject racks while it was running.

### **Autosampler - Bad Mixer Aspiration Cal**

Mixer-aspiration calibration failed in diagnostic mode (Exerciser tab).



#### **CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Autosampler calibration error.	Calibrate mixer aspirate position again.
<b>2</b> Autosampler CPU board failed to store calibration data in flash memory.	Replace autosampler CPU board.

### **Autosampler - Bad Mixer Shuttle Cal**

Mixer shuttle/index calibration failed in diagnostic mode (Exerciser tab).



#### **CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Autosampler calibration error.	Calibrate mixer shuttle/index position again.
<b>2</b> Autosampler CPU board failed to store calibration data in flash memory.	Replace autosampler CPU board.

### **Autosampler - Calibration Required**

To start the analyzer, initial calibration values for the Car Index position, Mixer Shuttle position and the Mixer Aspirate position must be stored in flash memory.



#### **CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Autosampler CPU board contains new, unprogrammed flash memory.	Using Exerciser tab, calibrate <b>Car Index</b> position, <b>Mixer-Shuttle</b> position, and <b>Mixer-Aspirate</b> position.
<b>2</b> Flash memory has lost the stored values.	Using Exerciser tab, calibrate <b>Car Index</b> position, <b>Mixer-Shuttle</b> position, and <b>Mixer-Aspirate</b> position.

### **Autosampler - Car Alignment Error, Reset Autosampler**

The autosampler car is out of alignment. A reset is required.

#### **Corrective Action**

- 1** Open the autosampler access door.
- 2** Close the autosampler access door. The autosampler resets.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Car Initialization Failed, Reset Autosampler**

The autosampler car has failed to initialize properly. A reset is required.

#### **Corrective Action**

- 1** Open the autosampler access door.
- 2** Close the autosampler access door. The autosampler will reset.
- 3** If the problem persists, press the Off button on the analyzer touchpad.
- 4** Wait about 1 minute and press the On button to restart the analyzer.
- 5** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Car Lost Steps, Reset Autosampler**

The autosampler car is not in the expected position. A reset is required.

### Possible Cause

**1** Car movement problem.

**2** Persistent car movement problem causing binding and excessive drag on the racks.

### Corrective Action

- a** On the analyzer touchpad, select **Off**.
- b** Wait about 1 minute and select **On** to restart the analyzer.
- c** If the problem persists, call Siemens Service for assistance.



### CAUTION

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions.

- a** Using the Autosampler window of the **Exerciser** tab, move the mixer to the Home position.
- b** Manually move a rack from the input shuttle, through the mixer, to the output shuttle. Check for binding and excessive drag when moving the rack.
- c** Perform the mixer alignment procedure as necessary.

### Autosampler - Car Motion Denied

To prevent the collision of autosampler components, the system did not execute the command to move the autosampler car.

### Autosampler - Car Motion Denied, Reset Autosampler

The autosampler attempted an inappropriate car motion. An autosampler reset is required.

#### Corrective Action

- 1** Select **Off** at the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### Autosampler - Car Motion Failed, Reset Autosampler

The autosampler car has failed to move properly. A reset is required.

#### Corrective Action

- 1** Open the autosampler access door.
- 2** Close the autosampler access door. The autosampler resets.

- 3 If the problem persists, select **Off** ay the analyzer touchpad.
- 4 Wait about 1 minute and select **On** to restart the analyzer.
- 5 If the problem persists, call Siemens Service for assistance.

### **Autosampler - Centering Collar Extend Denied**

To prevent the collision of autosampler components, the system did not execute the command to extend the autosampler centering collar.

### **Autosampler - Centering Collar Failed to Extend, Reset Autosampler**

The autosampler centering collar failed to extend properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Critical Sampler Error. Partial Reset is required.	<b>a</b> Open the autosampler access door. <b>b</b> Close the autosampler access door. The autosampler will reset.
<b>2</b> Critical Sampler Error. Full Reset is required.	<b>a</b> At the analyzer touchpad, select <b>Off</b> . <b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer. <b>c</b> If the problem persists, call Siemens Service for assistance.
<b>3</b> Air lines supplying the centering collar are pinched.	<b>a</b> Open the autosampler access door. <b>b</b> Check for kinked or pinched tubing. Replace if necessary. <b>c</b> Close the autosampler access door. The autosampler will reset. <b>d</b> If the problem persists, call Siemens Service for assistance.
<b>4</b> Faulty output-queue sensor or wiring.	Call Siemens Service for assistance.

### **Autosampler - Centering Collar Failed to Retract, Reset Autosampler**

The autosampler centering collar failed to retract properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Critical Sampler	<b>a</b> Open the autosampler access door.

- |  |   |
|--|---|
| Error. Partial Reset is required.                              | <b>b</b> Close the autosampler access door. The autosampler will reset.   |
| <b>2</b> Critical Sampler Error. Full Reset is required.       | <b>a</b> At the analyzer touchpad, select <b>Off</b> .<br><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.<br><b>c</b> If the problem persists, call Siemens Service for assistance.  |
| <b>3</b> Air lines supplying the centering collar are pinched. | <b>a</b> Open the autosampler access door.<br><b>b</b> Check for kinked or pinched tubing. Replace if necessary.<br><b>c</b> Close the autosampler access door. The autosampler will reset.<br><b>d</b> If the problem persists, call Siemens Service for assistance. |
| <b>4</b> Faulty output-queue sensor or sensor wiring.          | Call Siemens Service for assistance.  |

### **Autosampler - Collar Failed to Extend, Reset Autosampler**

The autosampler centering collar failed to extend properly.

- | <b>Possible Cause</b>                                       | <b>Corrective Action</b>   |
|---|--|
| <b>1</b> Critical Sampler Error. Partial Reset is required. | <b>a</b> Open the autosampler access door.<br><b>b</b> Close the autosampler access door. The autosampler will reset.  |
| <b>2</b> Critical Sampler Error. Full Reset is required.    | <b>a</b> At the analyzer touchpad, select <b>Off</b> .<br><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.<br><b>c</b> If the problem persists, call Siemens Service for assistance. |

- |  |   |
|--|---|
| <b>3</b> Air lines supplying the centering collar are pinched. | <b>a</b> Open the autosampler access door.<br><b>b</b> Check for kinked or pinched tubing. Replace if necessary.<br><b>c</b> Close the autosampler access door. The autosampler will reset.<br><b>d</b> If the problem persists, call Siemens Service for assistance. |
| <b>4</b> Faulty output-queue sensor or wiring.                 | Call Siemens Service for assistance.  |

### **Autosampler - Collar Failed to Retract, Reset Autosampler**

The autosampler centering collar failed to retract properly.

- | <b>Possible Cause</b>  | <b>Corrective Action</b>  |
|--|---|
| <b>1</b> Critical Sampler Error. Partial Reset is required.    | <b>a</b> Open the autosampler access door.<br><b>b</b> Close the autosampler access door. The autosampler will reset.   |
| <b>2</b> Critical Sampler Error. Full Reset is required.       | <b>a</b> At the analyzer touchpad, select <b>Off</b> .<br><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.<br><b>c</b> If the problem persists, call Siemens Service for assistance.  |
| <b>3</b> Air lines supplying the centering collar are pinched. | <b>a</b> Open the autosampler access door.<br><b>b</b> Check for kinked or pinched tubing. Replace if necessary.<br><b>c</b> Close the autosampler access door. The autosampler resets.<br><b>d</b> If the problem persists, call Siemens Service for assistance. |
| <b>4</b> Faulty output-queue sensor or wiring.                 | Call Siemens Service for assistance.  |

### **Autosampler - Centering Collar Motion Denied, Reset Autosampler**

The autosampler attempted an inappropriate centering collar motion. An autosampler reset is required.

### **Corrective Action**

- 1** Select **Off** at the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Centering Collar Retract Denied**

To prevent the collision of autosampler components, the system did not execute the command to retract the autosampler centering collar.

### **Autosampler - Critical Error, Reset Autosampler**

Critical autosampler error. A reset is required.

#### **Corrective Action**

- 1** Select **Off** at the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Diagnostic Mode Not In Effect**

The analyzer sent a diagnostic command to the autosampler while the autosampler was in operating mode.

#### **Corrective Action**

- 1** Open the **Autosampler** window of the Exerciser tab.
- 2** Select **Enter Diagnostic Mode**.

### **Autosampler - Eject Rack Failed**

The autosampler failed to respond to the eject rack command and is not clearing racks from the mixer and input and output shuttles.

#### **Possible Cause**

- 1** Command from analytical module not received by autosampler.
- 2** All communication

#### **Corrective Action**

- a** At the analyzer touchpad, select **Off**.
- b** Wait about 1 minute and select **On** to restart the analyzer.
- c** If the problem persists, call Siemens Service for assistance.

See **1a, b, c**



between the autosampler and the analyzer may be down.

- 3** Autosampler operation may be down. See **1a, b, c**

### **Autosampler Error - Reason Unknown**

Unknown autosampler software error.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Error, Reset Autosampler**

The autosampler has experienced a software error and must be reset.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and pr select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Extra Rack Ejected**

This message is for your information only. If the message persists, call Siemens Service for assistance.

### **Autosampler Failure - Stop**

There has been an autosampler communication error. A reset is required.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
  - 2** Wait about 1 minute and select **On** to restart the analyzer.
- If the problem persists, call Siemens Service for assistance.

### **Autosampler - Flash Memory Failed, Reset Autosampler**

The autosampler flash memory failed to respond to a routine command and might be defective. An autosampler reset is required.

#### **Corrective Action**

- 1** Select **Off** on the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Initialization Required**

In diagnostic mode, the analyzer sent a position command before the appropriate initialization was performed. For example, a position mixer command could have been sent before a mixer initialization.

#### **Corrective Action**

Call Siemens Service for assistance.

### **Autosampler - Input Queue Jammed**

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Rack has jammed the leading edge of input-queue blade.	Remove and reset rack.
<b>2</b> Queue pan motion is impeded.	Check for foreign objects in input-queue pan.
<b>3</b> Feed motor failed.	Call Siemens Service for assistance.

### **Autosampler - Input Queue Motion Denied**

To prevent the collision of autosampler components, the system did not execute the command to move the autosampler input queue.

### **Autosampler - Input Queue Motion Denied, Reset Autosampler**

The autosampler attempted an inappropriate input queue motion. An autosampler reset is required.

### Corrective Action

- 1 Select **Off** at the analyzer touchpad.
- 2 Wait about 1 minute and select **On** to restart the analyzer.
- 3 If the problem persists, call Siemens Service for assistance.

### Autosampler - Input Queue Motion Failed

The autosampler input queue failed to move properly.

Possible Cause	Corrective Action
1 Rack has jammed the leading edge of the input-queue blade.	<b>a</b> Remove and replace rack. <b>b</b> Select <b>Start</b> at the analyzer touchpad. The autosampler resumes operation.
2 Queue pan cannot move properly.	Check the queue pan for foreign objects.
3 Feed motor has failed.	Call Siemens Service for assistance.

### Autosampler - Input Queue Motion Failed, Reset Autosampler

The autosampler input queue failed to move properly. An autosampler reset is required.

Possible Cause	Corrective Action
1 Rack has jammed the leading edge of the input-queue blade.	<b>a</b> Remove and replace rack. <b>b</b> Select <b>Start</b> on the analyzer touchpad. The autosampler resumes operation. If the autosampler does not start: <b>a</b> Select <b>Off</b> at the analyzer touchpad. <b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer. <b>c</b> If the problem persists, call Siemens Service for assistance.
2 Queue pan cannot move properly.	Check the queue pan for foreign objects.
3 Feed motor has failed.	Call Siemens Service for assistance.

### **Autosampler - Input Shuttle Blocked**

A rack in the input-shuttle position is preventing the autosampler from completing a movement.

#### **Corrective Action**

- 1** Remove the rack from the shuttle position at the front of the input queue.
- 2** Select **Start** at the analyzer touchpad to restart autosampler operation.

### **Autosampler - Input Shuttle Not Empty**

A rack in the input-shuttle position is preventing the autosampler from completing a movement.

#### **Corrective Action**

- 1** Remove the rack from the shuttle position at the front of the input queue.
- 2** Select **Start** at the analyzer touchpad to restart autosampler operation.

### **Autosampler - Internal Communication Failure**

During normal operation, the autosampler detected an internal, software-level communication failure. This caused the autosampler to stop operation.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Invalid Operation Mode, Reset Autosampler**

The autosampler was unable to carry out a requested motion. The autosampler might not be in the correct mode.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Invalid Sequence Number**

The autosampler sent the analyzer a sample ID sequence number that did not match the expected sequence number.

<b>Possible Cause</b>	<b>Corrective Action</b>
<p><b>1</b> The autosampler performed two index operations, but no aspiration.</p>	<p><b>a</b> At the analyzer touchpad, select <b>Off</b>.</p> <p><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</p> <p><b>c</b> If the problem persists, call Siemens Service for assistance.</p>
<p><b>2</b> The message sent from the autosampler to the analyzer did not contain the sample ID sequence number expected for the tube in the current rack position.</p>	<p>See <b>1a, b, c</b></p>

### **Autosampler - Mechanical Constraint**

To prevent the collision of autosampler components, the system did not execute the requested action.

### **Autosampler - Mixer Failed**

The autosampler mixer failed and may be defective.

#### **Corrective Action**

- 1** On the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Mixer Lost Steps, Reset Autosampler**

The autosampler mixer is not in the expected position. A reset is required.

<b>Possible Cause</b>	<b>Corrective Action</b>
<p><b>1</b> Car movement problem.</p>	<p><b>a</b> At the analyzer touchpad, select <b>Off</b>.</p> <p><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</p> <p><b>c</b> If the problem persists, call Siemens Service for assistance.</p>

- 2 Persistent car movement problem causing binding and excessive drag on the racks.



**CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions.

- a Perform the mixer alignment procedure as necessary.
- b Check pushpin and centering collar operation when the mixer is in the aspirate position.
- c Check for signs of excessive friction in the mixer bearings.

**Autosampler - Mixer Motion Denied, Reset Autosampler**

The autosampler attempted to perform an inappropriate mixer motion. An autosampler reset is required.

**Corrective Action**

- 1 Select **Off** at the analyzer touchpad.
- 2 Wait about 1 minute and select **On** to restart the analyzer.
- 3 If the problem persists, call Siemens Service for assistance.

**Autosampler - Mixer Motion Failed, Reset Autosampler**

The autosampler failed to perform a routine mixer motion during normal rack processing. A reset is required.

**Possible Cause**

**Corrective Action**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1 Critical autosampler error.</li> </ol>             | <ol style="list-style-type: none"> <li>a At the analyzer touchpad, select <b>Off</b>.</li> <li>b Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li>c If the problem persists, call Siemens Service for assistance.</li> </ol> |
| <ol style="list-style-type: none"> <li>2 Mixer is blocked by a foreign object.</li> </ol>   | <ol style="list-style-type: none"> <li>a Open the autosampler access door.</li> <li>b Remove any foreign objects that might block mixer motion.</li> <li>c Close the autosampler access door. The autosampler will reset.</li> </ol>                   |
| <ol style="list-style-type: none"> <li>3 Mixer home sensor is faulty.</li> </ol>            | <p>Call Siemens Service for assistance.</p>  |
| <ol style="list-style-type: none"> <li>4 Mixer motor power cable is not properly</li> </ol> | <p>Call Siemens Service for assistance.</p>  |

connected or is  
faulty.

### **Autosampler - Mode of Operation Not Set**

The autosampler was unable to carry out a requested motion while the system was in the Exerciser tab.

#### **Corrective Action**

In the **Exerciser** tab, set the autosampler to the correct mode for the operation you want to perform. You may have to reset the autosampler before proceeding.

#### **To reset the autosampler**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Motion Denied, Reset Autosampler**

The autosampler has failed to execute a command to move and must be reset.

#### **Corrective Action**

- 1** At the analyzer touchpad, select **Off**.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Motion Request Failed, Reset Autosampler**

The autosampler failed to perform a requested motion and might be defective. An autosampler reset is required.

#### **Corrective Action**

- 1** Select **Off** at the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Motor Controller Failed, Reset Autosampler**

The autosampler motor controller failed to respond to a routine command and might be defective. An autosampler reset is required.

#### **Corrective Action**

- 1** Select **Off** on the analyzer touchpad.

- 2 Wait about 1 minute and select **On** to restart the analyzer.
- 3 If the problem persists, call Siemens Service for assistance.

### **Autosampler - Needle Extend Denied**

To prevent the collision of autosampler components, the system did not execute the command to extend the autosampler needle.

### **Autosampler - Needle Failed to Extend, Reset Autosampler**

The autosampler needle failed to extend properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Critical Sampler Error.	<b>a</b> Open the autosampler access door. <b>b</b> Close the autosampler access door. The autosampler will reset. <b>c</b> If the problem persists, select <b>Off</b> on the analyzer touchpad. <b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer. <b>e</b> If the problem persists, call Siemens Service for assistance.
<b>2</b> 40 PSI line is out of range.	<b>a</b> Check pressure and adjust if necessary. <b>b</b> Check for pinched air lines supplying needle cylinder. <b>c</b> On the analyzer touchpad, select <b>Off</b> . <b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer. <b>e</b> If the problem persists, call Siemens Service for assistance.
<b>3</b> Needle is bent.	Replace needle.
<b>4</b> Needle sensor failed.	Call Siemens Service for assistance.

### **Autosampler - Needle Failed to Retract, Reset Autosampler**

The autosampler needle failed to retract properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Critical Sampler	<b>a</b> Open the autosampler access door. <b>b</b> Close the autosampler access door. The autosampler



Error.	will reset.
	<ul style="list-style-type: none"> <li><b>c</b> If the problem persists, select <b>Off</b> at the analyzer touchpad.</li> <li><b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>2</b> 40 PSI line is out of range.	<ul style="list-style-type: none"> <li><b>a</b> Check pressure and adjust if necessary.</li> <li><b>b</b> Check for pinched air lines supplying needle cylinder.</li> <li><b>c</b> At the analyzer touchpad, select <b>Off</b>.</li> <li><b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>3</b> Needle is bent.	Replace needle.
<b>4</b> Needle sensor failed.	Call Siemens Service for assistance.

### Autosampler - Needle Jammed

The needle failed to extend or retract during sample aspiration.

Possible Cause	Corrective Action
<b>1</b> 40 PSI line out of range.	<ul style="list-style-type: none"> <li><b>a</b> Check pressure and adjust if necessary.</li> <li><b>b</b> Check for pinched air lines supplying needle cylinder.</li> <li><b>c</b> At the analyzer touchpad, select <b>Off</b>.</li> <li><b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>2</b> Needle sensor failed.	Call Siemens Service for assistance.

### Autosampler - Needle Motion Denied, Reset Autosampler

The autosampler attempted an inappropriate needle motion. An autosampler reset is required.

#### Corrective Action

- 1 Select **Off** at the analyzer touchpad.
- 2 Wait about 1 minute and select **On** to restart the analyzer.
- 3 If the problem persists, call Siemens Service for assistance.

### **Autosampler - Needle Retract Denied**

To prevent the collision of autosampler components, the system did not execute the command to retract the autosampler needle.

### **Autosampler - No Tube Present**

Pushpin cannot find tube in current rack position. Rack spring clip is broken and holds tube incorrectly.

#### **Corrective Action**

Remove rack and check spring clip.

### **Autosampler - Operating Mode Not in Effect**

The autosampler is not in operating mode.

#### **Corrective Action**

- 1 Open the **Autosampler** window of the Exerciser tab .
- 2 Exit the **Exerciser** tab by opening another tab.

### **Autosampler - Output Queue Full**

#### **Possible Cause**

- 1 Output queue and/or output shuttle are full.
- 2 Output queue sensor, ribbon cable, or autosampler CPU board is faulty.

#### **Corrective Action**

Remove racks from output queue and/or output shuttle.



#### **CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take these corrective actions:

- a** Check output-queue sensor and sensor wiring.
- b** Make sure pressing output-queue sensor flag triggers sensor.
- c** Make sure output-queue ribbon is plugged in securely.

- d** Replace autosampler CPU board.

### **Autosampler - Output Queue Jammed**

The output queue is jammed.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Leading edge of the output-queue pan blade spears rack.	Remove racks from output queue and/or output shuttle.
<b>2</b> Output-queue motion impeded.	<b>a</b> Check for foreign objects in output queue, queue covers, or pinch guard. <b>b</b> Make sure output queue moves freely.
<b>3</b> Feed-motor failure.	Call Siemens Service for assistance.

### **Autosampler - Output Queue Motion Denied**

To prevent the collision of autosampler components, the system did not execute the command to move the autosampler output queue.

### **Autosampler - Output Queue Motion Failed**

The autosampler output queue failed to move properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Leading edge of the output-queue blade has speared a rack.	<b>a</b> Remove racks from output queue and shuttle. <b>b</b> Select <b>Start</b> at the analyzer touchpad. The autosampler resumes operation.
<b>2</b> Queue cannot move properly.	Check the output queue, queue covers, and pinch guard for foreign objects. Make sure the queue moves freely.
<b>3</b> Feed motor has failed.	Call Siemens Service for assistance.

### **Autosampler - Output Shuttle Blocked**

A rack in the output-shuttle position is preventing the autosampler from completing a movement.

### **Corrective Action**

- a** Remove the rack from the shuttle position at the front of the output queue.
- b** Select **Start** at the analyzer touchpad to restart autosampler operation.

### **Autosampler - Output Shuttle Failed**

There is no rack in the output shuttle position at the end of shuttle motion. The probable cause is the removal of the rack by the user before the shuttle stops.

### **Autosampler - Output Shuttle Not Empty**

The autosampler has attempted to move a rack to the output shuttle, but the shuttle is not empty.

### **Corrective Action**

Remove rack from the output shuttle.

### **Autosampler - Pushpin Extend Denied**

To prevent the collision of autosampler components, the system did not execute the command to extend the autosampler pushpin.

### **Autosampler - Pushpin Motion Denied, Reset Autosampler**

The autosampler attempted an inappropriate pushpin motion. An autosampler reset is required.

### **Corrective Action**

- 1** Select **Off** at the analyzer touchpad.
- 2** Wait about 1 minute and select **On** to restart the analyzer.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Pushpin Retract Denied**

To prevent the collision of autosampler components, the system did not execute the command to retract the autosampler pushpin.

### **Autosampler - Pushpin Failed to Extend, Reset Autosampler**

The autosampler pushpin failed to extend properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Pushpin is jammed.	<ul style="list-style-type: none"> <li><b>a</b> Open the autosampler access door.</li> <li><b>b</b> Close the autosampler access door. The autosampler will reset.</li> <li><b>c</b> If problem persists, select <b>Off</b> at the analyzer touchpad.</li> <li><b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>2</b> Pushpin catches on the bottom of an improperly positioned rack.	<ul style="list-style-type: none"> <li><b>a</b> Check rack position in mixer. Adjust if necessary.</li> <li><b>b</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>3</b> Pushpin catches on the bottom of the mixer.	<ul style="list-style-type: none"> <li><b>a</b> Check rack position in mixer. Adjust if necessary.</li> <li><b>b</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>4</b> Faulty output-queue sensor or wiring.	Call Siemens Service for assistance.

### **Autosampler - Pushpin Failed to Retract, Reset Autosampler**



The autosampler pushpin failed to retract properly.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Pushpin is jammed.	<ul style="list-style-type: none"> <li><b>a</b> Open the autosampler access door.</li> <li><b>b</b> Close the autosampler access door. The autosampler will reset.</li> <li><b>c</b> If problem persists, select <b>Off</b> at the analyzer touchpad.</li> <li><b>d</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>e</b> If the problem persists, call Siemens Service for assistance.</li> </ul>
<b>2</b> Pushpin catches on the	<ul style="list-style-type: none"> <li><b>a</b> Check rack position in mixer. Adjust if necessary.</li> <li><b>b</b> If the problem persists, call Siemens Service for</li> </ul>

- |  |   |
|--|---|
| bottom of an improperly positioned rack.             | assistance.   |
| <b>3</b> Pushpin catches on the bottom of the mixer. | <b>a</b> Check rack position in mixer. Adjust if necessary.<br><b>b</b> If the problem persists, call Siemens Service for assistance. |
| <b>4</b> Faulty output-queue sensor or wiring.       | Call Siemens Service for assistance.  |

### Autosampler - Pushpin Jammed

Pushpin is jammed and cannot extend or retract properly.

- | Possible Cause  | Corrective Action  |
|---|--|
| <b>1</b> Pushpin catches on bottom of improperly positioned rack. | <b>a</b> Check and adjust rack position in mixer.<br> <b>CAUTION</b><br>Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take this corrective action.<br><b>b</b> Check output-queue sensor and sensor wiring.   |
| <b>2</b> Pushpin catches on bottom surface of mixer extrusion.    | <b>a</b> Check and adjust rack position in mixer.<br> <b>CAUTION</b><br>Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take this corrective action.<br><b>b</b> Check output-queue sensor and sensor wiring. |

### Autosampler - Rack Index Failed, Reset Autosampler

The scanner has read a valid barcode that does not correspond to the expected rack or position numbers. This indicates that the rack has not moved to the proper position.

- | Possible Cause                  | Corrective Action  |
|---------------------------------|--|
| <b>1</b> Rack movement problem. | <b>a</b> At the analyzer touchpad, select <b>Off</b> .<br><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.<br><b>c</b> If the problem persists, call Siemens Service for |

assistance.

- 2 Persistent mixer problem causing binding and excessive drag on the racks.



**CAUTION**

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take this corrective action.

- a Using the Autosampler window of the **Exerciser** tab, move the mixer to the Home position.
- b Manually move a rack from the input shuttle, through the mixer, to the output shuttle. Check for binding and excessive drag when moving the rack.
- c Perform the mixer alignment procedure as necessary.

### **Autosampler - Rack or Position Barcode Not Read**

The barcode reader cannot determine a valid rack ID or position number for the current tube position.

**Possible Cause**

**Corrective Action**

- 1 Rack barcode label improperly placed, obscured, or absent.
- 2 Window of barcode reader is dirty, or line of sight is obstructed.
- 3 Faulty barcode reader.

- Make sure the barcode label is correctly placed on the rack, is clean, and meets specifications.
- a Clean barcode reader window.
  - b Make sure there is no visual obstruction between the barcode reader window and the rack.
  - c If problem persists, call Siemens Service for assistance.
- Call Siemens Service for assistance.

### **Autosampler - Rack Scan Denied**

Barcode reader is unable to scan.

**Possible Cause**

**Corrective Action**

- 1 Faulty barcode reader cabling.

- a At the analyzer touchpad, select **Off**.
- b Wait about 1 minute and select **On** to restart the analyzer.
- c If the problem persists, call Siemens Service for assistance.

- |   |  |
|---|--|
| <b>2</b> Faulty barcode reader.   | See <b>1a, b, c</b>  |
| <b>3</b> Window of barcode reader is dirty, or line of sight is obstructed. | <b>a</b> Clean barcode reader window.<br><b>b</b> Make sure there is no visual obstruction between the barcode reader window and the rack.<br><b>c</b> If problem persists, call Siemens Service for assistance. |
| <b>4</b> Rack barcode label improperly placed, obscured, or absent.         | Make sure the barcode label is correctly placed on the rack, is clean, and meets specifications.   |

### Autosampler - Rack Scan Failed

Barcode reader is unable to scan.

- | Possible Cause                          | Corrective Action  |
|---|--|
| <b>1</b> Faulty barcode reader cabling. | <b>a</b> At the analyzer touchpad, select <b>Off</b> .<br><b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.<br><b>c</b> If the problem persists, call Siemens Service for assistance. |
| <b>2</b> Faulty barcode reader.         | See <b>1a, b, c</b>  |

### Autosampler - Shuttle Gate Open

Input queue cannot advance the rack because the shuttle gate is not closed.

- | Possible Cause                               | Corrective Action  |
|--|--|
| <b>1</b> Shuttle gate only partially closed. | <b>a</b> Check for an obstruction to the shuttle gate.<br><b>b</b> Push the shuttle gate to check for spring resistance. |

- 2** Faulty sensor or sensor wiring.



#### CAUTION

Call Siemens Service for assistance. Only Siemens Service personnel are authorized to take this corrective action:

Check sensor and associated wiring.



### **Autosampler - Startup Failed, Reset Autosampler**

The autosampler has failed to start up. A reset is required.

#### **Corrective Action**

- 1** Open the autosampler access door.
- 2** Close the autosampler access door. The autosampler resets.
- 3** If the problem persists, call Siemens Service for assistance.

### **Autosampler - Tube Too High**

Tube is sitting too high in rack, or tube exceeds specifications, halting autosampler.

#### **Possible Cause**

#### **Corrective Action**

- |   |  |
|---|--|
| <b>1</b> Tube is improperly positioned. | <b>a</b> Push tube down.<br><b>b</b> At the analyzer touchpad, select <b>Start/Stop</b> to continue operations.                              |
| <b>2</b> Tube is too long.              | <b>a</b> Remove tube from rack and aspirate manually.<br><b>b</b> At the analyzer touchpad, select <b>Start/Stop</b> to continue operations. |

### **Autosampler Startup Complete**

The autosampler has successfully completed the startup process.

### **Autosampler - Unexpected Car Position, Reset Autosampler**

The autosampler car is not in the proper position. A reset is required.

#### **Corrective Action**

- 1** Open the autosampler access door.
- 2** Close the autosampler access door. The autosampler resets.
- 3** If the problem persists, call Siemens Service for assistance.

### **Awaiting Header**

Software communication error.

#### **Possible Cause**

#### **Corrective Action**

This error can occur during the following analytical cycles:

- Adjust Gains - RBC/RETIC
- Align Optics
- Direct Optics

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

## B

### **Bad Analysis for R Message :10402**

The results message sent to the host is incorrect.

#### **Corrective Action**

Call Siemens Service for assistance.

### **Bad Analysis for Y Message :10402**

The format of the received workorder is incorrect. The workorder cannot be created.

#### **Corrective Action**

Call Siemens Service for assistance.

### **Bad Mixer Cal Value - Reset Autosampler**

Mixer-aspirate calibration failed while the system was in diagnostic mode (Exerciser).

The corrective actions for this error must be performed by Siemens Service personnel only.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Autosampler Calibration error	Calibrate the mixer aspirate position again.
<b>2</b> Autosampler CPU board fails to store calibration data in flash memory	Replace autosampler CPU board.

### **Bad Test in Profile**

An incorrect test code is defined in a profile.

### **Corrective Action**

Correct the Profile Table using the List menu in the Table Dictionaries window.

### **BASO Count Suspect - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **BASO Count Suspect - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **BASO Irregular Flow Rate - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **BASO Irregular Flow Rate - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **BASO Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **BASO Reagent Expired**

Present date is beyond the BASO reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **BASO Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **BASO Saturation - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **BASO Saturation - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **BASO Temperature Out - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **BASO Temperature Out - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Blasts - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Blasts - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **BTRIEVE - TabDic.dat File**

The Type Table Dictionary contains the code of a profile that has been deleted.

#### **Corrective Action**

Check and correct the Type Table Dictionary. Select Customize menu, System Setup, Tools Modify, Type Table Dictionary.

## **C**

### **Car Motion Failed - Reset Autosampler**

The autosampler failed to move as expected.

<b>Possible Cause</b>	<b>Corrective Action</b>
-----------------------	--------------------------

- |                            |   |
|----------------------------|---|
| Autosampler software error | <ol style="list-style-type: none"> <li><b>1</b> At the analyzer touchpad, select <b>Off</b>.</li> <li><b>2</b> Wait about 1 minute and select <b>On</b> to restart the analyzer.</li> <li><b>3</b> If problem persists, call Siemens Service for assistance.</li> </ol> |
|----------------------------|---|

### Check Waste Container Vacushield

The vacuum pump filter (vacushield) on the waste container may be saturated with liquid.

Possible Cause	Corrective Action
<b>1</b> Vacuum pump filter (vacushield) is clogged	Replace the vacuum pump filter.
<b>2</b> Vacuum leak	<ol style="list-style-type: none"> <li><b>a</b> Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary.</li> <li><b>b</b> Check the waste container to make sure that the spigot is closed and the cap is on securely.</li> </ol>
<b>3</b> Crimped waste line	Check for a crimped waste line on the waste container. Straighten or reconnect lines as necessary.

### IMPORTANT

If problems persist, Call Siemens Service for assistance. Further corrective action must be taken by Siemens service personnel only.

### Communications Error with Analyzer

Software communication error between the computer and the analyzer.

Possible Cause	Corrective Action
<b>1</b> Internal software corruption	<ol style="list-style-type: none"> <li><b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b>.</li> <li><b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer, and then restart.               <ol style="list-style-type: none"> <li><b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window.</li> <li><b>ii</b> Select <b>Off</b> at the analyzer touchpad.</li> <li><b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software.</li> </ol> </li> </ol>

iv Restart the analyzer by selecting **On** at the analyzer touchpad.

- 2 Faulty or disconnected Ethernet cable (from the analyzer - J2 Workstation connection to the computer) Verify that the Ethernet connection is secure. Replace if necessary.

### **Comparison Error MCHC/CHCM - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Comparison Error MCHC/CHCM - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Comparison Error WBCB/WBCP - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

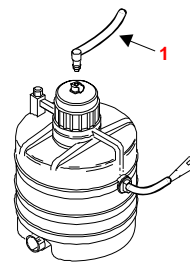
### **Comparison Error WBCB/WBCP - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

## Compressor Timeout

During system startup or when exiting standby, the compressor has failed to reach the acceptable pressure or vacuum levels within the allotted time.

Possible Cause	Corrective Action
<b>1</b> System restarted too quickly after being turned off	Manually vent the waste container by disconnecting the waste container vacuum line (1), waiting for the vacuum to dissipate, and then reconnecting the line.
<b>2</b> Vacuum line attached to the waste container is disconnected or crimped	<b>a</b> Reconnect or remove any crimps from the waste container vacuum lines. <b>b</b> At the analyzer touchpad, select <b>Off</b> . <b>c</b> Wait at least 1 minute and select <b>On</b> to restart the analyzer.
<b>3</b> Vacuum pump filter (vacushield) is clogged	Replace the vacuum pump filter.
<b>4</b> Compressor failure	Call Siemens service for assistance.



## Control Out of Range - Alarm

One or more control samples have yielded out of range test results. The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria.

## Control Out of Range - Stop

One or more control samples have yielded out of range test results. The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts when the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria.

## Could Not Attempt Location of a Workorder, Exception Occurred

A sample workorder could not be located because of a software error.

### Corrective Action



The default selectivity has been applied for the affected sample. Rerun the sample if desired.

### **Cycle Aborted for Unknown Reason - Reset Required**

A cycle abort condition was triggered by the analyzer, but the reason given was not recognized by the computer.

#### **Corrective Action**

- 1** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset**.
- 2** After about 1 minute, if the status line does not display Ready to Run and the green ready aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer, and then restart.
  - a** Select **Shut Down ADVIA** at the Log On/Off window.
  - b** Select **Off** at the analyzer touchpad.
  - c** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - d** Restart the analyzer by selecting **On** at the analyzer touchpad.

## **D**

### **Data Manager Critical Error**

An internal software communication error has triggered a high-level Data Manager error.

#### **Corrective Action**

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### **Defined More Than Once In File**

**Note:** This message can begin with a keyword or a test code.

#### **Possible Cause**

- 1** The same keyword is set several times in the header of the Report.par, Prevalid.par, Print.par, or QCreport.par files. No blank or presentation line can be inserted after the asterisk (\*) in the result block.

#### **Corrective Action**

Use the Format window to correct the file layout.

- 2 The same test code is used twice in the \*.par file. Remove the duplicate test codes from the \*.par file in Tools Modify.

### **DEFOAMER Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **DEFOAMER Reagent Expired**

Present date is beyond the DEFOAMER reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **DEFOAMER Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

## **E**

### **Error Opening Port**

This error can occur during the system preparation (initialization) process.

#### **Corrective Action**

Select Shut Down ADVIA in the Log On/Off window. Select CTRL+ALT+DELETE and log back onto the system to restart the software. If the error recurs, check the communication port where the problem occurs (COM 1 or MCA Serial Board).

### **EZ KLEEN Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **EZ KLEEN Reagent Expired**

Present date is beyond the EZ KLEEN reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **EZ KLEEN Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

## F

### **File Does Not Exist**

A patient or control result printout has been selected in the Routine Parameters window. But one of the files, Report.par, Prevalid.par, Print.par, or QCreport.par, is not defined.

#### **Corrective Action**

Restore dictionaries in Other Utilities window.

### **File Not Found: C:\Wst\Oen.cnf**

The default workorder screen configuration file is missing.

#### **Corrective Action**

Continue to create workorders in Order Entry as needed. To restore the Oen.cnf file, select Other Utilities and restore dictionaries.

### **File Not In Modifiable File List - Updating**

This message appears when a file is created through the Format window. The file is then stored in the database.

#### **Corrective Action**

No action is required.

## G

### **GETEQUAL**

This control is not defined in the Control Dictionary.

#### **Corrective Action**

Define the control in the Control Dictionary.

### **GlobalLock or GlobalUnlock**

The selected dispositions cannot be stored because the sample record is full.

#### **Corrective Action**

Reduce the number of dispositions selected or cancel the selections and create a new workorder through the Order Entry window.

## H

### HGB Colorimeter Error - Reset Required

Potential software communication error or a hardware failure associated with the HGB Colorimeter.

Possible Cause	Corrective Action
<b>1</b> Hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.
<b>2</b> Faulty power supply, fuse, cable, HGB Interface Node Board, or Can Bus Scrambler Board	Call Siemens Service for assistance.

### HGB Concentration Variance - Alarm

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### HGB Concentration Variance - Stop

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **HGB Irregular Flow Rate - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **HGB Irregular Flow Rate - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **HGB Power Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **HGB Power Low - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **HGB Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **HGB Reagent Expired**

Present date is beyond the HGB reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **HGB Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **Hyperchromia - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Hyperchromia - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

I

### **Image Affected to Wrong Group**

There is a conflict between two settings in the Customer Parameters.

The parameters in Customer Parameters §21, ASSOCIATE CBC/DIFF IMAGE WITH A TEST GROUP and ASSOCIATE RETIC IMAGE WITH A TEST GROUP, can be set only to values attached to a test group. The test groups are defined in Customer Parameters §17.

### **Corrective Action**

- 1** Open **Customer Parameters** in Tools Modify mode.
- 2** Define the test groups in Customer Parameters §17.
- 3** Set the values in §21 to correspond to the test groups you have defined.

or

- 1** Open **Customer Parameters** in Tools Modify mode.
- 2** Set the values in §21 = **0**.

### **Immature Granulocytes - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Immature Granulocytes - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Indicator and Switch Error - Reset Required**

Potential software communication error or a hardware failure associated with the front panel switch/indicator.

#### **Possible Cause**

- 1** Hardware failure

#### **Corrective Action**

- a** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset**.
- b** After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.



- i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Press **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.
  
- 2** The cable connected to the switch/indicator is crimped. Select **Off** at the analyzer touchpad to check for crimped cable. Free the crimped cable if necessary and restart the analyzer by selecting **On** at the analyzer touchpad.
  
- 3** Faulty power supply, fuse, Switch/Indicator board, cable, Parallel Node Board, Can Bus Scrambler Board, or Switch/Indicator panel. Call Siemens Service for assistance.

### Initialization Failed - During Communication from Analyzer

Software communication error.

#### Corrective Action

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### Initialization Failed - During Configuration Download

Software communication error.

#### Corrective Action

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### Initialization Failed - During Download of Cycle Definition

Software communication error.

### **Corrective Action**

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### **Initialization Failed - During Image Download**

Software communication error.

#### **Corrective Action**

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### **Initialization Failed - During OMF File Download**

Software communication error.

#### **Corrective Action**

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### **Initialization Failed - Waiting for Waste and Rinse Clear**

During System Preparation in Progress, the SHEATH/RINSE was empty or the waste container was full.

#### **Possible Cause**

- 1** SHEATH/RINSE empty during System Preparation.

#### **Corrective Action**

Replace the SHEATH/RINSE reagent. The system preparation process will continue automatically.

- 2** Waste container full during System Preparation.

Empty the waste container and replace. The system preparation process will continue automatically.

### **Initialization Failed - Writing Image Download**

Software communication error or possible faulty Ethernet cable (from the analyzer - J2 Workstation connection to the computer).

#### **Corrective Action**

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, verify that the Ethernet connection is secure, and replace if necessary. If the problem recurs, call Siemens Service for assistance.

### **Invalid / Unknown TDC Error**

An unrecognized Data Manager error has occurred.

#### **Corrective Action**

Follow these steps to exit the ADVIA 2120/2120i software and then restart:

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.

If the problem persists, call Siemens Service for assistance.

### **Invalid Configuration, Mandatory Field Missing**

The configuration file is incorrect. A mandatory field is missing.

#### **Corrective Action**

On the Screen Configuration window, correct the configuration file. Select Customize menu, System Setup, Tools Modify, Screen Configuration.

### **Invalid Host Test Number (=0)**

A test has an improper host number defined in the Test Dictionary.

#### **Corrective Action**

Verify host number in Test Dictionary, Characteristics.

### **Invalid Morphology Flags Host Number: xxx**

The morphology flags from the analyzer cannot be managed by the Data Manager and cannot be transmitted to the host.

**Corrective Action**

Call Siemens Service for assistance.

**Invalid Numerical Result Format**

A result edited in the Review and Edit window has a format incompatible with the communications protocol.

**Corrective Action**

Verify that the format shows four results of one character each.

**Invalid RBC or WBC Flag**

The RBC or WBC has incorrect or undefined values in the analyzer. The sample will not be transmitted to the host.

**Corrective Action**

Verify that the result is composed of four results of one character each.

**Invalid System Number**

The computer system number, as it applies to the host, is improperly defined or undefined in the parameter file.

**Corrective Action**

Call Siemens Service for assistance.

**Invalid Test Code in Report.par File**

A test code entered in the Report.par file is not valid.

**Corrective Action**

Correct problem using Key list in Format window.

J  
K  
L

### **Large Platelets - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Large Platelets - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Laser Power Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Laser Power Low - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Left Shift - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Left Shift - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Length of Range Field Too Long in REPORT.PAR File**

The ranges have been incorrectly defined in the Report.par file.

#### **Corrective Action**

Use the Format window to correct the problem.

## **M**

### **Macrocytosis - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Macrocytosis - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Manual Sample ID - Auto Increment Off**

Auto increment feature has been turned off. (Use Operations, Manual Sample ID.) The sample ID for manually aspirated samples will not automatically increment by one. The sample ID must be entered by keyboard, barcode reader, or workorder.

### **Manual Sample ID - Auto Increment On**

Auto increment feature has been selected. (Use Operations, Manual Sample ID.) The sample ID for manually aspirated samples will increment by one for each succeeding aspiration.

### **Matching Not Possible - Mismatch of Sample Types**

The test request sent by the host and the unmatched sample are not the same type. The test request is refused and the sample remains unmatched.

#### **Corrective Action**

Verify the accuracy of the host test table. Verify type in Test Dictionary. Select Customize menu, System Setup, Tools Modify, Test Dictionary.

### **Microcytosis - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Microcytosis - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **MPO Deficiency - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **MPO Deficiency - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

## **N**

### **NACK Received**

A conflict has occurred in host communications.

### **Corrective Action**

Call Siemens Service for assistance.

### **No BASO MN/PMN Valley - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **No BASO MN/PMN Valley - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **No Cell Cluster Fit on PEROX - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **No Cell Cluster Fit on PEROX - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **No Data Available in Result Message**

The Data Manager cannot recognize the result types received from the analyzer.

### **Corrective Action**

Call Siemens Service for assistance.



### **No Graphic Result Data in Result Message**

The Data Manager cannot compress graphic results before storing them in the database.

#### **Corrective Action**

Call Siemens Service for assistance.

### **No Help Available for this Message**

There is no Help available for this message at this time. If you cannot find sufficient information in the Operator's Guide, contact your Siemens Representative for assistance.

### **No Numerical Result in Result Message**

The Data Manager cannot convert CBC/DIFF or Retics results into numerical or comment results.

#### **Corrective Action**

Call Siemens Service for assistance.

### **No PEROX Noise/Lymph Valley - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **No PEROX Noise/Lymph Valley - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **No Test**

There is a message problem with the test request sent from the host.

#### **Corrective Action**

Verify that the host is sending the test request. If the problem recurs, call Siemens Service for assistance.

### **No Type**

The type of test request sent by the host is not defined in the Test Dictionary.

#### **Corrective Action**

Verify the accuracy of the host test table. Define the test in Test Dictionary. Select Customize menu, System Setup, Tools Modify, Test Dictionary.

### **No Workorder - Alarm**

No workorder received for current patient sample. The number of consecutive occurrences of this condition has met the criterion specified for an alarm message.

#### **Possible Cause**

- 1** A work order has not been created for the current patient sample.
- 2** A work order has not been transmitted for the current patient sample.

#### **Corrective Action**

- Verify that a work order has been created at the host computer or at the Data Manager.
- Check if problem exists at the host computer. If problem is not at the host level, call Siemens Service for assistance.

### **No Workorder - Stop**

No workorder received for current patient sample. The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler has stopped.

#### **Possible Cause**

- 1** A work order has not been created for the current patient sample.
- 2** A work order has not been transmitted for the current patient sample.

#### **Corrective Action**

- Verify that a work order has been created at the host computer or at the Data Manager.
- Check if problem exists at the host computer. If problem is not at the host level, call Siemens Service for assistance.

### **No Working Buffer Initialized**

This error can occur during the system preparation (initialization) process.

#### **Corrective Action**

Restart the ADVIA 2120/2120i software. If the error recurs, call Siemens Service for assistance.

### **Noise BASO - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Noise BASO - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Noise PEROX - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Noise PEROX - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Non WBC Interference - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Non WBC Interference - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Nucleated Red Blood Cells - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Nucleated Red Blood Cells - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **# \$ > NULL - Delta Check Alarm Not Defined**

The Delta Check mechanism is defined in the parameter file but not in the Alarm Dictionary.

#### **Corrective Action**

Define the Delta Check alarm in the Alarm Dictionary.

### **NULL - Delta Check Alarm Not Selected**

The Delta Check mechanism is not defined in the parameter file.

#### **Corrective Action**

Call Siemens Service for assistance in modifying the parameter file.

### **NULL - Number Max of Rerun Not Defined**

The number of authorized reruns is not defined in the parameter file.

### **Corrective Action**

Using the Customer Parameters window, define the parameter, Max Number of Automatically Proposed Reruns, to specify the maximum number of reruns proposed by the Data Manager.

### **NULL - Status Modified**

The status of the specified sample has been modified.

### **Corrective Action**

No operator action required.

## **O**

### **Open Port Error**

A software preparation (initialization) error has occurred.

#### **Corrective Action**

- 1** Select **Shut Down ADVIA** at the Log On/Off window.
- 2** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
- 3** If the error recurs, select **Customize** menu, **System Setup, Tools Modify, Port Configuration**.
- 4** Verify that the Inst1 device is listed as ADVIA 2120/2120i and correct it if necessary.
- 5** Check the communications port where the problem occurs (COM 1 or MCA Serial board).

If the system is using the Host Spec 79 Network connection, Siemens Field Service personnel should make sure the Host name and IP address are specified correctly:

- 1** Use Windows Explorer to open the directory **C:\WINNT\system32\drivers\etc**.
- 2** Double-select **Hosts**.
- 3** In the Open with box, select **Notepad** and select **OK**.
- 4** At the bottom of the document, verify the host IP address and the host computer name match those supplied by the host computer administrator. Make sure the address and name are separated by at least one space.
- 5** If there is an error in the Host name or IP address, correct it. Then on the File menu, select **Save**.
- 6** Close Notepad.

## OPEN - Sid# Already Exists

The host has sent a workorder to the Data Manager that already exists in the database. The Data Manager cannot update the current workorder with the new one because the sample status is Incomplete, Current Complete, Complete, or All Complete.

## P

### Parallel Node Error - Reset Required

Potential software communication error or hardware failure associated with the Parallel Node Board.

Possible Cause	Corrective Action
<b>1</b> Software communication error or hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset.</b> <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> in the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.
<b>2</b> Faulty power supply, fuse, cable, Parallel Node Board, or Can Bus Scrambler Board	Call Siemens Service for assistance.

### Patient QC Formula Not Defined

This error occurs when there is no value defined for the FSE parameter `Calculs_PatientQC_Formula`. This parameter determines the formula used to calculate the moving average. To define the parameter, contact your local Siemens technical support provider.

The possible settings for the parameter are:

0 = parameter not active

1 = Bull's Algorithm

2 = arithmetic mean

### **Patient QC Formula Not Defined – Parameterization – Calcul**

This error occurs when there is no value defined for the FSE parameter `Calculs_PatientQC_Formula`. This parameter determines the formula used to calculate the moving average. To define the parameter, contact your Siemens Field Service Representative.

The possible settings for the parameter are:

0 = parameter not active

1 = Bull's Algorithm

2 = arithmetic mean

### **Patient Result Database Is Full**

The patient result database has reached maximum capacity, causing the autosampler to stop and transition the system state to "Aspiration Paused."

#### **Corrective Action**

Increase available patient result database space by deleting data from the sample results file. Use `Customize, System Setup, Tools Modify, End of Day`.

#### **IMPORTANT**

Deleting files permanently erases data. If you need an electronic copy of the data, back up the files before deleting.

### **Patient Result Database Is Nearly Full**

The patient result database has reached the level specified as the warning level, causing the autosampler to stop and transition the system state to "Ready to Run."

#### **Corrective Action**

Increase available patient result database space by deleting data from the sample results file. Use `Customize, System Setup, Tools Modify, End of Day`.

#### **IMPORTANT**

Deleting files permanently erases data. If you need an electronic copy of the data, back up the files before deleting.

### **Pattern File (Win.cus) Does Not Exist**

The file containing the customer parameters does not exist. A substitute file using default values has been created.

#### **Corrective Action**

Call Siemens Service for assistance.

### **PEROX 1 Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **PEROX 1 Reagent Expired**

Present date is beyond the PEROX 1 reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX 1 Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.



### **PEROX 2 Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **PEROX 2 Reagent Expired**

Present date is beyond the PEROX 2 reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX 2 Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX 3 Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **PEROX 3 Reagent Expired**

Present date is beyond the PEROX 3 reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX 3 Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX Irregular Flow Rate - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **PEROX Irregular Flow Rate - Stop**

The number of cycles specified for a stop message. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **PEROX Power Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

## PEROX Power Low - Stop

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

## PEROX Sample Pump Error - Reset Required

PEROX sample syringe pump not in home position, failed to respond, or a transmission error occurred.

Possible Cause	Corrective Action
<b>1</b> PEROX sample syringe pump not moving or not in home position.	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset.</b> <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.
<b>2</b> PEROX sample syringe incorrectly assembled.	Follow the steps in Replacing the Syringe Plungers.
<b>3</b> Faulty power supply, fuse, cable, pump assembly, Can Bus Scrambler Board, or Dual Servo Pump Control Board.	Call Siemens Service for assistance.

## PEROX Saturation - Alarm

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

## PEROX Saturation - Stop

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

## PEROX SHEATH Pump Error - Reset Required

PEROX SHEATH syringe pump not in home position, failed to respond, or a transmission error occurred.

Possible Cause	Corrective Action
<b>1</b> PEROX SHEATH syringe pump not moving or not in home position.	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset.</b> <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.
<b>2</b> PEROX SHEATH syringe incorrectly assembled.	Follow the steps in Replacing the Syringe Plungers.
<b>3</b> Faulty power supply, fuse, cable, pump assembly, Can Bus Scrambler Board, or Dual Servo Pump Control Board.	Call Siemens Service for assistance.

### **PEROX SHEATH Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **PEROX SHEATH Reagent Expired**

Present date is beyond the PEROX 3 SHEATH reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX SHEATH Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### **PEROX Temperature Out - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **PEROX Temperature Out - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Platelet Clumps - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Platelet Clumps - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Platelet Noise - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **Platelet Noise - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Possible Blasts or Abnormal Cells - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### Possible Blasts or Abnormal Cells - Stop

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### Power Pack Temperature High

The internal temperature of the power supply has exceeded the maximum limit.

Possible Cause	Corrective Action
<b>1</b> Fan filters are dirty	Shut down the system and remove and clean the air-circulation filter as directed in the Operator's Guide.
<b>2</b> System internal temperature exceeds the maximum limit	<b>a</b> Shut down the system. <b>b</b> Allow the system to cool down for 15 minutes. <b>c</b> Restart the system. <b>d</b> If the problem persists, call Siemens Service for assistance.
<b>3</b> Fans are not functioning properly	Verify fan operation. If you suspect that a fan is not working properly, call Siemens Service for assistance.
<b>4</b> Faulty power pack temperature sensor	Call Siemens Service for assistance.

### Pressure Node Error - Reset Required

Potential software communication error or a hardware failure associated with the Pressure Node Board.

Possible Cause	Corrective Action
<b>1</b> Hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.

- i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.
- 2** Pressure out of range. Verify pressure readings and adjust if necessary.
- 3** Faulty power supply, fuse, cable, Pressure/Switch Node Board, or Can Bus Scrambler Board. Call Siemens Service for assistance.

### **Printer Busy - Printing Aborted**

The printer was busy when a printout was requested.

#### **Corrective Action**

Restart the printout when the printer is free.

### **Printer Not Defined**

The printer is not defined in the Port Configuration window.

#### **Corrective Action**

Correct or enter the printer definition in the Port Configuration window. Select Customize menu, System Setup, Tools Modify, Port Configuration.

### **Printer Not Ready - Impression Aborted**

A printer problem has occurred during background printing of a results report. No message box is displayed. The printout will resume as soon as the printer is available.

#### **Corrective Action**

Verify printer connections and operation.



### **Printer Problem - Alarm**

A printer problem has occurred. The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

#### **Corrective Action**

Verify printer connections and operation. Typical printer problems include:

- Paper jams
- Out of paper
- Printer offline
- Printer disconnected

### **Printer Problem - Stop**

A printer problem has occurred. The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

#### **Corrective Action**

Verify printer connections and operation. Typical printer problems include:

- Paper jams
- Out of paper
- Printer offline
- Printer disconnected

### **Probe Clog**

Conductivity detector did not detect a sample within twenty seconds of aspiration.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Clogged sample	Check for sample clots.
<b>2</b> Insufficient sample volume	Sample tube may have been removed before aspiration was complete. Re-aspirate sample. If error persists clean the sample shear valve.

- |          |                                 |   |
|----------|---------------------------------|---|
| <b>3</b> | Insufficient vacuum             | Check vacuum gauge and adjust if necessary.   |
| <b>4</b> | Clogged clot filter             | Remove clot filter and discard as biohazardous material. Replace clot filter.                     |
| <b>5</b> | Loose connection in sample line | Check connections and tighten if necessary.   |
| <b>6</b> | Clogged needle                  | Rinse needle. Select <b>Utilities</b> menu, <b>Hydraulic Functions</b> tab, <b>Needle Rinse</b> . |
| <b>7</b> | Bent or damaged needle          | Replace the needle.<br>Follow the steps in Replacing the Sampler Needles                          |
| <b>8</b> | Faulty Conductivity Detector    | Contact your local Siemens technical support provider for assistance.                             |

## Q

### QC Sample Deleted Before Validation

A control sample that was not validated has been deleted.

Daily QC may not be consistent.

## R

### Rack or Position Barcode Not Read - Alarm

The barcode reader cannot determine a valid rack ID or position number for the current tube position. The number of consecutive occurrences of this condition has met the criterion specified for an alarm message in the Alarm/Stop Criteria window.

- | <b>Possible Cause</b>  | <b>Corrective Action</b>  |
|--|---|
| <b>1</b> Barcode label improperly placed, obscured, or absent. | Check that a barcode label is properly attached and meets specifications. Replace if necessary. |
| <b>2</b> Faulty barcode reader.                                | Call Siemens Service for assistance.  |

### **Rack or Position Barcode Not Read - Stop**

The barcode reader cannot determine a valid rack ID or position number for the current tube position. The number of consecutive occurrences of this condition has met the criterion specified for a stop message in the Alarm/Stop Criteria window, and the autosampler has halted.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Barcode label improperly placed, obscured, or absent.	Check that a barcode label is properly attached and meets specifications. Replace if necessary.
<b>2</b> Faulty barcode reader.	Call Siemens Service for assistance.

### **RBC Fragments - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RBC Fragments - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RBC Ghosts - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RBC Ghosts - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RBC Irregular Flow Rate - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RBC Irregular Flow Rate - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RBC Reagent Empty - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The reagent is empty, and the autosampler has halted. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

#### **Corrective Action**

The stop counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation. Select Start/Stop to continue the run.

### **RBC Reagent Expired**

Present date is beyond the RBC reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **RBC Reagent Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message, indicating that the reagent level is low. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria, Reagent Conditions.

### Corrective Action

The alarm counter is automatically reset after reagents are replenished and the Reagent Installation window is updated. Go to Logs, Reagent Log, Reagent Installation.

### RBC Sample Pump Error - Reset Required

RBC sample syringe pump not in home position, failed to respond, or a transmission error occurred.

Possible Cause	Corrective Action
<b>1</b> RBC sample syringe pump not moving or not in home position.	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by selecting <b>On</b> at the analyzer touchpad.
<b>2</b> RBC sample syringe incorrectly assembled.	Follow the steps in Replacing the Syringe Plungers.
<b>3</b> Faulty power supply, fuse, cable, pump assembly, Can Bus Scrambler Board, or Dual Servo Pump Control Board.	Call Siemens Service for assistance.

### RBC Sheath Pump Error - Reset Required

RBC Sheath syringe pump not in home position, failed to respond, or a transmission error occurred.

### Possible Cause

**1** RBC Sheath syringe pump not moving or not in home position.

**2** RBC Sheath syringe incorrectly assembled.

**3** Faulty power supply, fuse, cable, pump assembly, Can Bus Scrambler Board or Dual Servo Pump Control Board.

### Corrective Action

- a** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset.**
- b** After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.
  - i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

Follow the steps in Replacing the Syringe Plungers.

Call Siemens Service for assistance.

### Ready to Run

The system is ready to accept the aspiration of a sample or the start of a hydraulic cycle. The green ready-to-aspirate light is lit.

### Results Received for Tube Not in

Pending File Sid#: xxx Seq#: A set of results has been received for a sample that is not in the Pending file. The set of results has been refused and deleted.

### Corrective Action

Check pending list before run.

### **RETIC Absorption Distribution Abnormal - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Absorption Distribution Abnormal - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC Fit Suspect - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Fit Suspect - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC Irregular Flow Rate - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Irregular Flow Rate - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC Noise Origin - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Noise Origin - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC - PLT Interference/Error - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC - PLT Interference/Error - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC RBC Count Low - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.



### **RETIC RBC Count Low - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC Saturation Cells - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Saturation Cells - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **RETIC Slope Error - Alarm**

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### **RETIC Slope Error - Stop**

The number of consecutive occurrences of this condition has met the criterion specified for a stop message. The autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

### **Review Mode Change to Review None**

The validation mode has been modified through the Parameters menu in the Review and Edit window.

## Running

Displayed after pressing the autosampler Start/Stop button or during sample processing.

### Possible Cause

If the system halts in the **Running** state, there could be a hardware or software failure.

### Corrective Action

- a** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset**.
- b** After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.
  - i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

## S

### # \$ > Sample ID Not Read - Alarm

Sample-tube barcode label is unreadable or missing. The number of consecutive occurrences of this condition has met the criterion specified for an alarm message.

### Possible Cause

- 1** Barcode label improperly placed, obscured, or not present.
- 2** Barcode reader faulty.

### Corrective Action

- Verify that a barcode is present and correctly applied to the sample tube (with the label flush against the rim of the stopper). Verify that the barcode is clean and of specified quality.
- Call Siemens Service for assistance.

### Sample ID Not Read - Stop

Sample-tube barcode label is unreadable or missing. The number of consecutive occurrences of this condition has met the criterion specified for a stop message, and the autosampler has halted.

### Possible Cause

- 1** Barcode label improperly

### Corrective Action

- Verify that a barcode is present and correctly applied to the sample tube (with the label flush against the rim of

placed, the stopper). Verify that the barcode is clean and of obscured, or specified quality. not present.

- 2 Barcode reader faulty. Call Siemens Service for assistance.

### **Sample Rejected: SID #**

The results for the last aspiration of this sample have been rejected. This sample record is full. A sample record can hold only 110 results, including C.Res. Prev.Run, and Prev.Res.

#### **Corrective Action**

Create a new workorder with the same patient demographics and assign a new SID #. Label the sample tube again with the new SID #, and run.

### **Sample Result Data Communication Failure**

The Align Optics or Direct Optics cycle was exited before result processing was complete.

#### **Corrective Action**

Results produced when this error was triggered are invalid. Repeat sample aspiration for the affected samples.

### **Sample SID Not Found - Printing Aborted**

The sample displayed in the Review and Edit window does not exist in the database. The system cannot provide the requested printout.

#### **Corrective Action**

Correct the problem using the Key list in the Format window.

### **Sample Status: – THE STATUS – Sid#:x R&P#:y**

A sample with this status could not receive results. The results received for this sample have been refused.

#### **Corrective Action**

In the Customer Parameters window, modify the parameter that specifies each sample status allowed to receive results.

### Sample xxx Is Not Transmitted to the Host

There is a transmission problem to the host computer. The message specifies the Sid# of the nontransmitted samples. Another message will follow identifying the specific problem.

### Scan Denied - Reset Autosampler

Barcode reader is unable to scan.

Possible Cause	Corrective Action
<b>1</b> Faulty barcode reader cabling	<b>a</b> At the analyzer touchpad, select <b>Off</b> . <b>b</b> Wait about 1 minute and select <b>On</b> to restart the analyzer. <b>c</b> If the problem persists, call Siemens Service for assistance.
<b>2</b> Faulty barcode reader	See <b>1a, b, c</b>

### SD Not Defined For Test# xx Control# xxyyzzz

No standard deviation is defined for this test and for this control in the Control Dictionary.

#### Corrective Action

Define the SD in the Control Dictionary.

### Selected Printer Not Available - Result Report for SID#:

The printer is not responding to a print request.

#### Corrective Action

Check that the printer is powered on and has paper. Refer to the Message Log for details.

### Selector Valve Error

Potential software communication error or a hardware failure associated with the selector-valve assembly.

Possible Cause	Corrective Action
<b>1</b> Hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display

Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.

- i** Select **Shut Down ADVIA** at the Log On/Off window.
- ii** Select **Off** at the analyzer touchpad.
- iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
- iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

- 2** Faulty power supply, fuse, cable, selector valve assembly, UFC Scrambler Board, or Can Bus Scrambler Board

Call Siemens Service for assistance.

### Selector Valve Timeout

The selector valve failed to return to the home position within the expected time interval.

#### Possible Cause

- 1** Hardware failure

#### Corrective Action

- a** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset**.
- b** After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.
  - i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

- 2** Faulty power supply, fuse, cable, selector valve assembly, UFC

Call Siemens Service for assistance.

Scrambler Board, or  
Can Bus Scrambler  
Board.

### **SHEATH / RINSE Reagent Container Empty**

SHEATH/RINSE level has dropped below the level sensor in the SHEATH/RINSE container, indicating that the container is empty. When this error message is displayed, the aspirate plate will not function, nor will the Ready light illuminate.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> SHEATH/RINSE is empty.	Replace SHEATH/RINSE reagent and use the message icon to Remove the error message.
<b>2</b> Faulty level sensor.	Call Siemens Service for assistance.

### **SHEATH / RINSE Reagent Expired**

Present date is beyond the SHEATH/RINSE reagent expiration date, as determined by encoded reagent container barcode label or as calculated from installation date and open container stability.

#### **Corrective Action**

Replenish expired reagents and update the Reagent Installation window. Go to Logs, Reagent Log, Reagent Installation.

### **Sid# Already Exists - Result Message Rejected**

You have created a workorder with an Sid# having the format: 999XXXX. This format is used by the analyzer to send results of misread samples. The results are refused.

#### **Corrective Action**

Create a workorder with a proper Sid# format.

### **Standby**

The analyzer is in a low-power state that reduces component wear during periods of inactivity. The green ready-to-aspirate light is off. Typically, the analyzer enters standby automatically. Use the touchpad Standby button to exit or enter the standby state manually.

#### **Corrective Action**

If the analyzer is locked in the standby state, verify that the pressure and vacuum readings are within range and adjust if necessary. Select Standby to exit.

### **Status BTRIEVE - Alarm Not Defined**

An alarm sent from the analyzer is unknown to the Data Manager (not defined in the Alarm Dictionary).

#### **Corrective Action**

See Alarm Dictionary.

### **Status BTRIEVE - Test Not Found**

A test defined in the Control Dictionary has been erased from the Test Dictionary.

#### **Corrective Action**

Enter test information in the Test Dictionary.

### **Syntax Error in AlarmExc.par**

The parameter file, AlarmExc.par, is not correctly defined, or there is a blank line in the file. No exclusive analytical alarm will be taken into account in the patient QC calculation.

#### **Corrective Action**

Call Siemens Service for assistance.

### **System Preparation Failed**

An error occurred during the initial system preparation phase.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Software communication failure	Follow these steps to exit the ADVIA 2120/2120i software and then restart. <b>a</b> Select <b>Shut Down ADVIA</b> in the Log On/Off window. <b>b</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software.
<b>2</b> Hardware error	Refer to associated hardware error message for appropriate corrective action.
<b>3</b> Faulty CPU board	Call Siemens Service for assistance.

## System Preparation in Progress

When the ADVIA 2120/2120i is first powered on or the software is restarted, the analyzer and the computer go through a preparation process which includes the following:

- Software initialization
- Internal diagnostic checks
- Priming of reagent lines
- Startup, including a background verification cycle

## System Preparation Not Complete

### Corrective Action

- a** Reset the analyzer by selecting **Utilities, Exerciser, Indicators, Analyzer Reset**.
- b** After about 1 minute, if the status line does not display **Ready to Run** and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart.
  - i** Select **Shut Down ADVIA** at the Log On/Off window.
  - ii** Select **Off** at the analyzer touchpad.
  - iii** Select **CTRL+ALT+DELETE** and log back onto the system to restart the software.
  - iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

## T

### Test Not Buffered - cTestCode

There are more than 60 tests ACTIVE in the Test Dictionary. No additional tests can be stored in memory.

### Corrective Action

Cancel the selection of the active test that exceeded this limit in the Test Dictionary. Select Customize menu, System Setup, Tools Modify, Test Dictionary.

### Tube xxx Not Transmitted to the Host

An expected result was not transmitted.

### Corrective Action



Check the sample status and the contents of the file before attempting to retransmit this sample. The problem may be an acknowledgement problem at the host level. The communication line should be checked by Siemens Service personnel.

### **Type Not Found**

The type of workorder sent by the host is unknown to the Data Manager. No type can be associated with the test request.

#### **Corrective Action**

Create this type in the Type Table Dictionary. Select Customize menu, System Setup, Tools Modify, Type Table Dictionary.

### **Types Table Test Doesn't Exist**

A test defined in the Types Table has been deleted in the Test Dictionary.

#### **Corrective Action**

As appropriate, delete the test from the Type Table, or reenter the test in the Test Dictionary.

## **U**

### **UFC Vacuum Out of Range**

UFC Vacuum is out of range. The difference between the compressor vacuum and UFC vacuum is greater than 5" Hg.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Vacuum Setting is out of range	Check the system vacuum gauge and adjust the regulator if necessary. Setpoint: 20"Hg ± 1
<b>2</b> Vacuum leak	<b>a</b> Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary. <b>b</b> Check the waste container to make sure that the spigot is closed and the cap is on securely.
<b>3</b> Vacuum pump filter (vacushield) is clogged	Replace the vacuum pump filter.
<b>4</b> Crimped waste line	Check for a crimped waste line on the waste container. Straighten or reconnect lines as necessary.

## UFC Vacuum Out of Range - Stop

System vacuum is out of range. The system has stopped because the vacuum has reached a critical level that may affect the integrity of sample results and damage the system. The difference between the compressor vacuum and UFC vacuum is greater than 5" Hg.

Possible Cause	Corrective Action
<b>1</b> Vacuum Setting is out of range	Check the system vacuum gauge and adjust the regulator if necessary. Setpoint: 20"Hg ± 1
<b>2</b> Vacuum leak	<b>a</b> Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary. <b>b</b> Check the waste container to make sure that the spigot is closed and the cap is on securely.
<b>3</b> Vacuum pump filter (vacushield) is clogged	Replace the vacuum pump filter.
<b>4</b> Crimped waste line	Check for a crimped waste line on the waste container. Straighten or reconnect lines as necessary.

### IMPORTANT

If problems persist, Call Siemens Service for assistance. Further corrective action must be taken by Siemens service personnel only.

## Unable to Process Results - Check Instrument Parameterization

The image result does not match the numeric result.

### Corrective Action

Call Siemens Service for assistance.

## Unable to Process Results - Communication Line Fault

A defect on the communication line has made the numeric results unreadable.

### Corrective Action

Call Siemens Service for assistance.

## Unable to Process Results - IDee Too Long

The IDee received from the analyzer is longer than 14 digits.

### Corrective Action

Check the length of the sample ID.

### **Unknown Host Test Number xx**

A workorder from the host contains a test that is not defined in the Test Dictionary or contains an incorrect host number.

#### **Corrective Action**

Modify the Test Dictionary or correct the host test table. Do not modify the Test Dictionary while samples remain in the database.

## **V**

### **Vacuum Out of Range**

System vacuum is out of range.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Vacuum gauge is out of range	Check the system vacuum gauge and adjust the regulator if necessary. Setpoint 20" Hg $\pm$ 1.
<b>2</b> Vacuum leak	<b>a</b> Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary. <b>b</b> Check the waste container to make sure that the spigot is closed and the cap is on securely.

### **Vacuum Out of Range - Stop**

System vacuum is out of range.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> Vacuum gauge is out of range	Check the system vacuum gauge and adjust the regulator if necessary. Setpoint 20" Hg $\pm$ 1.
<b>2</b> Vacuum leak	<b>a</b> Check for crimped or disconnected hydraulic or pneumatic lines. Straighten or reconnect lines as necessary. <b>b</b> Check the waste container to make sure that the spigot is closed and the cap is on securely.

## Valve Node 1 Error - Reset Required

Potential software communication error or a hardware failure associated with the Valve Driver 1 Board.

Possible Cause	Corrective Action
<b>1</b> Hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> at the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software. <b>iv</b> Restart the analyzer by pressing <b>On</b> at the analyzer touchpad.
<b>2</b> Faulty power supply, fuse, cable, Valve Driver 1 Board, or Can Bus Scrambler Board	Call Siemens Service for assistance.

## Valve Node 2 Error - Reset Required

Potential software communication error or a hardware failure associated with the Valve Driver 2 Board.

Possible Cause	Corrective Action
<b>1</b> Hardware failure	<b>a</b> Reset the analyzer by selecting <b>Utilities, Exerciser, Indicators, Analyzer Reset</b> . <b>b</b> After about 1 minute, if the status line does not display Ready to Run and the green ready-to-aspirate light is still off, follow these steps to exit the ADVIA 2120/2120i software, turn off the analyzer and then restart. <b>i</b> Select <b>Shut Down ADVIA</b> in the Log On/Off window. <b>ii</b> Select <b>Off</b> at the analyzer touchpad. <b>iii</b> Select <b>CTRL+ALT+DELETE</b> and log back onto the system to restart the software.

**iv** Restart the analyzer by selecting **On** at the analyzer touchpad.

- |   |                                      |
|---|--------------------------------------|
| <b>2</b> Faulty power supply, fuse, cable, Valve Driver 2 Board, or Can Bus Scrambler Board | Call Siemens Service for assistance. |
|---|--------------------------------------|

## W

### Waste Container - Full

Waste level in the container has reached the level sensor indicating that the container is full. When this error message is displayed, the aspirate plate will not function, nor will the Ready light illuminate.

<b>Possible Cause</b>	<b>Corrective Action</b>
<b>1</b> The waste container is full.	Follow the steps in Emptying the Waste Container.
<b>2</b> Level sensor cable is disconnected.	Verify connection is secure.
<b>3</b> Faulty level sensor.	Call Siemens Service for assistance.

### WBC Substitution - Alarm

The number of consecutive occurrences of this condition has met the criterion specified for an alarm message. The specified alarm criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Alarm Criteria is automatically reset.

### WBC Substitution - Stop

The number of consecutive occurrences of this condition has

autosampler halts at the same time the stop message occurs. The specified stop criterion is user definable in the Customize Menu, System Setup, Alarm/Stop Criteria. The counter associated with the Stop Criteria is reset when the Start/Stop button is selected.

**Wrong Sample Type for Test Number xx**

The type defined in the Test Dictionary for this test is not consistent with the sample type in process.

**Corrective Action**

Check the Test Dictionary and the pending sample for the proper sample type.

**Wrong Test Group Defined**

A test has been defined in several test groups, or it has been defined in a test group but not in the Test Order Table. The Data Manager cannot manage the defined test groups.

**Corrective Action**

Use the Customer Parameters window to correct the test group definition.

**X****Y****Z**



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## Basophil / Lobularity Method

### Cytochemical Reactions

The basophil/lobularity cytochemical reactions consist of two steps:

**Step 1** Red blood cells and platelets are lysed using the ADVIA 2120/2120i BASO reagent.

**Step 2** All white blood cells *except* basophils are stripped of their cytoplasm using the ADVIA 2120/2120i BASO reagent and the increased temperature in the reaction chamber.

The stripped white cells can now be categorized as mononuclear or polymorphonuclear cells based on the shape and complexity of their cell nuclei. The intact basophils can be easily distinguished from the smaller cell nuclei.

### Basophil / Lobularity Temperature Control

Temperature control is critical to the cell-stripping process. The baso reaction chamber temperature, which is automatically monitored by the analyzer, must be between 32 °C and 34 °C.

If you want to check the baso reaction chamber temperature:

At the Utilities menu, select **Analyzer Status**.

If you need to adjust the baso reaction chamber temperature:

1. At the Special Procedures menu, select **Adjust Lamp / Temp**.
2. Select **Baso Temperature**.

### ADVIA 2120/2120i BASO Reagent

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i BASO reagent, please see Chapter 8.

The ADVIA 2120/2120i BASO reagent contains phthalic acid and a surfactant that lyses the red cells, platelets, and the cytoplasm of all white cell types except basophils.

### ADVIA 2120/2120i SHEATH / RINSE

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i SHEATH/RINSE, please see Chapter 8

ADVIA 2120/2120i SHEATH/RINSE has several important functions:

#### Optical sheath for Baso, RBC / Platelet, and Reticulocyte Methods

- Constricts the sample stream so that only one cell at a time can pass through the viewing area

- Prevents contact between the sample stream and the flowcell walls, which prevents clogs and staining of the flowcell
- Provides an optically transparent medium through which the sample stream can be clearly focused

**Rinse for Baso, RBC / Platelet, Peroxidase, Reticulocyte, and Hemoglobin Methods**

- Cleans the hydraulic pathways for each method

**Baseline solution for Hemoglobin Method**

- Provides a baseline reading

**Measurement**

A constant volume of the cell suspension from the baso reaction chamber passes through the flowcell where the low-angle light scatter ( $2^{\circ} - 3^{\circ}$ ) and high-angle light scatter ( $5^{\circ} - 15^{\circ}$ ) signatures of each white blood cell are measured, based on:

- The size of the cell or nucleus
- The nuclear configuration, which is a combination of the nuclear shape and cell density

ADVIA 2120/2120i SHEATH/RINSE encases the sample stream as the two fluids pass through the flowcell.

The optical signals from the flowcell are converted to electrical pulses by photodiodes. After processing, the following information is available:

**BASO Rate** histogram displays the arrival rate of cells in the Baso channel.

**BASO X** histogram displays the high-angle light scatter information (nuclear configuration) for the MN (mononuclear) and PMN (polymorphonuclear) populations.

**BASO Y** histogram displays the low-angle light scatter information (size) for the MN population.

**BASO** cytogram is formed from the paired low and high-angle light scatter data. Cluster analysis identifies the individual populations.

If cluster analysis cannot be used for a particular sample, the cell populations are identified using histogram analysis.

**BASO Rate Histogram**



The BASO Rate histogram shows the uniformity of the cell-counting rate.

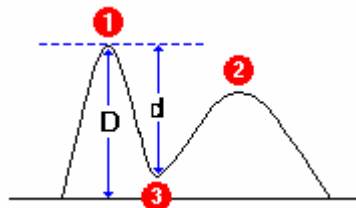
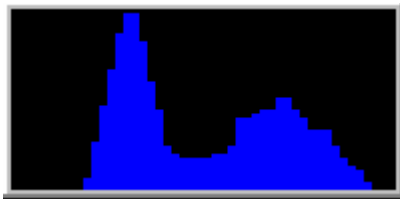
The rate histogram data consists of 50 points, one taken every 200 milliseconds. Each point represents the number of valid cells counted during the last 200 milliseconds.

## BASO X Histogram

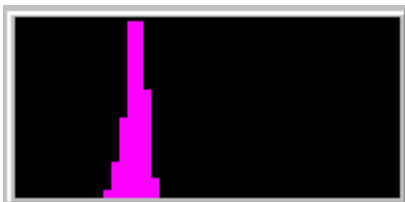
The BASO X histogram displays the event distributions that correspond to the entire x axis of the BASO cytogram. However, it contains only those events on the y axis between the noise and basophil thresholds of the BASO cytogram. This will include the MN (mononuclear) and PMN (polymorphonuclear) populations.

The following parameters are derived from the BASO X histogram:

- The mode channel (MN<sub>x</sub>) of the MN population on the x axis (1) (The mode channel contains the largest number of cells in a particular population.)
- The mode channel (PMN<sub>x</sub>) of the PMN population on the x axis (2)
- The valley channel that separates the MN/PMN populations (3) (The valley channel contains the fewest number of cells between two populations.)
- The relative depth of the valley as expressed by d/D (BASO d/D)
- The Lobularity Index (LI) value provides an indication of sample abnormality. The LI is the PMN peak channel number on the Baso X histogram divided by 14, and it is greater than 1.9 for normal samples. Values lower than 1.9 are usually indicative of sample abnormality.



## BASO Y Histogram



The BASO Y histogram displays the event distributions from the noise threshold to channel 49 on the y axis of the BASO cytogram. However, it contains only those events on the x axis up to the MN/PMN valley channel of the BASO cytogram. This will include the MN (mononuclear) population.

The BASO Y histogram is used to determine the mode channel (MN<sub>y</sub>) of the MN population on the y axis.

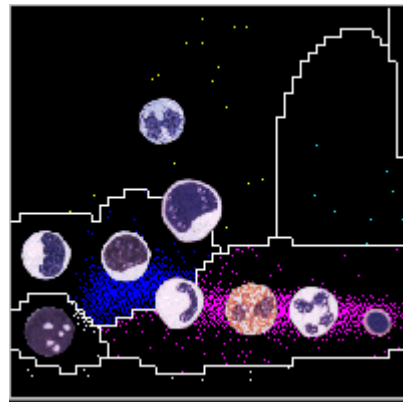
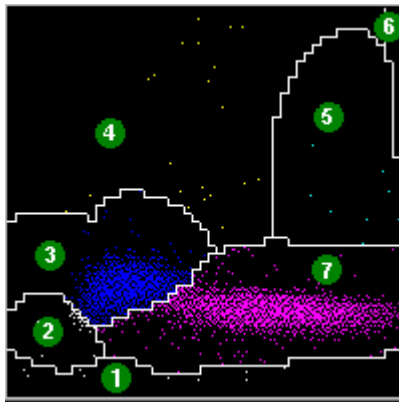
## BASO Cytogram: Cluster Analysis

The BASO cytogram is divided into 50 counting channels on each axis.

When the high-angle light scatter (nuclear configuration) is plotted on the x axis, and the low-angle light scatter (cell size) is plotted on the y axis, distinct populations or clusters are formed.

Cluster analysis identifies each population based on its position, area, and density, and then counts the number of cells/nuclei in each population.

The following BASO cytograms were obtained from a representative patient specimen.



- |  |  |
|--|--|
| 1 Noise  | 5 Baso Suspect   |
| 2 Blast cell nuclei                                    | 6 Saturation   |
| 3 Mononuclear WBCs<br>(Monocyte and Lymphocyte nuclei) | 7 Polymorphonuclear WBCs<br>(Neutrophil and Eosinophil nuclei) |
| 4 Basophils  |  |

### Noise Area

This area contains platelets, RBC stroma, and other cellular debris that are not included in the total white blood cell count (WBCB).

### Blast Cluster

When present, blasts appear in the blast cluster.

### Mononuclear Cluster

In normal samples, the MN population contains lymphocyte and monocyte nuclei.

### Basophil Cluster

With their cytoplasm intact, basophils are much larger than the white cell nuclei and appear in the Basophil cluster.

### Baso Suspect Cluster

Contains unlysed cells other than basophils. Counts from this area are not included in the basophil count.

### Saturation Area

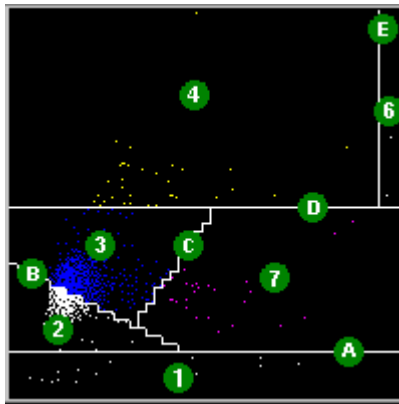
Typically, this area contains air bubbles that are not included in the basophil or WBCB count.

### Polymorphonuclear Cluster

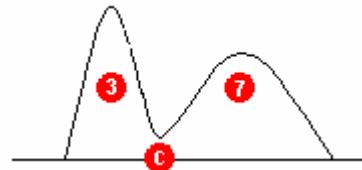
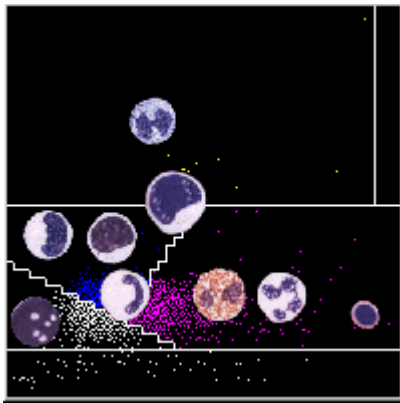
In normal samples, the PMN population contains eosinophil and neutrophil nuclei.

### BASO Cytogram: Histogram Analysis

If the cluster analysis does not agree with a normal archetype due to a low cell count, or if there is only one identifiable cell population, the following cell populations are identified using histogram analysis: Basophils, MN (mononuclear cells), PMN (polymorphonuclear cells), Blasts, Noise, and Baso Saturation area.

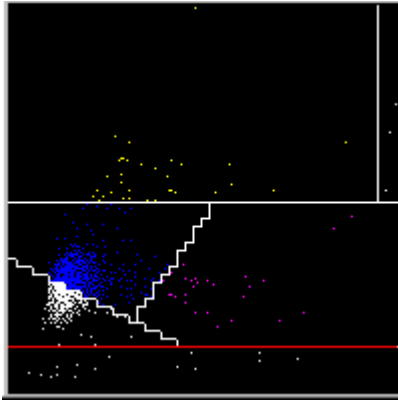


- A Baso Noise threshold
- B Blast threshold
- C MN/PMN valley threshold
- D Basophil threshold
- E Baso Saturation threshold
- 1 Noise nuclei
- 2 Blast cell
- 3 Mononuclear WBCs (Monocyte and Lymphocyte nuclei)
- 4 Basophils
- 5 not used
- 6 Saturation
- 7 Polymorphonuclear WBCs (Neutrophil and Eosinophil nuclei)



BASO X histogram

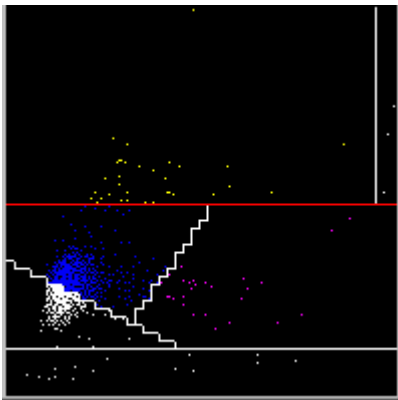
### Baso Noise Threshold



This threshold (shown as a red line) is set at channel 4 on the y axis.

Events below this threshold are counted as noise, while cells above the threshold are included in the white cell count (WBCB).

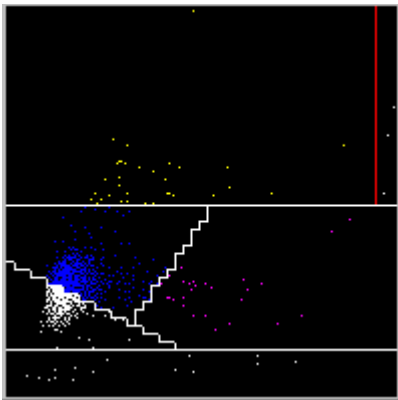
### Basophil Threshold



This threshold (shown as a red line) separates the Basophils from the nuclei of the other cell types.

The threshold is set at channel 21 on the y axis. All cells above this threshold are counted as Basophils.

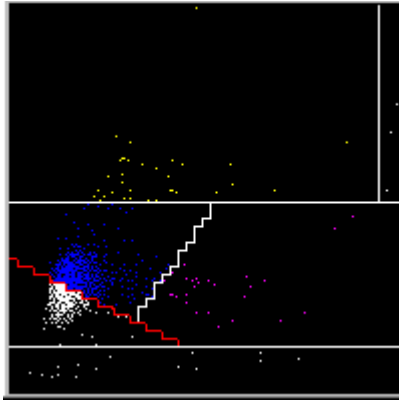
### Baso Saturation Threshold



This threshold (shown as a red line) is set at channel 45 on the x axis and channel 21 on the y axis.

Events within this area (microbubbles, clumped cells, and unlysed cells) are monitored for flagging purposes.

### Blast Threshold

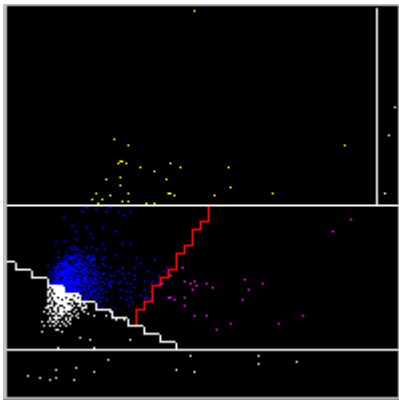


This threshold (shown as a red line) is set at channel 8 on the x axis and between channels 4 and 21 on the y axis.

All cells below (to the left of) this threshold are counted as Blasts, which are monitored for flagging purposes only.

The Blast count should not be reported as a patient result.

### MN / PMN Threshold



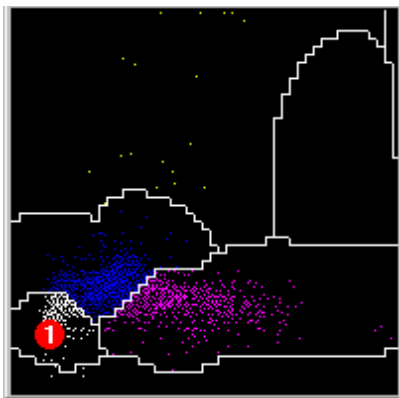
The "valley" threshold (shown as a red line) separates the Mononuclear (MN) and Polymorphonuclear (PMN) populations.

The valley threshold is a floating threshold that is set using the Baso X histogram.

### Abnormal Cell Locations

If abnormal cells are present, their size and nuclear configuration determine the location of their signals on the BASO cytogram. Click the cytogram buttons below to see where the abnormal cells will appear.

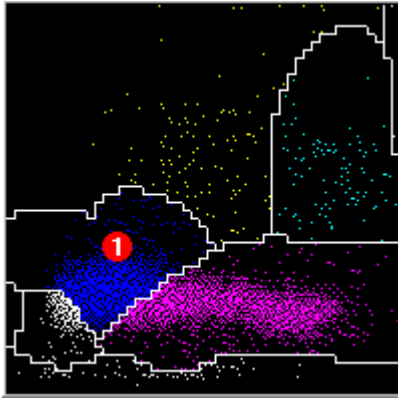
#### Location of Blasts on the BASO Cytogram



**Blasts** appear in the Blast area (1) on the BASO cytogram.

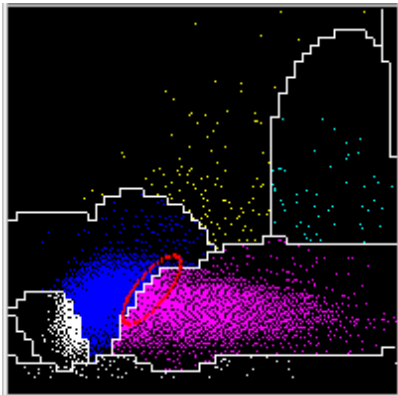


### Location of Atypical Lymphocytes on the BASO Cytogram



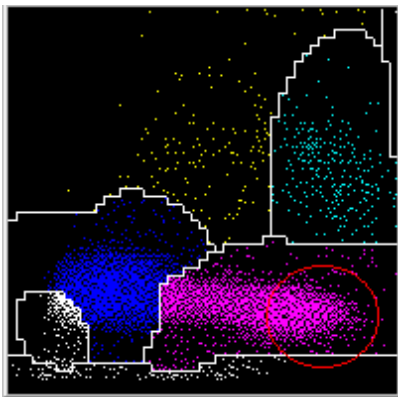
**Atypical Lymphocytes** appear within the mononuclear (MN) area (1) on the BASO cytogram.

### Location of Immature Granulocytes on the BASO Cytogram



**Immature Granulocytes** appear within the MN area on the BASO cytogram.

### Location of NRBCs on the BASO Cytogram

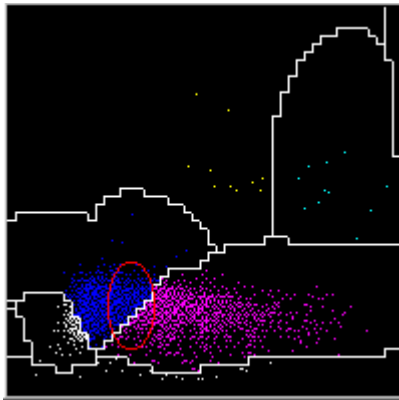


**Nucleated Red Blood Cells (NRBCs)** appear within the PMN population on the BASO cytogram. However, NRBCs are identified for flagging purposes in the peroxidase method.

The system uses data from the perox channel and the baso channel to derive the

Nucleated Red Blood Cell (NRBC) count (%NRBC and #NRBC). If NRBCs are present, the system corrects the WBC results to account for them.

## Location of Bands on the BASO Cytogram



**Bands** appear between the mononuclear (MN) and polymorphonuclear (PMN) populations.

## Calculating Parameters

### Reported Parameters

The following parameters are available for patient reporting:

Parameter	Explanation
WBCB	$\text{RawWBC} \times (\text{BasoCalFactor} \div [1 - \text{FracDT}])$
%BASO	$100 \times (\text{BASO Count} \div \text{BASO PHA Cells})$
#BASO	$(\% \text{BASO} \div 100) \times \text{WBCB}$

The system uses data from the perox channel and the baso channel to derive the Nucleated Red Blood Cell (NRBC) count (%NRBC and #NRBC). If NRBCs are present, the system corrects the WBC results to account for them.

### Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
%BASO Suspect	$100 \times (\text{BASO Suspect} \div \text{BASO PHA Cells})$
%BLAST	$100 \times (\text{Blasts} \div \text{BASO PHA Cells})$
%MN	$100 \times (\text{MN} \div \text{BASO PHA Cells})$
%PMN	$100 \times (\text{PMN} \div \text{BASO PHA Cells})$
%PMN Ratio	$\% \text{PMN} \div (\% \text{NEUTS} + \% \text{EOS})$
BASO % Dead Time	$100 \times \text{FracDT}$
BASO % Noise	$100 \times (\text{Noise} \div \text{BASO PHA Cells})$

<b>Parameter</b>	<b>Explanation</b>
BASO % Saturation	$100 \times (\text{BASO Saturation} \div \text{BASO PHA Cells})$
BASO Flatness	$\sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$
LI	$\text{PMN}_x \div \text{MN}_x$
MN <sub>x</sub>	Peak X channel of Mononuclear cluster
MN <sub>y</sub>	Peak Y channel of Mononuclear cluster
PMN <sub>x</sub>	Peak X channel of Polymorphonuclear cluster

### **Parameter Key**

#### **WBCB**

White blood cell count from the Basophil/Lobularity method

#### **# BASO**

Absolute count of Basophils

#### **% BASO**

Percent of Basophils

#### **% BASO Suspect**

Percent of events from Baso Suspect area

#### **% MN**

Percent of events from Mononuclear area

#### **% PMN**

Percent of events from Polymorphonuclear area

#### **% PMN Ratio**

Ratio of the percent of the Polymorphonuclear events to the percent of NEUTS and EOS obtained from the peroxidase method

#### **BASO % Dead Time**

Percent of analysis time when the channel is busy and cannot detect flowcell events

#### **BASO % Noise**

Percent of events from Noise area

#### **BASO % Saturation**

Percent of events from Saturation area

#### **LI**

Lobularity Index

#### **% Blast**

Percent of events from Blast area

**BASO PHA Cells (B-acq)**

The total number of events in the BASO cytogram excluding the Noise area.

**BASO PHA Total (B-tot)**

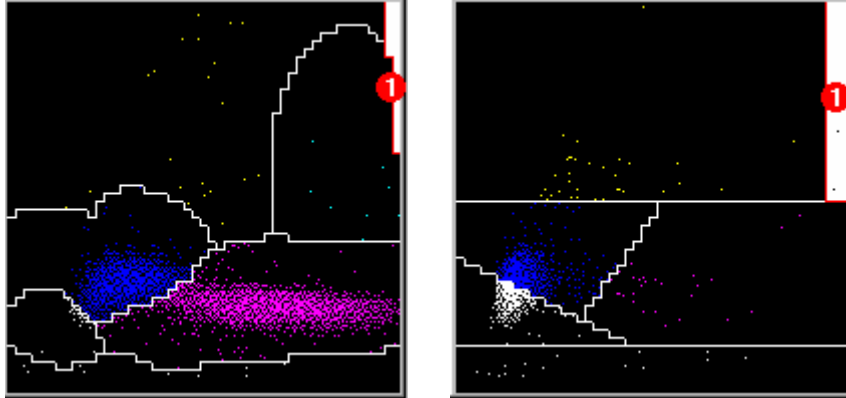
The total number of events in the BASO Cytogram including the Noise area.

**BASO Valid Cells (B-vc)**

The number of valid electronic pulse signals detected from flowcell events.

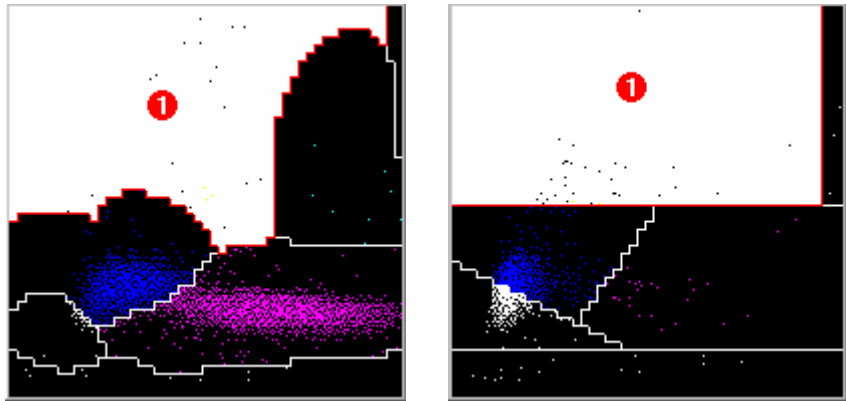
**BASO Saturation**

The number of events in the Saturation area (1) of the BASO cytogram.



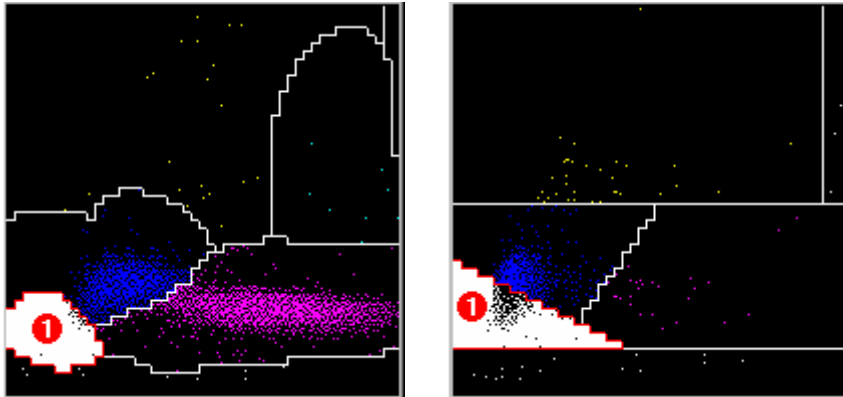
**BASO Count**

The number of cells in the Baso area (1) of the BASO cytogram.



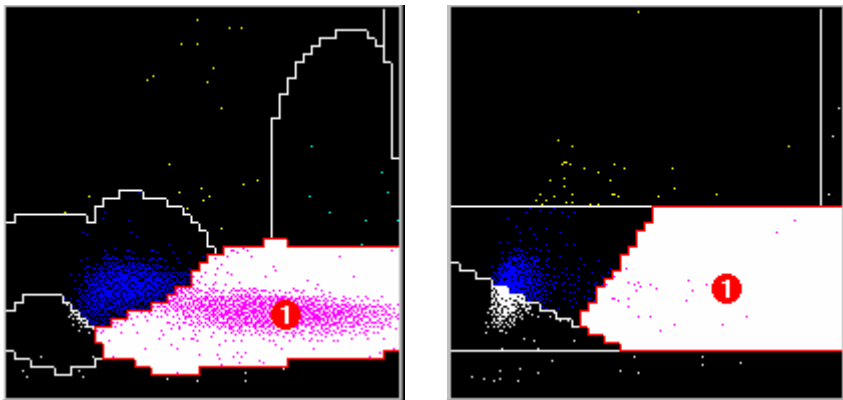
**Blasts**

The number of events in the Blasts area (1) of the BASO cytogram.



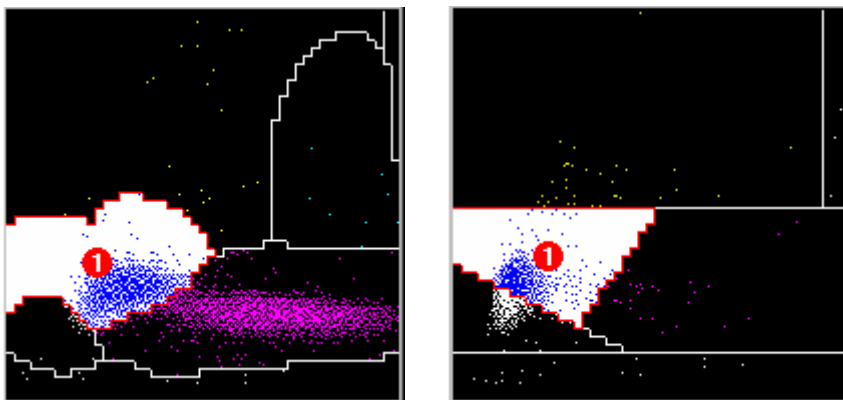
**PMN**

The number of events in the PMN area (1) of the BASO cytogram.



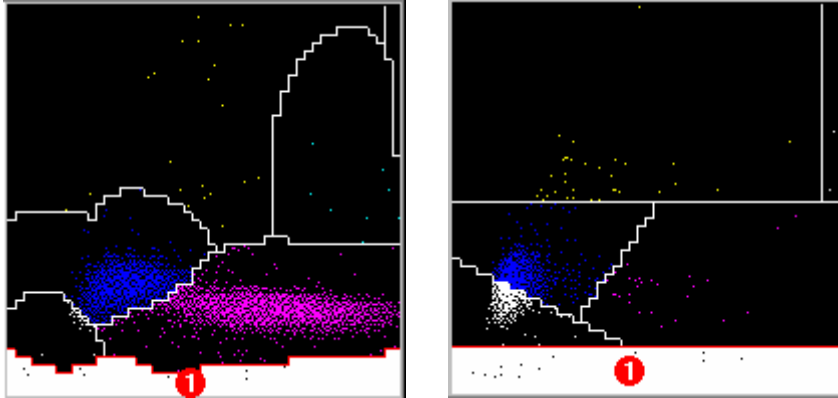
**MN**

The number of events in the MN area (1) of the BASO cytogram.



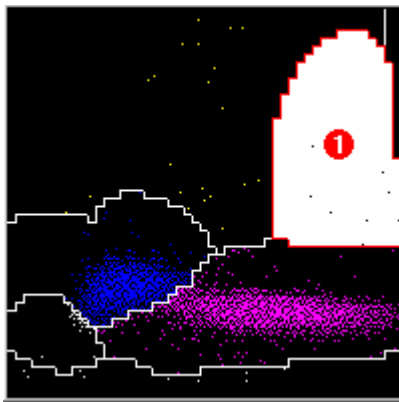
### Noise

The number of events in the Noise area (1) of the BASO cytogram.



### BASO Suspect

The number of events in the Baso Suspect area (1) of the BASO cytogram.



### RawWBC

$\text{BASO Valid Cells} \times (\text{BASO PHA Cells} \div \text{BASO PHA Total})$

### BasoCalFactor

The sampler-specific calibration factor:

$\text{BasoCalFactor} = \text{BASO WBC (AS)} \times 0.0012475$

$\text{BasoCalFactor} = \text{BASO WBC (MCTS)} \times 0.0012475$

$\text{BasoCalFactor} = \text{BASO WBC (OTS)} \times 0.0012475$

To view the BASO WBC calibration factors, click **Cal/Gain Logs** on the System Logs menu.

### FracDT

The fraction of time that the channel is busy processing flowcell events. While the baso channel is busy identifying a particular flowcell event, it is unable to process any additional events that might occur. By measuring this "dead time", the analyzer can compensate for these events.

## CSF Method

### Cytochemical Reactions

The ADVIA 22120/2120i/22120/2120ii CSF Assay provides a rapid, automated analysis of CSF samples by counting and distinguishing certain cell types. When using the ADVIA 22120/2120i/22120/2120ii CSF Assay, the CSF sample is mixed with ADVIA 2120/2120i CSF Reagent, which spheres and fixes the cells. After a minimum 4-minute to 4-hour incubation period, the prepared sample is then aspirated directly into the ADVIA 22120/2120i/22120/2120ii system.

### Measurement

The ADVIA 22120/2120i/22120/2120ii CSF Assay provides a rapid, automated analysis of CSF samples by counting and distinguishing certain cell types. When using the ADVIA 22120/2120i/22120/2120ii CSF Assay, the CSF sample is mixed with ADVIA 2120/2120i CSF Reagent, which spheres and fixes the cells. After a minimum 4-minute to 4-hour incubation period, the prepared sample is then aspirated directly into the ADVIA 22120/2120i/22120/2120ii system. The cells are then detected and enumerated based on light scatter and absorbance measurements using the ADVIA 22120/2120i/22120/2120ii laser optics. A scatter versus scatter and scatter versus absorbance cytogram is displayed with the thresholds and results automatically calculated for each sample. Reportable parameters are WBC and RBC counts along with absolute and percentage counts for neutrophils, lymphocytes, monocytes, polymorphonuclear (PMN), and mononuclear (MN) cells. A research-use-only eosinophil count is also given.

### CSF Scatter/Scatter Cytogram

The CSF Scatter/Scatter Cytogram is a 100 x 100-channel, two-dimensional, pulse height distribution of the scatter high and scatter low data for WBC, RBC, and noise, where the X-axis is high-angle scatter and the Y-axis is low angle scatter. A fixed mask is used to set thresholds for Neutrophil, Lymphocyte, Monocyte and RBC regions. Eosinophils fall within the Neutrophil region in this cytogram. The number of eosinophils is determined from the Scatter/Absorption cytogram and is subtracted from the number of cells in the Neutrophil region prior to calculating WBC and Neutrophil parameters. At this time, eosinophil data is for research purposes only and is non-reportable

### CSF Scatter/Absorption Cytogram

The CSF Scatter/Absorption Cytogram is a 100 x 100-channel, two-dimensional, pulse height distribution of the scatter high and absorption data for WBC, RBC, and noise, where the X-axis is absorption and the Y-axis is high angle scatter. A fixed mask is used to set the threshold for eosinophil analysis. Because of their higher absorption, eosinophils fall to the right of the neutrophil population in this cytogram and are thus able to be separated from the neutrophil population. The number of eosinophils is subtracted from the number of cells falling in the neutrophil region of the Scatter/Scatter cytogram before calculating WBC and Neutrophil parameters.

## Calculating Parameters

### Reported Parameters

The following parameters are available for patient reporting:

Parameter	Explanation
CSF WBC	$CSF\ WBC/\mu L = (CSF\ PHA\ WBC / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
%CSF PMN	$\%CSF\ PMN = 100 \times CSF\ PMN / CSF\ WBC$
#CSF PMN	$\#CSF\ PMN/\mu L = (CSF\ PHA\ PMN / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
%CSF MN	$\%CSF\ MN = 100 \times CSF\ MN / CSF\ WBC$
#CSF MN	$\#CSF\ MN/\mu L = (CSF\ PHA\ MN / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
%CSF Neut	$\%CSF\ Neut = 100 \times CSF\ Neut / CSF\ WBC$
#CSF Neut	$\#CSF\ Neut/\mu L = (CSF\ PHA\ Neut / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
%CSF Lymph	$\%CSF\ Lymph = 100 \times CSF\ Lymph / CSF\ WBC$
#CSF Lymph	$\#CSF\ Lymph / \mu L = (CSF\ PHA\ Lymph / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
%CSF Mono	$\%CSF\ Mono = 100 \times CSF\ Mono / CSF\ WBC$
#CSF Mono	$\#CSF\ Mono/\mu L = (CSF\ PHA\ Mono / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
CSF RBC	$CSF\ RBC/\mu L = (CSF\ R\ Count / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$



## Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
%CSF Eos	$\%CSF\ Eos = 100 \times CSF\ Eos / CSF\ WBC$
#CSF Eos	$\#CSF\ Eos/\mu L = (CSF\ PHA\ Eos / CSF\ PHA\ Total \times CSF\ PHA\ Cells) / (1 - Fractional\ Dead\ Time) \times Perox\ Nominal\ Factor$
CSF PHA Total	The total number of cells displayed in the CSF Scatter/Scatter cytogram including the noise region.
CSF PHA Cells	The total number of cells displayed in the CSF Scatter/Scatter cytogram excluding the noise region.
CSF %Noise	The percentage of cells that are located in the noise region of the CSF Scatter/Scatter cytogram.
CSF PHA WBC	The number of cells falling into the WBC regions of the CSF Scatter/Scatter cytogram.
CSF PHA Eos	The number of cells falling in the Eosinophil Region of the CSF Scatter/Absorption cytogram.
CSF PHA Lymphs	The number of cells falling in the Lymphocyte Region of the CSF Scatter/Scatter cytogram.
CSF PHA Monos	CSF PHA Monos is the number of cells falling in the Monocyte Region of the CSF Scatter/Scatter cytogram.
CSF PHA Neuts	The number of neutrophils falling in the Neutrophil Region of the CSF Scatter/Scatter cytogram. Due to their scatter/scatter properties, both neutrophils and eosinophils fall in this region of the CSF Scatter/Scatter cytogram. The number of CSF PHA Eos is identified in the Eosinophil Region of the CSF Scatter/Absorption cytogram and subtracted from the number of cells in the Neutrophil Region of the CSF Scatter/Scatter cytogram to determine the CSF PHA Neuts.  $CSF\ PHA\ Neuts = \# \text{ cells in Neutrophil Region (CSF Scatter/Scatter Cytogram)} - CSF\ PHA\ Eos\ (CSF\ Scatter/Absorption\ Cytogram)$

<b>Parameter</b>	<b>Explanation</b>
CSF R Count	The number of cells falling in the Red Cell Region of the CSF Scatter/Scatter cytogram.

**Parameter Key**

**CSF WBC**

The reportable CSF white blood cell count (WBC/ $\mu$ L).

**# CSF PMN**

The reportable CSF absolute polymorphonuclear cell count.

**%CSF PMN**

The reportable CSF differential percentage polymorphonuclear cell count.

**#CSF MN**

The reportable CSF absolute mononuclear cell count.

**%CSF MN**

The reportable CSF differential percentage mononuclear cell count.

**#CSF Neut**

The reportable CSF absolute neutrophil cell count.

**%CSF Neut**

The reportable CSF differential percentage neutrophil cell count.

**#CSF Lymph**

The reportable CSF absolute lymphocyte cell count.

**%CSF Lymph**

The reportable CSF differential percentage lymphocyte cell count.

**#CSF Mono**

The reportable CSF absolute monocyte cell count.

**%CSF Mono**

The reportable CSF differential percentage monocyte cell count.

**CSF RBC**

The reportable CSF red blood cell count (RBC/ $\mu$ L).

**CSF WBC**

The reportable CSF white blood cell count (WBC/ $\mu$ L).

**# CSF PMN**

The reportable CSF absolute polymorphonuclear cell count.

**%CSF PMN**

The reportable CSF differential percentage polymorphonuclear cell count.

**#CSF MN**

The reportable CSF absolute mononuclear cell count.

**%CSF MN**

The reportable CSF differential percentage mononuclear cell count.

**#CSF Neut**

The reportable CSF absolute neutrophil cell count.

**%CSF Neut**

The reportable CSF differential percentage neutrophil cell count.

**#CSF Lymph**

The reportable CSF absolute lymphocyte cell count.

**%CSF Lymph**

The reportable CSF differential percentage lymphocyte cell count.

**#CSF Mono**

The reportable CSF absolute monocyte cell count.

**%CSF Mono**

The reportable CSF differential percentage monocyte cell count.

**CSF RBC**

The reportable CSF red blood cell count (RBC/ $\mu$ L).

**%CSF Eos**

The research-only CSF differential percentage eosinophil cell count.

**#CSF Eos**

The research-only CSF absolute eosinophil cell count.

## Hemoglobin Method

### Chemical Reactions

The ADVIA 22120/2120i/22120/2120ii Hematology system normally uses a cyanide-free hemoglobin method, but can be configured to use a reagent that contains cyanide.

The sample and the ADVIA 2120/2120i CN-FREE HGB reagent or ADVIA 2120/2120i HGB reagent are mixed in the hemoglobin reaction chamber (colorimeter). The hemoglobin chemical reactions consist of two steps:

#### ADVIA CN-FREE HGB Reagent

**Step 1** Red blood cells are lysed to release hemoglobin

**Step 2** The heme iron in the hemoglobin is oxidized from the ferrous to the ferric state and coordinates one hydroxide ion and one water molecule as an axial ligand to form monoaquomonohydroxyferri-porphyrin as the reaction product.

#### ADVIA HGB Reagent

**Step 1** Red blood cells are lysed to release hemoglobin.

**Step 2** The heme iron in the hemoglobin is oxidized from the ferrous to the ferric state, and is then combined with cyanide in the ADVIA 2120/2120i HGB reagent to form the reaction product.

#### ADVIA 2120/2120i HGB

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i HGB reagent, please see Chapter 8.

ADVIA 2120/2120i HGB reagent contains a surfactant and potassium cyanide, which are dissolved in an alkaline borate solution at pH 11.3.

The surfactant hemolyzes the red blood cells and then emulsifies the cellular debris and lipids in a reaction mixture that is essentially free of turbidity.

After release of hemoglobin by hemolysis, the combined action of an alkaline pH and the surfactant causes a rapid denaturation of the protein with solubilization of the hemes by surfactant micelles.

The hemes then undergo air oxidation of ferrous iron to the ferric state and combine with cyanide forming micellized ferriheme. Published studies show that each ferriheme combines with two cyanide ions.

The mechanism and clinical performance of the Siemens Hemoglobin method have been described. The presence of carboxyhemoglobin (even up to 100%) has no effect on the reaction rate or transformation to the cyanated product.

## Bibliography

Duck-Chong CG: Differential effect of detergents on the alkaline denaturation of haemoglobin in maternal and fetal blood, with particular reference to Triton X-100. *J Clin Pathol* **36**:910 (1983)

Simplicio and Schwenzer, *Biochem* **12**:1923 (1983)

Malin MJ, Sclafani LD and Wyatt JL: Evaluation of 24-second cyanide-containing and cyanide-free methods for whole blood hemoglobin on the Technicon H-1 analyzer with normal and abnormal blood samples. *Am J Clin Path* **92**:286 (1989)

Malin MJ, Fan SS and Benezra J: Mechanism of automated alkaline methods for the determination of hemoglobin in whole blood based on the micellization of ligated heme in the presence and absence of cyanide. *Anal Chim Acta* **262**:67 (1992)

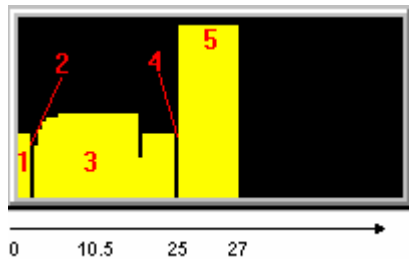
## Measurement

Optical readings are obtained colorimetrically at 565 or 546 nm according to the method installed.

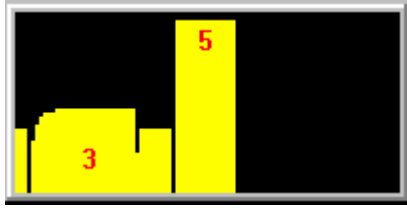
After processing, the optical data are plotted on the hemoglobin rate curve where time in seconds is plotted along the x axis, and the percent light transmission is plotted along the y axis.

The hemoglobin transmission histogram is divided into five parts:

### HGB Trans



1. ADVIA 2120/2120i SHEATH/RINSE reading from previous cycle
2. Draining of the ADVIA 2120/2120i SHEATH/RINSE, and refilling with the reaction solution consisting of sample and ADVIA 2120/2120i HGB reagent
3. Reaction solution readings (15.5s to 18.0s) - Sample Mean
4. Draining of the reaction solution, and refilling with ADVIA 2120/2120i SHEATH/RINSE
5. ADVIA 2120/2120i SHEATH/RINSE readings (baseline transmittance) for the current sample – Baseline Mean value should be between 2.5 and 4.1.



Sample readings (3): sample and ADVIA 2120/2120i HGB reagent

$$\text{Sample Mean} = \frac{\sum \text{Sample Counts}}{N}$$

Baseline readings (5): ADVIA 2120/2120i SHEATH/RINSE

$$\text{Baseline Mean} = \frac{\sum \text{Baseline Counts}}{N}$$

## Calculating Parameters

### Reported Parameters

The following parameters are available for patient reporting:

Parameter	Explanation
HGB	$\log (\text{Sample Mean} \div \text{Baseline Mean}) \times \text{Hgb Cal Factor} \times 50.0$
MCH	$(\text{HGB} \div \text{RBC}) \times 10$
MCHC	$(\text{HGB} \div [\text{RBC} \times \text{MCV}]) \times 1000$

### Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
Calculated HGB	$(\text{CHCM} \times \text{RBC} \times \text{MCV}) \div 1000$
Delta HGB	$\text{HGB} - \text{Calculated HGB}$
HGB Baseline Transmission	$\text{Baseline Mean} \times 3.05194\text{E-}4$
HGB Sample Transmission	$\text{Sample Mean} \times 3.05194\text{E-}4$
HGB Baseline Flatness	$\text{Maximum Baseline Value} - \text{Minimum Baseline Value}$
HGB Sample Flatness	$\text{Maximum Sample Value} - \text{Minimum Sample Value}$

## Parameter Key

### HGB

Measured hemoglobin concentration

### MCH

Mean Corpuscular Hemoglobin

### MCHC

Mean Corpuscular Hemoglobin Concentration

## Calculating the HGB Result Using CHCM

The Corpuscular Hemoglobin Concentration Mean (CHCM) and Mean Corpuscular Hemoglobin Concentration (MCHC) both provide a measurement of the average corpuscular hemoglobin concentration in the sample. The CHCM is a directly measured parameter based on a cell-by-cell analysis, while the MCHC is a calculated parameter based on the HGB, MCV, and RBC results.

If they differ by more than 1.9 g/dL, a Comparison Error MCHC / CHCM (CHCMCE) sample/system flag alerts operators to a condition that could be affecting one or more of the three results (RBC, MCV or HGB) used to calculate MCHC.

For example, severe lipemia is a known interference that can falsely elevate a HGB result obtained from the colorimetric hemoglobin method. When the hemoglobin is falsely increased, the MCHC is also falsely increased.

Using CHCM to calculate HGB avoids this interference since CHCM is directly measured and is virtually unaffected by lipemia. To calculate HGB, replace MCHC with CHCM as follows:

$$\text{MCHC} = (\text{HGB} \div [\text{RBC} \times \text{MCV}]) \times 1000$$

$$\text{HGB} = (\text{MCHC} \times \text{RBC} \times \text{MCV}) \div 1000$$

$$\text{Calculated HGB} = (\text{CHCM} \times \text{RBC} \times \text{MCV}) \div 1000 \quad \text{or} \quad (\text{CHCM} \times \text{Hct}) \div 100$$

The Measured HGB and Calculated HGB values are displayed on the HGB panel of the Run Screen.

## Peroxidase Method

### Cytochemical Reactions

The peroxidase cytochemical reactions consist of three steps:

**Step 1** Red blood cells are lysed using ADVIA 2120/2120i PEROX 1 reagent and the high temperature in the reaction chamber.

**Step 2** White blood cells are fixed using ADVIA 2120/2120i PEROX 1 reagent.

**Step 3** White blood cells are stained using ADVIA 2120/2120i PEROX 2 reagent and ADVIA 2120/2120i PEROX 3 reagent.

White blood cells are identified based on size and different intensity of peroxidase reaction (staining).

Neutrophils, eosinophils, and monocytes are stained based on their levels of peroxidase activity. Since lymphocytes, basophils, and large unstained cells contain no peroxidase, these cell types remain unstained.

### Perox Temperature Control

Temperature control is critical to lysing the red blood cells. The perox reaction chamber temperature, which is automatically monitored by the analyzer, must be between 58°C and 72.1°C.

If you want to check the perox reaction chamber temperature, use the Analyzer Status tab.

If you need to adjust the perox reaction chamber temperature:

1. At the Special Procedures menu, select **Adjust Lamp / Temp.**
2. Select **Perox Temperature.**

### ADVIA 2120/2120i PEROX 1

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i PEROX 1 reagent, please see Chapter 8.

ADVIA 2120/2120i PEROX 1 is the first reagent added to whole blood sample in the heated peroxidase reaction chamber. Its function is to lyse the red blood cells and fix the white blood cells.

Surfactants (sodium dodecyl sulfate and Brij-35) in combination with thermal stress lyse the red blood cells.

Formaldehyde fixes the white blood cells. The hypertonic environment causes some shrinkage and crenation of the white cells. This increases the refractive index of the cells and enhances the detection of lymphocytes over noise.

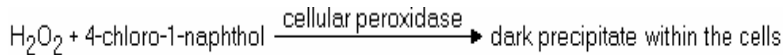


## ADVIA 2120/2120i PEROX 2

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i PEROX 2 reagent, please see Chapter 8.

ADVIA 2120/2120i PEROX 2 and ADVIA 2120/2120i PEROX 3 are added to the peroxidase reaction chamber in the second reagent addition.

The 4-Chloro-1-naphthol in ADVIA 2120/2120i PEROX 2 serves as a substrate that enables the hydrogen peroxide in ADVIA 2120/2120i PEROX 3 to form a dark precipitate at endogenous sites of peroxidase activity in the granules of white blood cells, as described by the following equation:

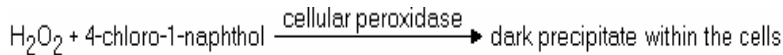


## ADVIA 2120/2120i PEROX 3

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i PEROX 3 reagent, please see Chapter 8.

ADVIA 2120/2120i PEROX 2 and ADVIA 2120/2120i PEROX 3 are added to the peroxidase reaction chamber in the second reagent addition.

The 4-Chloro-1-naphthol in ADVIA 2120/2120i PEROX 2 serves as a substrate that enables the hydrogen peroxide in ADVIA 2120/2120i PEROX 3 to form a dark precipitate at endogenous sites of peroxidase activity in the granules of white blood cells, as described by the following equation:



## ADVIA 2120/2120i PEROX SHEATH

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i PEROX SHEATH reagent, please see Chapter 8.

ADVIA 2120/2120i PEROX SHEATH has three important functions:

- To constrict the sample stream so that only one cell at a time can pass through the viewing area.
- To prevent contact between the sample stream and the flowcell walls. This prevents clogs and staining of the flowcell.
- To provide an optically transparent medium through which the sample stream can be clearly focused.

## Measurement

A constant volume of the cell suspension from the Perox reaction chamber passes through the flowcell where the absorption (peroxidase staining) and the forward light-scattering (size) signatures of all white blood cells are measured.

ADVIA 2120/2120i PEROX SHEATH encases the sample stream as the two fluids pass through the flowcell.

The light-scatter and the light-absorption signals are detected and electronically amplified. After processing, the following information is available:

**PEROX Rate** histogram displays the arrival rate of cells in the Perox channel.

**PEROX X** histogram displays the absorption values for all cells. Information from the noise area is excluded.

**PEROX Y** histogram displays the light scattering values for all events, including those from the noise area.

**Noise-Lymph** histogram provides the light scattering values for the noise, lymphocyte, and large unstained cells (LUC) areas. Information from the monocyte, neutrophil, and eosinophil areas is excluded.

**PEROX Cytogram** is formed from the paired light scatter and absorption data. Cluster analysis identifies the individual populations.

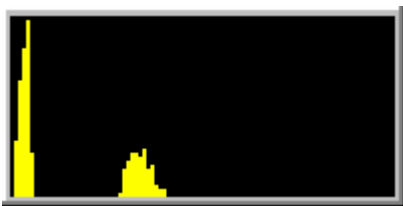
### Perox Rate Histogram



The PEROX Rate histogram shows the uniformity of the cell-counting rate.

The rate histogram data consists of 50 points, one taken every 200 milliseconds. Each point represents the number of valid cells counted during the last 200 milliseconds.

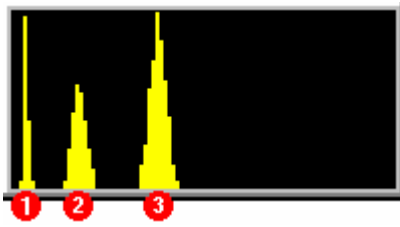
### Perox X Histogram



PEROX X histogram displays the absorption values for all cells. Information from the noise area is excluded.

Increasing channel numbers on the PEROX X histogram correspond to greater intensity of peroxidase staining.

## Perox Y Histogram



- 1 Noise
- 2 Lymphocytes
- 3 Large Unstained Cells (LUC)

PEROX Y histogram displays the light scattering values for all events, including those from the noise area.

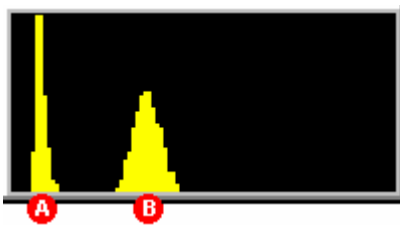
Increasing channel numbers on the PEROX Y histogram correspond to greater cell size (volume).

## Noise–Lymph Histogram

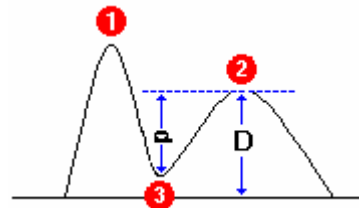
The Noise-Lymph histogram provides the light scattering values for the noise, lymphocyte, and large unstained cells (LUC) areas.

The Noise-Lymph histogram is used to derive the following parameters:

- The mode channel of the noise population on the y axis (1)
- The peak channel (Lymph Mode) of the lymphocyte population on the y axis (2)
- The valley channel (Noise-Lymph Valley) that separates the noise and lymphocyte populations (3)
- The relative depth of the valley as expressed by  $d/D$  (PEROX  $d/D$ ).



- A Noise
- B Lymphocytes



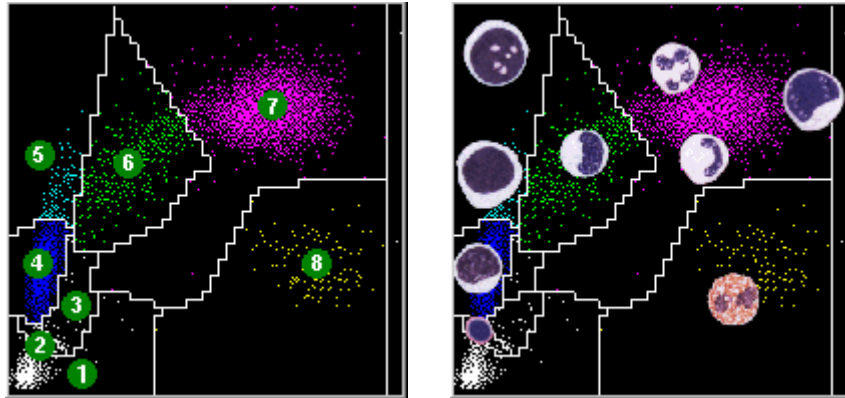
## PEROX Cytogram

The PEROX cytogram is divided into 100 counting channels on each axis. The cells absorb light proportional to the amount of peroxidase stain present, and this is represented on the x axis. Cells scatter light proportional to their size, and this is represented on the y axis.

When the light scatter and absorption data are plotted, distinct populations or clusters are formed.

Cluster analysis identifies each population based on its position, area, and density, and then the number of cells in each population is processed. The lines that separate the different cell populations are calculated by the software on a sample-by-sample basis.

The following PEROX cytograms were obtained from a representative patient specimen.



- |                             |                         |
|-----------------------------|-------------------------|
| 1 Noise                     | 5 Large Unstained Cells |
| 2 Nucleated Red Blood Cells | 6 Monocytes             |
| 3 Platelet Clumps           | 7 Neutrophils           |
| 4 Lymphocytes and Basophils | 8 Eosinophils           |

### Noise

This area contains Platelets, RBC stroma, and debris that are excluded from the Total White Count (WBCP) and WBC differential.

### Nucleated Red Blood Cells

If present, nucleated red blood cells appear in this area because of their small size and lack of peroxidase staining. The system uses data from the perox channel and the baso channel to derive the Nucleated Red Blood Cell (NRBC) count (%NRBC and #NRBC). If NRBCs are present, the system corrects the WBC results to account for them.

### Platelets Clumps

If present, platelet clumps appear in this area. The platelet clump count is not included in the WBCP and differential, but it is monitored for flagging purposes.

### Lymphocyte and Basophil Cluster

Lymphocytes and Basophils appear in the same cluster because they have similar size and no peroxidase activity.

### LUC Cluster

The LUC cluster contains Large Unstained Cells (atypical lymphocytes, blasts, and other abnormal cells).

### Monocyte Cluster

Monocytes are medium-sized cells with some peroxidase activity.

### Neutrophil Cluster

Neutrophils are large cells with strong peroxidase activity.

### Eosinophil Cluster

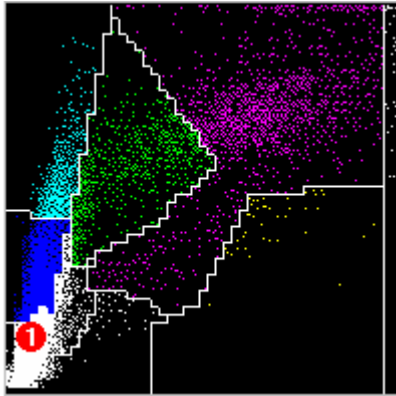
Eosinophils have the most peroxidase activity of all the white blood cell types and are large cells, approximately the same size as neutrophils.

Eosinophils stain so intensely that they absorb light that would otherwise be scattered. Consequently, eosinophils appear somewhat smaller than neutrophils and can be separated from them.

## Abnormal Cell Locations

If abnormal cells are present, their size and peroxidase activity determine their location on the PEROX cytogram.

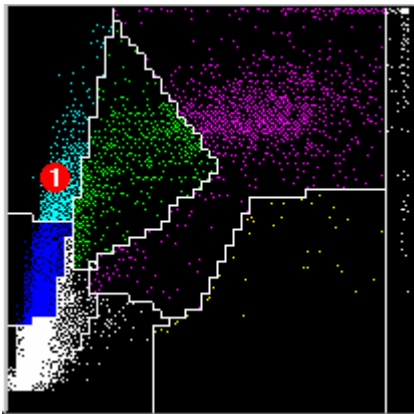
### Location of nRBCs on PEROX Cytogram



**Nucleated Red Blood Cells (nRBCs)** appear in the NRBC cluster (1), which is located between the Noise and Lymphocyte areas.

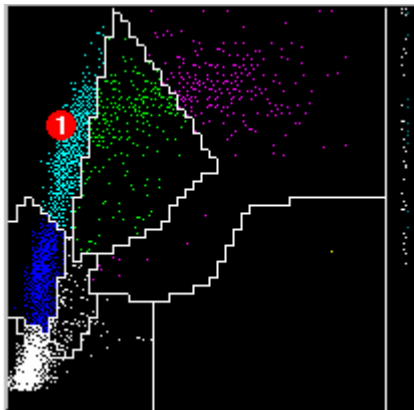
The system uses data from the perox channel and the baso channel to derive the Nucleated Red Blood Cell (NRBC) count (%NRBC and #NRBC). If nRBCs are present, the system corrects the WBC results to account for them.

### Location of Atypical Lymphocytes on PEROX Cytogram



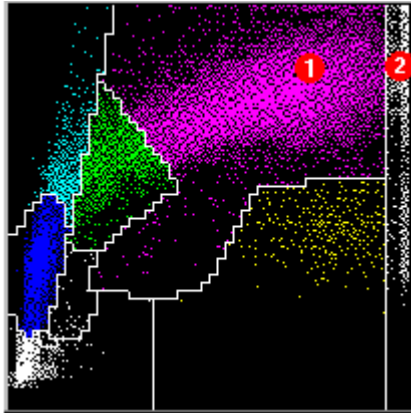
**Atypical lymphocytes** are large cells with no peroxidase activity that can appear in the LUC area (1).

### Location of Blasts on PEROX Cytogram



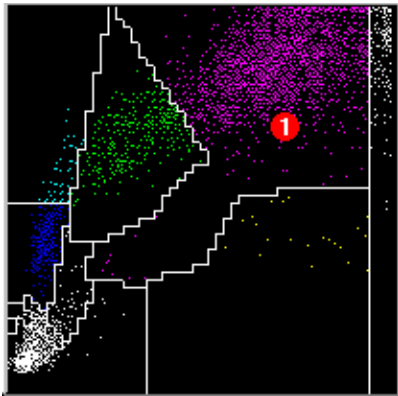
Similarly, **blasts** and other large abnormal cells with no peroxidase activity also appear in the LUC area (1).

### Location of Immature Granulocytes on PEROX Cytogram



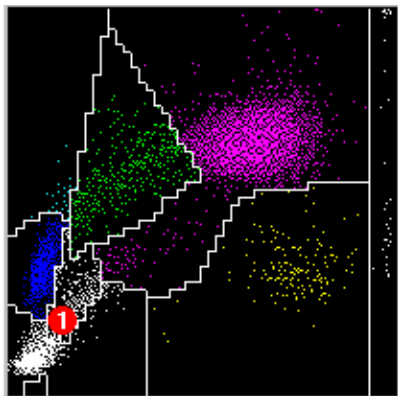
**Immature Granulocytes** are large cells with high peroxidase activity that can appear in the neutrophil area (1) and the saturation area (2).

### Location of Bands on PEROX Cytogram



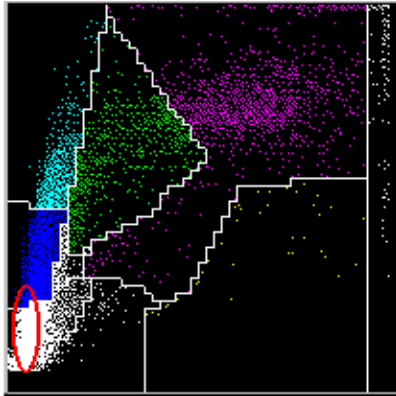
**Bands** appear within the the Neutrophil population (1) due to their similar size and degree of peroxidase staining.

### Location of Platelet Clumps on PEROX Cytogram



**Platelet Clumps** form a separate cluster (1) that originates in the Noise area on the PEROX cytogram.

## Location of Unlysed RBCs on PEROX Cytogram



**Unlysed RBCs** with no peroxidase activity appear along the left side of the PEROX cytogram.

## Calculating Parameters

### Reported Parameters

Parameter	Explanation
WBCP	$\text{RawWBC} \times (\text{PeroxCalFactor} \div [1 - \text{FracDT}])$
%NEUT	$(100 \times \text{Neutrophil Count}) \div \text{PHA Cells}$
#NEUT	$(\% \text{NEUT} \div 100) \times \text{WBC}$
%LYMPH	$([100 \times \text{Lymphocyte Count}] \div \text{PHA Cells}) - \% \text{BASO}$
#LYMPH	$(\% \text{LYMPH} \div 100) \times \text{WBC}$
%MONO	$(100 \times \text{Monocyte Count}) \div \text{PHA Cells}$
#MONO	$(\% \text{MONO} \div 100) \times \text{WBC}$
%EOS	$(100 \times \text{Eosinophil Count}) \div \text{PHA Cells}$
#EOS	$(\% \text{EOS} \div 100) \times \text{WBC}$
%LUC	$(100 \times \text{LUC Count}) \div \text{PHA Cells}$
#LUC	$(\% \text{LUC} \div 100) \times \text{WBC}$

The system uses data from the perox channel and the baso channel to derive the Nucleated Red Blood Cell (NRBC) count (%NRBC and #NRBC). If nRBCs are present, the system corrects the WBC results to account for them.

The system can also display Peroxidase channel and Basophil/Lobularity channel WBC counts and the associated differential counts that have not been corrected for NRBCs, even if NRBC counts are reported. The uncorrected counts are designated by a lower case "u".

### Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
%HPX	$100 \times (\text{HPX} \div \text{PHA Cells})$
Clumps Count	Number of events in the Platelet Clumps area of the PEROX cytogram
Valley Count	Number of events in the NRBC area of the PEROX cytogram
Lymph Mode	Mode channel of the Lymphocyte cluster
MPXI	$\frac{(\text{X Mean of Sample Neut} - \text{Expected staining index})}{\text{Expected staining index}} * 100$
NEUT X	Mean X channel for neutrophil cluster
NEUT Y	Mean Y channel for neutrophil cluster
Noise/Lymph Valley	Valley channel between Noise and Lymph clusters
Perox d/D	$\frac{\text{Lymph Mode Count} - \text{Noise/Lymph Valley Count}}{\text{Lymph Mode Count}}$
PEROX % Dead Time	$100 \times \text{FracDT}$
PEROX % Noise	$100 \times (\text{Noise} \div \text{PHA Cells})$
PEROX % Saturation	$100 \times (\text{Perox Saturation} \div \text{PHA Cells})$
PEROX Flatness	$\sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$

### Parameter Key

#### WBCP

The white blood cell count from the Peroxidase method.

#### %NEUT

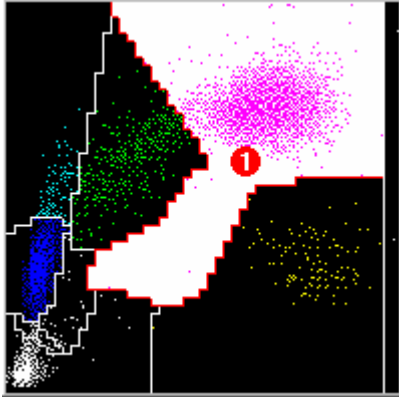
The percent of neutrophils.

#### #NEUT

The absolute count of neutrophils.



### Neutrophil Count



The number of events in the Neutrophil area (1) of the PEROX cytogram.

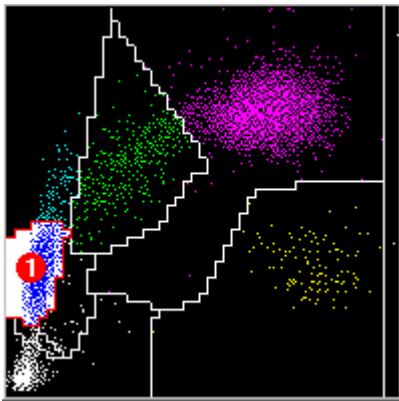
### %LYMPH

The percent of lymphocytes.

### #LYMPH

The absolute count of lymphocytes.

### Lymphocyte Count



The number of events in the Lymphocyte area (1) of the PEROX cytogram.

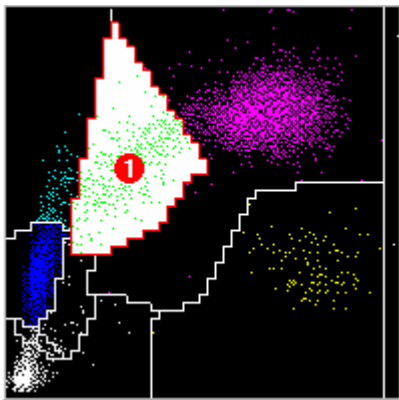
### %MONO

The percent of monocytes.

### #MONO

The absolute count of monocytes.

### Monocyte Count



The number of events in the Monocyte area (1) of the PEROX cytogram.

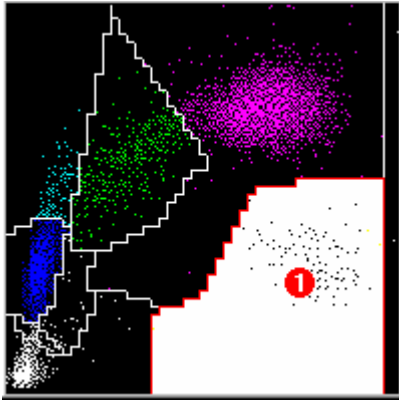
**%EOS**

The percent of eosinophils.

**#EOS**

The absolute count of eosinophils.

**Eosinophil Count**



The number of events in the Eosinophil area (1) of the PEROX cytogram.

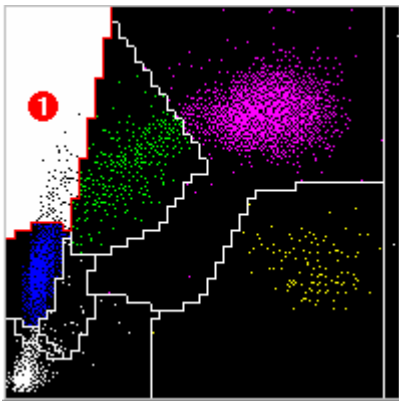
**%LUC**

The percent of large unstained cells.

**#LUC**

The absolute count of large unstained cells.

**Large Unstained Cell Count**



The number of events in the LUC area (1) of the PEROX cytogram.

**RawWBC**

$\text{Perox Valid Cells} \times (\text{PHA Cells} \div \text{PHA Total})$

**PeroxCalFactor**

The sampler-specific calibration factor:

$\text{PeroxCalFactor} = \text{PEROX WBC (AS)} \times 0.001248$

$\text{PeroxCalFactor} = \text{PEROX WBC (MCTS)} \times 0.001248$

$\text{PeroxCalFactor} = \text{PEROX WBC (OTS)} \times 0.001248$

To view the PEROX WBC calibration factors, select **Cal/Gain Logs** at the System Logs menu.

**FracDT**

The fraction of time that the channel is busy processing flowcell events. While the perox channel is busy identifying a particular flowcell event, it is unable to process any additional events that might occur. By measuring this "dead time", the analyzer can compensate for these events.

**MPXI**

The mean peroxidase activity index or staining intensity of the neutrophil population relative to the archetype.

**PEROX PHA Cells (P-acq)**

The total number of events in the PEROX cytogram excluding the Noise area.

**NOTE:** nRBC and PLT Clump events are components of Perox Noise. Therefore, they are not included in the PEROX PHA Cells.

**PEROX PHA Total (P-tot)**

The total number of events in the PEROX cytogram including the Noise area.

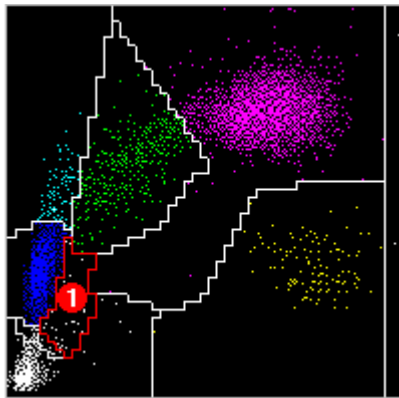
**Perox Valid Cells (P-vc)**

The number of valid electronic pulse signals detected from flowcell events.

**HPX**

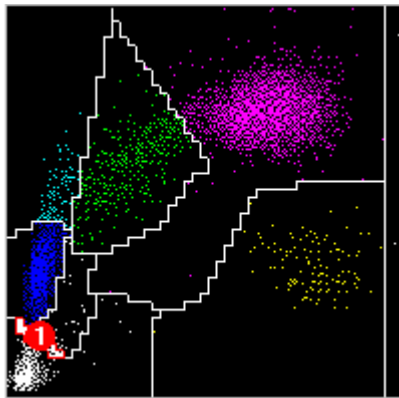
The number of events with absorption values greater than 1.4 times the X channel mean of the neutrophil cluster.

**Clumps Count**



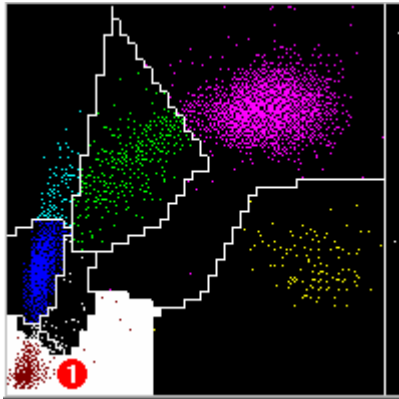
The number of events in the Platelet Clumps area (1) of the PEROX cytogram.

**Valley Count**



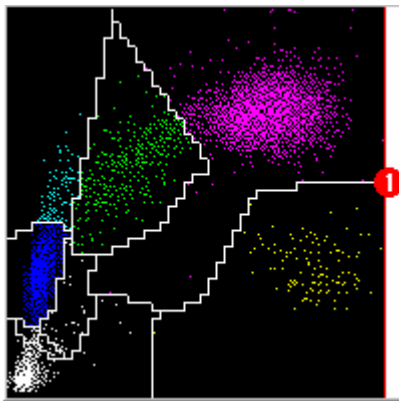
The number of events in the NRBC area (1) of the PEROX cytogram.

### Perox Noise



The number of events in the Noise area (1) of the PEROX cytogram.

### Perox Saturation



The number of events in the Saturation area (1) of the PEROX cytogram.

## RBC / Platelet Method

### Cytochemical Reactions

The RBC/Platelet cytochemical reactions consist of two steps:

**Step 1** RBCs and platelets are isovolumetrically sphered using the ADVIA 2120/2120i RBC/PLT reagent.

**Step 2** RBCs and platelets are fixed.

### ADVIA 2120/2120i RBC / PLT

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i RBC / PLT reagent, please see Chapter 8.

ADVIA 2120/2120i RBC/PLT reagent contains sodium dodecyl sulfate (SDS) and glutaraldehyde, which causes sphering of the red blood cells and platelets. When red cells and platelets are isovolumetrically sphered, shape is eliminated as a variability factor.

## Measurement

A constant volume of the cell suspension from the RBC reaction chamber passes through the flowcell where the low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) and high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) signatures of each cell are measured.

ADVIA 2120/2120i SHEATH/RINSE encases the sample stream as the two fluids pass through the flowcell.

The two light-scatter signals are detected, electronically amplified, and split into four signals:

- A pair of low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) and high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) signals are used to analyze red blood cells.
- A low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) signal is amplified 30 times, and a high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) signal is amplified 12 times. These signals are used to analyze platelets.

### Measurement: RBC Method

A pair of low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) and high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) signals are used to analyze red blood cells.

Using the Mie theory of light scattering for homogeneous spheres, the low-angle light scatter measurement is converted into cell volume and the high-angle light scatter measurement is converted into hemoglobin concentration.

The following histograms and cytograms are used for red blood cell analysis:

**RBC Rate** histogram shows the arrival rate of cells in the RBC/Platelet channel.

**RBC Volume** histogram shows the distribution of red cells by cell volume.

**RBC HC histogram** shows the distribution of red cells by hemoglobin concentration independent of cell volume.

**RBC CH histogram** shows the distribution of red cells by hemoglobin content.

**RBC Scatter** cytogram is formed by plotting the high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) along the x axis and the low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) on the y axis.

**RBC V/HC** cytogram is a presentation of the RBC volume and Hgb concentration data intended for evaluating red cell morphology.

**RBC Matrix** provides the cell counts and percentages for the corresponding nine regions on the RBC V/HC cytogram.

### Measurement: Platelet Method

A low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) signal is amplified 30 times, and a high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) signal is amplified 12 times. These "high-gain" signals are used to analyze platelets.

Using the Mie theory of light scattering for homogeneous spheres, the low-angle, high-gain light scatter measurement is converted into cell volume and the high-angle, high-gain light scatter measurement is converted into refractive index (n).

The following histograms and cytograms are used for platelet analysis:

**Platelet X** histogram is formed from the high-angle ( $5^\circ$  to  $15^\circ$ ), high-gain light scatter signals.

**Platelet Y** histogram is formed from the low-angle ( $2^\circ$  to  $3^\circ$ ), high-gain light scatter signals.

**Platelet Vol** histogram shows the distribution of platelets by cell volume.

**Platelet PM** histogram shows the distribution of platelets by dry mass.

**Platelet PC** histogram shows the distribution of platelets by refractive index.

**PLT Scatter** cytogram is formed by plotting the high-angle ( $5^\circ$  to  $15^\circ$ ), high-gain light scatter signals along the x axis and the low-angle ( $2^\circ$  to  $3^\circ$ ), high-gain light scatter signals on the y axis.

**PLT Volume PC** cytogram is formed by plotting the refractive index of platelets (PC) along the x axis and the platelet volume on the y axis.

## **Bibliography**

Tycko DH, Metz MH, Epstein EA, Grinbaum: Flow-cytometric light scattering measurement of red blood cell volume and hemoglobin concentration. *Applied Optics* **24(9)**:1355-1365 (1985)

## RBC Rate Histogram

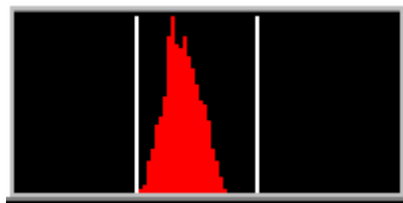


The RBC Rate histogram shows the uniformity of the cell-counting rate.

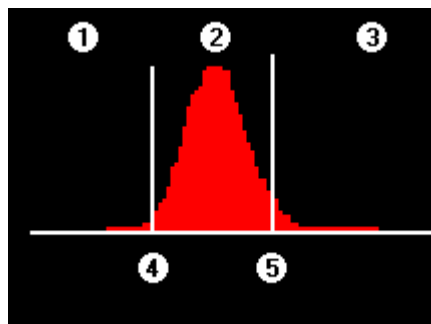
The rate histogram data consists of 50 points, one taken every 200 milliseconds. Each point represents the number of valid cells counted during the last 200 milliseconds

## RBC Volume Histogram

The RBC Volume histogram represents the distribution of red blood cells by cell volume. The histogram has a range of 0 fL to 200 fL.



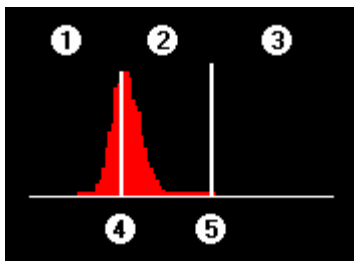
### RBC Volume histogram (normal sample)



- 1 Microcytic region
- 2 Normocytic region
- 3 Macrocytic region
- 4 60 fL marker
- 5 120 fL marker

Normal samples have a bell-curve shaped distribution with a mode channel between 60 fL and 120 fL. The mean corpuscular volume (MCV) and the red cell distribution width (RDW) are determined from this histogram. The MCV is the mean of the of RBC Volume histogram. The RDW is the coefficient of variation of the population. The MCV calibration factor has been applied to the displayed data.

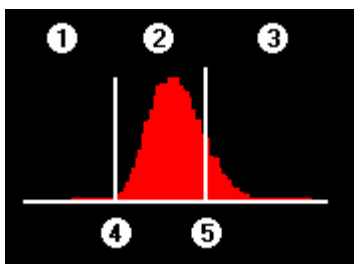
### RBC Volume histogram (microcytic sample)



- 1 Microcytic region
- 2 Normocytic region
- 3 Macrocytic region
- 4 60 fL marker
- 5 120 fL marker

In samples with increased numbers of microcytic red blood cells, the histogram curve shifts to the left, indicating an increase in the percentage of the cells with volumes less than 60 fL.

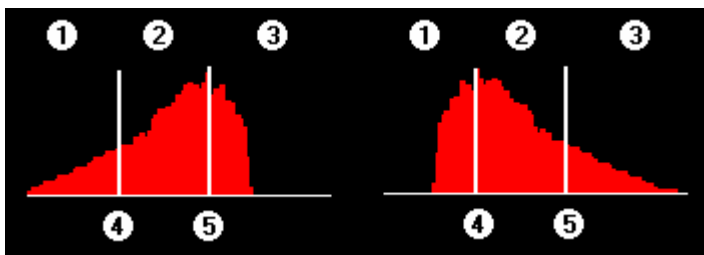
### RBC Volume histogram (macrocytic sample)



- 1 Microcytic region
- 2 Normocytic region
- 3 Macrocytic region
- 4 60 fL marker
- 5 2120/2120i fL marker

In samples with increased numbers of macrocytic red blood cells, the histogram curve shifts to the right, indicating an increase in the percentage of the cells with volumes greater than 2120/2120i fL.

### RBC Volume histogram (anisocytosis)



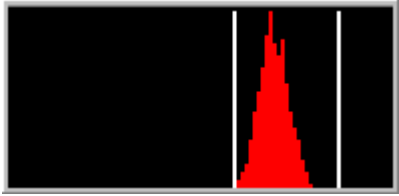
- 1 Microcytic region
- 2 Normocytic region
- 3 Macrocytic region
- 4 60 fL marker
- 5 120 fL marker

RDW is monitored as an indication of anisocytosis, and the results are flagged if the RDW exceeds 16%. Note that two specimens with the same RDW value can have different degrees of microcytosis and macrocytosis.

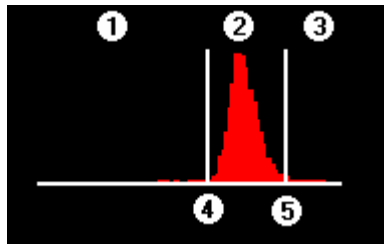


## RBC HC Histogram

The RBC hemoglobin concentration (RBC HC) histogram represents the distribution of red blood cells by cellular hemoglobin concentration. The histogram has a range of 0 g/dL to 50 g/dL.



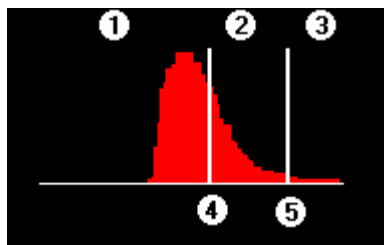
### RBC HC histogram (normal sample)



- 1 Hypochromic region
- 2 Normochromic region
- 3 Hyperchromic region
- 4 28 g/dL marker
- 5 41 g/dL marker

Normal samples have a bell-curve shaped Hgb concentration distribution with a mean channel between 28 g/dL and 41 g/dL. The cell hemoglobin concentration mean (CHCM) and the hemoglobin distribution width (HDW) are obtained from this histogram. The CHCM is the mean of the RBC HC histogram. The HDW is the standard deviation of the RBC HC histogram. The CHCM calibration factor has been applied to the displayed data.

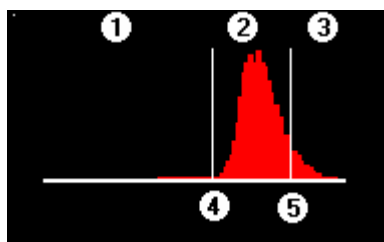
### RBC HC histogram (hypochromic sample)



- 1 Hypochromic region
- 2 Normochromic region
- 3 Hyperchromic region
- 4 28 g/dL marker
- 5 41 g/dL marker

In samples with increased numbers of hypochromic RBCs, the histogram curve shifts to the left, indicating an increase in the percentage of the cells with hemoglobin concentrations less than 28 g/dL.

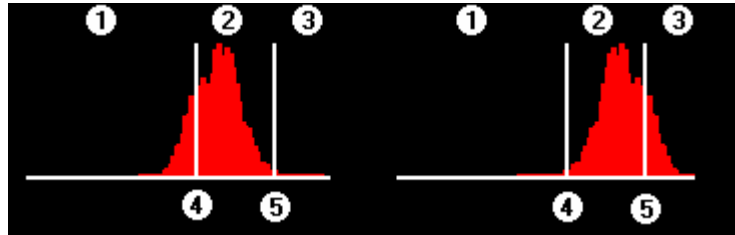
### RBC HC histogram (hyperchromic sample)



- 1 Hypochromic region
- 2 Normochromic region
- 3 Hyperchromic region
- 4 28 g/dL marker
- 5 41 g/dL marker

In samples with increased numbers of hyperchromic RBCs, the histogram curve shifts to the right, indicating an increase in the percentage of the cells with hemoglobin concentrations greater than 41 g/dL.

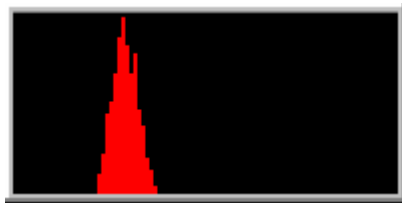
### RBC HC histogram (Hgb variance sample)



- 1 Hypochromic region
- 2 Normochromic region
- 3 Hyperchromic region
- 4 28 g/dL marker
- 5 41 g/dL marker

HDW provides an indication of Hgb concentration variance, and the results are flagged if the HDW exceeds 3.4 g/dL. Note that two specimens with the same HDW value can have different degrees of hypochromia and hyperchromia.

### RBC CH Histogram



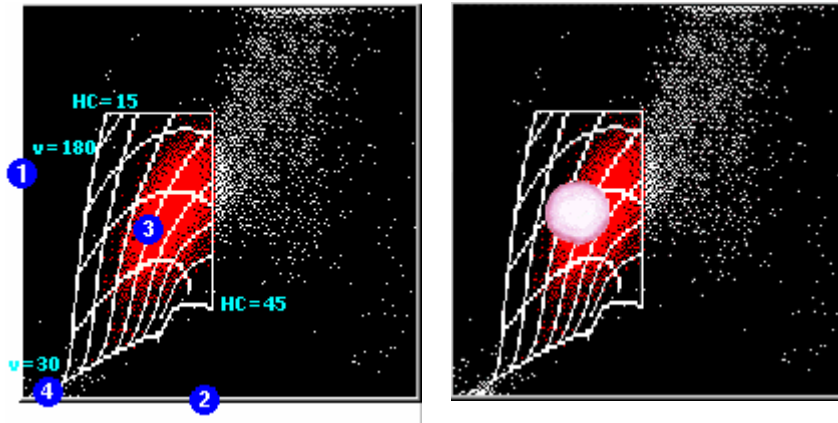
The RBC CH (cellular hemoglobin) histogram represents the distribution of red blood cells by the amount of hemoglobin present in each cell independent of cell volume.

The histogram has a range of 0 picograms to 100 picograms.

Cellular Hemoglobin Content (CH) is the mean of the RBC CH histogram. The cell hemoglobin distribution width (CHDW) is the standard deviation of the RBC CH histogram.

### RBC Scatter Cytogram

The RBC Scatter cytogram is the graphical representation of two light-scatter measurements: the high-angle light scatter ( $5^\circ$  to  $15^\circ$ ) is plotted along the x axis, and the low-angle light scatter ( $2^\circ$  to  $3^\circ$ ) is plotted along the y axis.



- 1 Low-angle light scatter ( $2^{\circ}$  to  $3^{\circ}$ )
- 2 High-angle light scatter ( $5^{\circ}$  to  $15^{\circ}$ )
- 3 Mie map containing RBCs
- 4 Platelets detected in RBC method

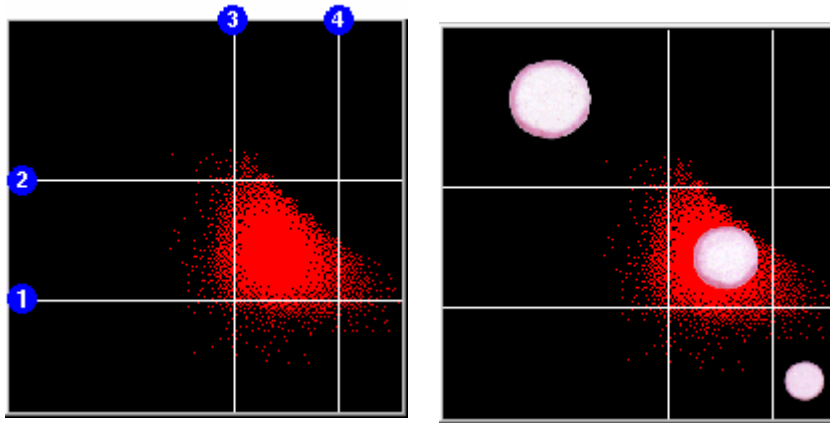
Using the Mie theory of light scattering for homogeneous spheres, the low-angle and high-angle light scatter signals for each cell are transformed into volume and hemoglobin concentration values.

The RBC map shows the relationship between the light-scatter measurements and the cell-by-cell characteristics of volume and hemoglobin concentration. The map grid encompasses RBC volumes between 30 fL and 180 fL and hemoglobin concentrations between 19 g/dL and 49 g/dL.

For a normal specimen, the RBC population appears in the center of the map. However, since this map is nonlinear, visually evaluating red cell morphology can be difficult. Use the V/HC cytogram, which provides a linear presentation of cell volume and hemoglobin concentration.

### **RBC Volume / Hemoglobin (V / HC) Cytogram**

The Volume/Hemoglobin Concentration (V/HC) cytogram is a linear version of the RBC map that appears on the RBC cytogram. On the V/HC cytogram, hemoglobin concentration is plotted along the x axis and cell volume is plotted along the y axis. Only red blood cells appear on this cytogram.



- 1 60 fL volume marker
- 2 2120/2120i fL volume marker
- 3 28 g/dL HC marker
- 5 41 g/dL HC marker

Markers organize the cytogram into 9 distinct areas of red blood cell morphology.

On the x axis, hemoglobin concentration markers are set at 28 g/dL (3) and 41 g/dL (4).

Red blood cells with a hemoglobin concentration less than 28 g/dL are hypochromic, while cells with a hemoglobin concentration greater than 41 g/dL are hyperchromic.

On the y axis, RBC volume markers are set at 60 fL (1) and 2120/2120i fL (2).

Red blood cells with a volume less than 60 fL are microcytic, while cells with a volume greater than 2120/2120i fL are macrocytic.

### RBC Matrix

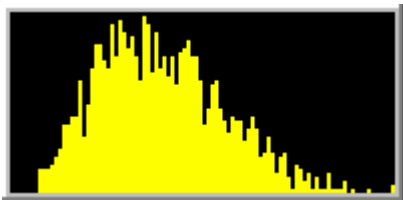
	HC < 28	HC = 28 - 41	HC > 41
V > 120	6 0.0 %	0 0.0 %	0 0.0 %
V = 60 - 120	12116 30.2 %	27558 68.8 %	5 0.0 %
V < 60	94 0.2 %	282 0.7 %	6 0.0 %

The RBC Matrix provides the cell counts and percentages for the nine regions of the RBC V/HC cytogram.

**NOTE:** Analysis of the RBC Volume and RBC HC histograms provides a quantitative analysis of the red blood cell populations. Additional, qualitative information concerning these red blood cell populations can be gained from simultaneous analysis of volume and hemoglobin concentration using the RBC V/HC cytogram.

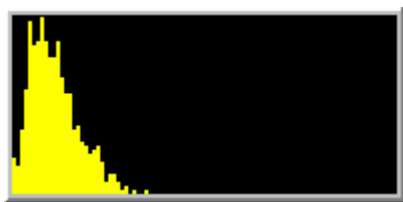
Since the histogram analysis uses calibration factors that are not applied to the RBC V/HC cytogram, there can be a discrepancy between the RBC matrix values and the corresponding %Micro, %Macro, %Hypo, and %Hyper values obtained from the histograms based on the value of the calibration factors. The closer the MCV and CHCM calibration factors are to 1.0, the smaller the discrepancies are.

### Platelet X Histogram



The Platelet X histogram is a 100-channel display of the high-angle ( $5^{\circ}$  to  $15^{\circ}$ ), high-gain light scatter measurements that corresponds to the x axis on the PLT Scatter cytogram.

### Platelet Y Histogram



The Platelet Y histogram is a 100-channel display of the low-angle ( $2^{\circ}$  to  $3^{\circ}$ ), high-gain light scatter measurements that corresponds to the y axis on the PLT Scatter cytogram.

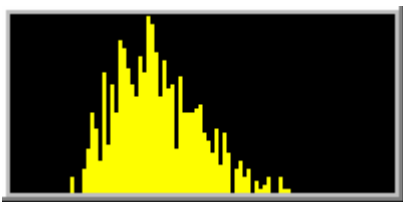
### Platelet VOL Histogram



The Platelet VOL histogram of the two-dimensional PLT analysis shows the distribution of cells by volume. Volume data are obtained from the integrated analysis.

The histogram has a range of 0 fL to 60 fL. Large platelets with volumes up to 60 fL are included in the PLT count.

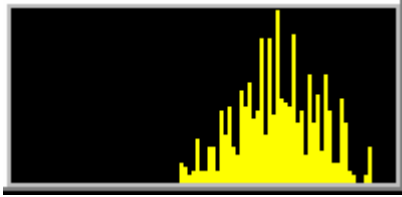
**NOTE:** Whenever the ratio of RBC fragments to platelets exceeds 0.25, the system uses the log normal fit calculation to determine the platelet count, and the log normal fit curve appears on the Platelet Volume histogram. Platelet PM Histogram



The Platelet PM histogram of the two-dimensional PLT analysis shows the distribution of platelets by the platelet dry mass (PM).

The histogram has a range of 0 pg to 5.0 pg.

### Platelet PC Histogram

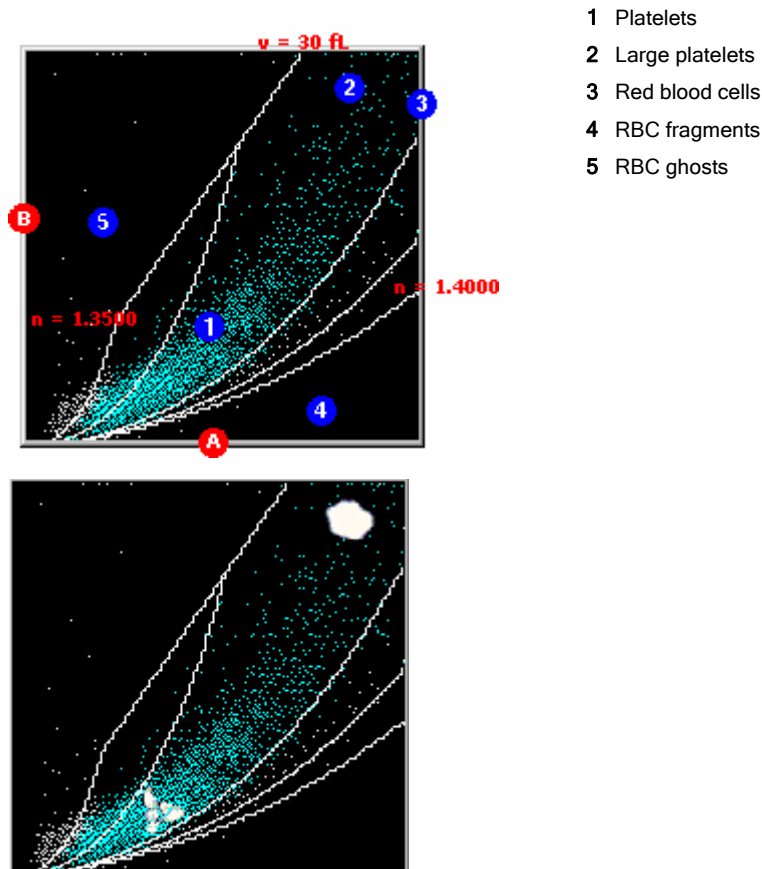


The Platelet PC histogram of the two-dimensional PLT analysis shows the distribution of platelets according to the refractive index (platelet component concentration [PC]).

The histogram has a range of 0 pg to 5.0 pg

### PLT Scatter Cytogram

The PLT Scatter cytogram is the graphical representation of two light-scatter measurements: the high-angle ( $5^\circ$  to  $15^\circ$ ), high-gain light scatter is plotted on the x axis (A), and the low-angle ( $2^\circ$  to  $3^\circ$ ), high-gain light scatter is plotted on the y axis (B).



- 1 Platelets
- 2 Large platelets
- 3 Red blood cells
- 4 RBC fragments
- 5 RBC ghosts

Using the Mie theory of light scattering for homogeneous spheres, the low-angle and high-angle light scatter signals for each cell are transformed into volume and refractive index (n) values.

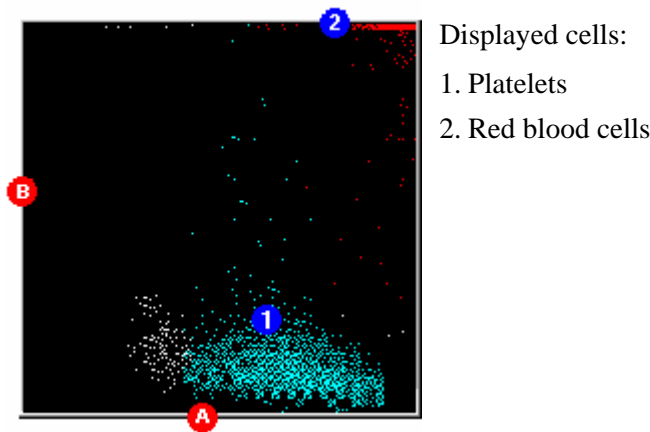
The PLT map shows the relationship between the light-scatter measurements and the cell-by-cell characteristics of volume and refractive index. The map grid encompasses volumes between 0 fL and 30 fL, and refractive index between 1.3500 and 1.4000.

The platelet count includes platelets (1) and large platelets (2).

RBC fragments (4) and RBC ghosts (5) are not included in the platelet count but are enumerated for flagging purposes.

Due to the high gain used in the platelet method, the RBCs appear in the saturation channels at the upper right corner of the cytogram.

### PLT Volume / PC Cytogram



The Platelet Volume / Refractive Index (PC) cytogram is a 100 by 100 channel display.

x axis (A): refractive index (concentration of the platelet component [PC]) range: 0 g/dL to 40 g/dL

y axis (B): platelet volume range: 0 fL to 60 fL

### Integrated Analysis

The 2-Dimensional platelet analysis (2D-PLT method) is based on the integrated analysis of red blood cell and platelet measurements. The PLT Scatter cytogram is formed by pairing light-scatter signals acquired at low angle - high gain and at high angle - high gain that are converted into volume and refractive index values. The PLT Scatter cytogram displays cells with volumes of 0 fL to 30 fL. Cell identification and counts for cells with volumes greater than 30 fL is done using the RBC Scatter cytogram.

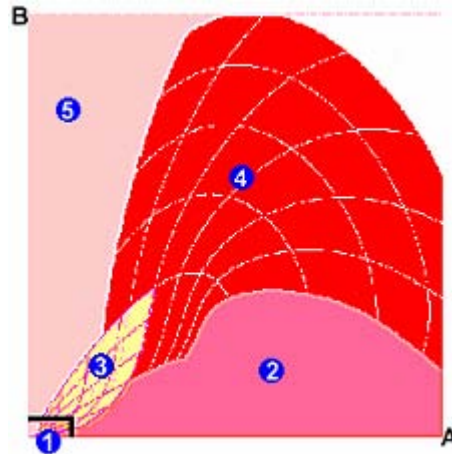
Integrated analysis is used to distinguish platelets, large platelets, red blood cells, RBC fragments, and RBC ghosts.

This example illustrates how large platelets are counted:

- Large platelets are identified on the PLT Scatter cytogram based on their refractive index values (1.35 to 1.40) and a volume greater than 20 fL.

- Large platelets are also identified on the RBC Scatter cytogram (area 3 below) based on their refractive index values (1.35 to 1.40) and a volume less than 60 fL.

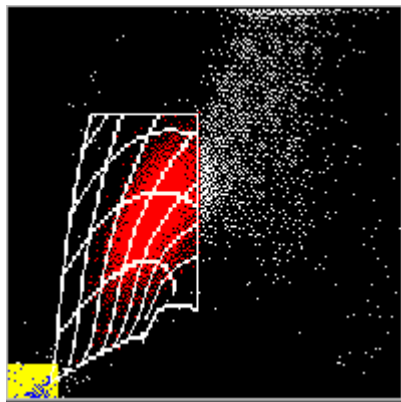
The Platelet VOL histogram contains platelets and large platelets with volumes up to 60 fL.



x axis (**A**) high-angle (5° to 15°) light scatter

y axis (**B**) low-angle (2° to 3°) light scatter

- Area covered by the PLT Scatter Cytogram
- RBC fragments
- Large platelets
- RBCs
- RBC ghosts



## Calculating RBC Parameters

### Reported Parameters

Parameter	Explanation
RBC	Number of Red Cells x RBC Cal Factor x Dilution Factor x Coincidence-correction Factor
MCV	Mean of RBC Volume histogram
RDW	100 x (SD of RBC Volume histogram ÷ MCV)
CHCM	Mean of RBC HC histogram
HDW	SD of RBC HC histogram



CH	Mean of RBC CH histogram
HCT	$(\text{RBC} \times \text{MCV}) \div 10$
MCH	$(\text{HGB} \div \text{RBC}) \times 10$
MCHC	$(\text{HGB} \div [\text{RBC} \times \text{MCV}]) \times 1000$

### Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
CHDW	SD of RBC CH histogram
RBC Flatness	$\sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$
RBC % Dead Time	$100 \times (\text{Measured Dead Time} \div \text{Measured Sample Time})$
RBC Coin Level	Number of coincidence events to be trimmed
RBC Coin Count	Coincidence Count in RBC Scatter cytogram
RBC R Count	Number of RBCs in RBC Scatter cytogram
RBC P Count	Number of platelets in RBC Scatter cytogram
RBC Valid Cells	Number of Valid Signals Obtained from Flowcell Events
#MICRO	Cell Count (30 fL to 60 fL) in RBC Volume histogram
%MACRO	$100 \times \frac{\text{Cell Count in RBC Volume histogram} > 120 \text{ fL}}{\text{Total Cell Count in RBC Volume histogram}}$
%MICRO	$100 \times \frac{\text{Cell Count in RBC Volume histogram} < 60 \text{ fL}}{\text{Total Cell Count in RBC Volume histogram}}$
%HYPER	$100 \times \frac{\text{Cell Count in RBC HC histogram} > 41 \text{ g/dL}}{\text{Total Cell Count in RBC HC histogram}}$
%HYPO	$100 \times \frac{\text{Cell Count in RBC HC histogram} < 28 \text{ g/dL}}{\text{Total Cell Count in RBC HC histogram}}$

$\frac{\% \text{MICRO}}{\% \text{HYPO}}$   
RATIO

### Parameter Key

#### Dilution Factor

The dilution factor for the RBC channel is 83.33333E-6.

#### RBC

Red blood cell count

#### MCV

Mean Corpuscular Volume

#### RDW

Red Cell Volume Distribution Width

#### CHCM

Corpuscular Hemoglobin Concentration Mean

#### CH

Cellular Hemoglobin Content

#### HDW

Hemoglobin Concentration Distribution Width

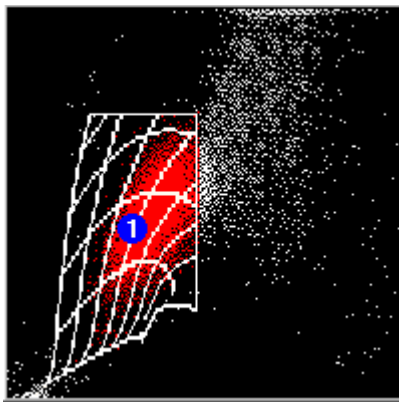
#### HCT

Hematocrit

#### Number of red cells

$(\text{RBC R Count} \times \text{RBC Valid Cells}) \div (\text{RBC R Count} + \text{RBC P Count})$

#### RBC R Count

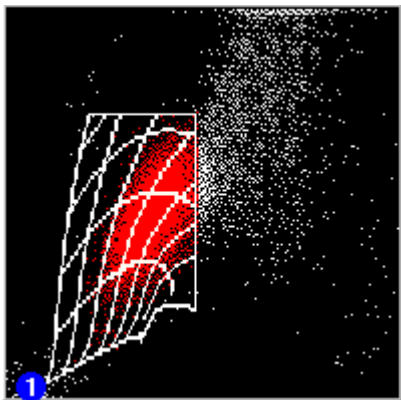


Number of cells in the RBC area (1) of the RBC Scatter Cytogram.

#### RBC Valid Cells

The number of valid electronic pulse signals detected from flowcell events.

### RBC P Count



Number of cells in the platelet area (1) of the RBC Scatter Cytogram.

### CHDW

Cell Hemoglobin Distribution Width

### RBC % Dead Time

Percent of analysis time when the channel is busy and cannot detect flowcell events

### RBC Coin Level

RBC Coincidence Level

### RBC Coin Count

RBC Coincidence Count

### RBC R Count

Raw red blood cell count from the RBC method

### RBC P Count

Raw platelet count from the RBC method

### % MACRO

Percent of macrocytic red blood cells

### % MICRO

Percent of microcytic red blood cells

### # MICRO

Number of microcytic red blood cells

### % HYPER

Percent of hyperchromic red blood cells

### % HYPO

Percent of hypochromic red blood cells

### %Micro / %Hypo Ratio

This parameter is reported to be of use in differentiating two types of microcytic anemia.

### Bibliography

D'Onofrio G., Zini G., Ricerca B. M., Mancini S., and Mango G.: Automated measurement of red blood cell microcytosis and hypochromia in iron deficiency and  $\beta$ -thalassemia trait. *Arch. Pathol. Lab. Med.* **116**:84 (1992)

## Calculating Platelet Parameters

### Reported Parameters

Parameter	Explanation
PLT	Corrected PLT Count x RBC Cal Factor x PLT Cal Factor x Dilution Factor
MPV	Mean of Platelet VOL histogram

### Additional Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
Large PLT	Platelets with volumes greater than 20 fL
MPC	Mean of Platelet PC histogram
MPM	Mean of Platelet PM histogram
PCDW	SD of Platelet PC histogram
P Count - 2D	Raw cell count for platelets and large platelets from 2D-platelet analysis
PCT	$(\text{PLT} \times \text{MPV}) \div 10,000$
PDW	$100 \times (\text{SD of Platelet VOL histogram} \div \text{MPV})$
PLT N	Mean of refractive index values for platelets only
PLT X	Mean of high-angle, high-gain values for platelets only
PLT Y	Mean of low-angle, high-gain values for platelets only
PMDW	SD of Platelet PM histogram
R Count - 2D	Raw cell count for RBCs, RBC ghosts, and RBC fragments from 2D-platelet analysis
RBC - 2D Count	Number of Red Cells-2D from 2D-platelet analysis x RBC Cal Factor x Dilution Factor x Coincidence-correction Factor

Parameter	Explanation
RBC Fragments	Count of RBC Fragments
RBC Ghosts	Count of RBC Ghosts

### Parameter Key

#### Dilution Factor

The dilution factor for the PLT channel is 83.33333E-3.

#### PLT

Platelet count

#### MPV

Mean Platelet Volume

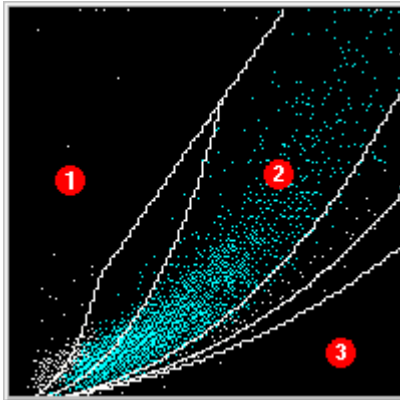
#### Large PLT

The count of platelets with volumes greater than 20 fL is derived from the Platelet Volume histogram based on Integrated Analysis.

Large Platelet Count in the same units selected for PLT on the Unit Set Configuration window of the System Setup tab.

#### RBC Fragments

This count includes events in the RBC Fragment area of the PLT Scatter cytogram that have volumes less than 30fL and refractive indexes greater than 1.400.

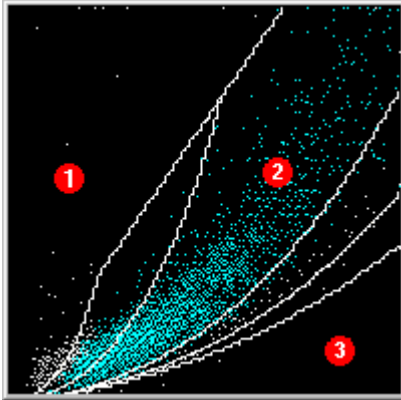


- 1 RBC Ghost area
- 2 Platelet area
- 3 RBC Fragment area

The RBC Fragments Count is in the same units selected for RBC on the Unit Set Configuration window of the System Setup tab.

### RBC Ghosts

This count includes events in the RBC Ghost area of the PLT Scatter cytogram that have refractive indexes lower than 1.350.



- 1 RBC Ghost area
- 2 Platelet area
- 3 RBC Fragment area

The RBC Ghosts Count is in the same units selected for RBC on the Unit Set Configuration window of the System Setup tab.

### MPC

Mean Platelet Component Concentration

### MPM

Mean Platelet Dry Mass

### PCDW

Platelet Component Distribution Width

### PDW

Platelet Volume Distribution Width

### PMDW

Platelet Dry Mass Distribution Width

### PCT

Platelet Crit

### RBC Fractional Dead Time

The fraction of time that the channel is busy processing flowcell events. While the RBC/Plt channel is busy identifying a particular flowcell event, it is unable to process any additional events that might occur. By measuring this "dead time", the analyzer can compensate for the missed events.

Note that the RBC / Plt channel dead time has RBC and platelet components.

### Corrected Platelet Count

The corrected platelet count is calculated using the P Count-2D , R Count-2D RBC Fractional Dead Time , and RBC Valid Cells.

### P Count-2D

The number of cells identified as platelets and large platelets. The platelets are obtained from the PLT Scatter cytogram, and the large platelets are obtained from the integrated analysis.

### R Count-2D

The count of RBCs, RBC ghosts, and RBC fragments that is obtained from the integrated analysis.

### Number of red cells-2D

$(R \text{ Count-2D} \times RBC \text{ Valid Cells}) \div (R \text{ Count-2D} + P \text{ Count-2D})$

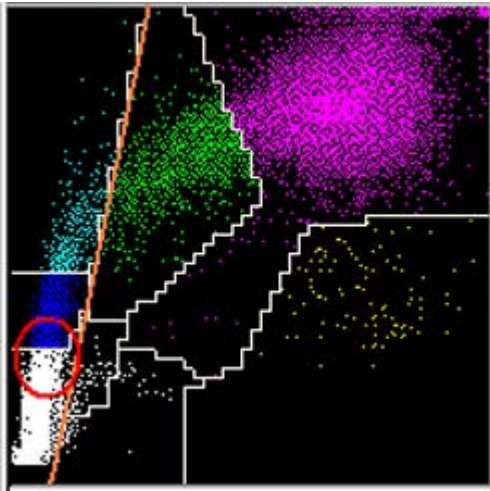
## NRBC Analysis

### NRBC Method Description

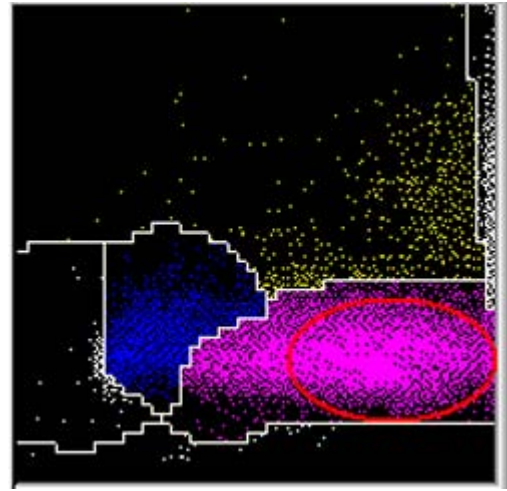
The ADVIA 22120/2120i/22120/2120ii NRBC analysis method reports NRBC counts for whole blood samples with either 200 or more nRBC/ $\mu\text{L}$  or with at least 2% nRBCs with a WBC count of at least 3000/ $\mu\text{L}$ .

The method reports both an absolute nRBC count ( $10^9/\text{L}$ ) and a percentage count (#NRBC/100 WBC). It also corrects the WBC count for nRBC, recalculates the WBC differential and %MN and %PMN. The uncorrected counts are also available and are designated by a lower case "u".

**NOTE:** NRBC results are available only for samples processed in CBC/Diff or CBC/Diff / Retic mode.



**PEROX Cytogram  
with location of nRBC and Unstained  
line**



**BASO Cytogram  
with location of nRBC**

The method identifies nRBCs by nuclear size in the Peroxidase channel, and by nuclear density in the Basophil/Lobularity channel.

In the unstained region of the Peroxidase Channel cytogram, nRBC nuclei are located between the noise and lymphocytes. They often form distinct populations, which are analyzed to produce counts.

In the Basophil/Lobularity channel cytogram, nRBC nuclei are located in the polymorphonuclear region, rather than in the mononuclear region, because they are denser than lymphocyte or monocyte nuclei. Since they are not the nuclei of polymorphonuclear cells, the difference between the number of nuclei in this region and the sum of neutrophils and eosinophils in the Peroxidase Channel may equal the NRBC count. This difference is called the "Barox" (**Baso / Perox**) count.

The method generates four NRBC counts for every sample.

**Histo count**

The NRBC count from analysis of the unstained region of the Peroxidase Channel Y-axis histogram

**Gaussian count**

The NRBC count from making a gaussian fit to the nRBC section of the unstained region of the Peroxidase Channel Y-axis

**Residual count**

The NRBC count from subtracting the noise and lymphocytes from the unstained region of the Peroxidase Channel Y-axis histogram

**Barox count**

The NRBC count from the equation #nRBC = #PMNs - #NEUTs - #EOS

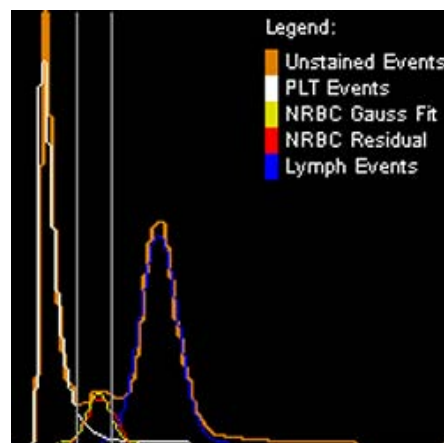
The system then uses selection rules to determine which, if any, of the NRBC counts to report.

**NRBC Enumeration Histogram**

The NRBC Enumeration Histogram is a 100-channel display of the light scatter measurements and corresponds to the unstained region of the Peroxidase Channel Y-axis histogram. This display of the NRBC Analysis shows overlays of:

- Unstained Events
- PLT Events
- NRBC Gauss Fit
- NRBC Residual
- Lymph Events

The histogram also includes goalposts, which designate the Histo and Residual counts. These goalposts appear only when the Histo or Residual count is the selected NRBC count.



**NRBC Enumeration Histogram**

**Calculating Reported NRBC Parameters**

The system corrects the reported WBC count when nRBCs are detected.

**Histo, Residual, or Gaussian Count** 
$$\frac{WBC_u}{1 + \frac{\% NRBC}{100}}$$

**Barox Count** 
$$\left( WBCP + \frac{\% Neut + \% Eos}{100} \right) + \left( WBCB + \frac{\% MN + \% Baso}{100} \right)$$



## Reticulocyte Method

### Cytochemical Reactions

The reticulocyte cytochemical reactions consist of two steps:

**Step 1** RBCs and platelets are isovolumetrically sphered using ADVIA 2120/2120i autoRETIC reagent.

**Step 2** Reticulocytes are differentially stained based on their RNA content.

### ADVIA 2120/2120i autoRETIC

**NOTE:** For more detailed information on the contents of ADVIA 2120/2120i autoRETIC reagent, please see Chapter 8.

The ADVIA 2120/2120i autoRETIC reagent contains a zwitterionic detergent (surfactant) that isovolumetrically spheres the red cells. It also contains a cationic dye, Oxazine 750, that stains cells according to their RNA content.

### Measurement

A constant volume of the cell suspension from the retic reaction chamber passes through the flowcell where the low-angle light scatter ( $2^\circ$  to  $3^\circ$ ), the high-angle light scatter ( $5^\circ$  to  $15^\circ$ ), and the absorption signatures for each cell are measured. ADVIA 2120/2120i SHEATH/RINSE encases the sample stream as the two fluids pass through the flowcell.

The low-angle and high-angle light scatter signatures are proportional to cell size and hemoglobin concentration. Light absorption is proportional to RNA content. The stained reticulocytes will absorb more light than the mature RBCs.

The two light-scatter signals and the absorption signal are detected, electronically amplified, and split into six signals.

One of the low-angle light scatter signals is amplified 28 times.

One of the high-angle light scatter signals is amplified 12 times.

One of the absorption signals is amplified 33 times.

After processing, this information is available:

**RETIC Rate** histogram displays the arrival rate of cells in the retic channel.

**RETIC Abs Flatness** histogram displays the mean absorption at 200-millisecond intervals.

**RETIC Abs** histogram displays the overlaid distribution of mature RBCs and reticulocytes by their absorption values.

**RETIC Volume** histogram shows the overlaid distribution of mature RBCs and reticulocytes by their cell volume independent of hemoglobin concentration.

**RETIC HC** histogram shows the overlaid distribution of mature RBCs and reticulocytes by hemoglobin concentration independent of cell volume.

**RETIC CH** histogram shows the overlaid distribution of mature RBCs and reticulocytes by hemoglobin content (cellular hemoglobin).

**RETIC Scatter Abs** cytogram is formed from the paired high-angle, low-gain light scatter and the high-gain absorption data. Sample-specific thresholds separate the cell populations.

**RETIC Scatter** cytogram is formed by plotting the high-angle, low-gain light scatter along the x axis, and the low-angle, low-gain light scatter on the y axis.

**RETIC V / HC** cytogram provides a representation of the cell volume and hemoglobin concentration.

## Reticulocyte Method Nomenclature

### Mature (m), Reticulocytes (r), Gated (g)

The lowercase letters m, r, and g are commonly used in the reticulocyte parameters to identify a specific population.

For example: MCV<sub>m</sub>, MCV<sub>r</sub>, and MCV<sub>g</sub> refer to the mean cell volume for the mature RBC, reticulocyte, and gated populations, respectively.

"Gated" refers to the total population of RBCs containing both mature RBCs and reticulocytes.

### Negative versus Positive Cell Populations

Since reticulocytes have RNA and stain with ADVIA 2120/2120i autoRETIC reagent, they are the positive cell population. Mature RBCs do not stain, and they are the negative cell population.

### Immature Reticulocyte Fraction

Immature Reticulocyte Fraction (IRF) is a descriptive term recommended in NCCLS Document H44-A "Methods for Reticulocyte Counting: Flow Cytometry and Supravital Dyes; Approved Guideline" to replace a previously-used term, Reticulocyte Maturation Index (RMI).

Two IRF parameters are calculated: IRF-H and IRF-H+M.

### RETIC Rate Histogram



The RETIC Rate histogram shows the uniformity of the cell-counting rate.

The rate histogram data consists of 50 points, one taken every 200 milliseconds. Each point represents the number of valid cells counted during the last 200 milliseconds.

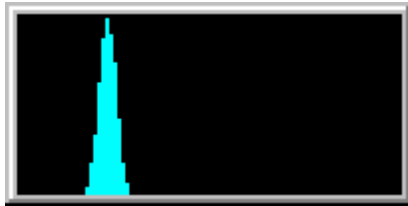
## RETIC Abs Flatness Histogram



The RETIC Abs Flatness histogram data consists of 50 points, one taken every 200 milliseconds. Each point represents the mean absorption for the last 200 milliseconds.

This histogram provides a visual indication of the absorption signal "flatness" to monitor the laser performance. Laser oscillation can cause an erratic presentation.

## RETIC Abs Histogram

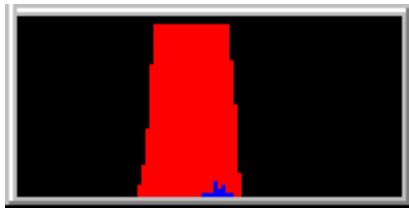


The RETIC Abs histogram represents the distribution of mature RBCs and reticulocytes according to their corrected absorption values.

Absorption correction compensates for drift in the absorption channel optics and for scattered light that is not collected.

## RETIC Volume Histogram

The RETIC Volume histogram represents the overlaid distributions of mature RBCs and reticulocytes by cell size only. The histogram has a range from 0 fL to 200 fL. The displayed data includes the MCVg calibration factor.



Mature RBC population  
(red)

Reticulocyte population  
(blue)

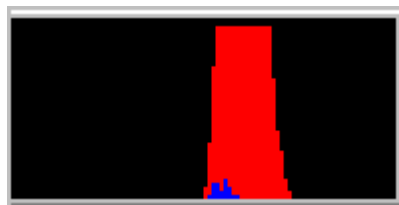
## RETIC Volume Histogram Parameters

%MACROr	Percentage of reticulocyte population with cell volumes greater than 120 fL
%MACROm	Percentage of mature RBC population with cell volumes greater than 120 fL
%MACROg	Percentage of gated cell population with cell volumes greater than 120 fL
%MICROr	Percentage of reticulocyte population with cell volumes less than 60 fL

%MICROm	Percentage of mature RBC population with cell volumes less than 60 fL
%MICROg	Percentage of gated cell population with cell volumes less than 60 fL
MCVr	Mean Corpuscular Volume is the mean of the RETIC Volume histogram for the reticulocyte population.
MCVm	Mean Corpuscular Volume is the mean of the RETIC Volume histogram for the mature RBC population.
MVCg	Mean Corpuscular Volume is the mean of the RETIC Volume histogram for the gated cells.
MCV Delta	$MCVr - MCVm$
RDWr	Red cell Distribution Width is the coefficient of variation (CV) of the RETIC Volume histogram (channels 15 to 99) for the reticulocyte population.
RDWm	Red cell Distribution Width is the coefficient of variation (CV) of the RETIC Volume histogram (channels 15 to 99) for the mature RBC population.
RDWg	Red cell Distribution Width is the coefficient of variation (CV) of the RETIC Volume histogram (channels 15 to 99) for the gated cells.
RDW Delta	$RDWr - RDWm$

### RETIC HC Histogram

The RETIC hemoglobin concentration (RETIC HC) histogram represents the overlaid distributions of mature RBCs and reticulocytes by cellular hemoglobin concentration only. The histogram has a range from 0 g/dL to 50 g/dL. The displayed data includes the CHCMg calibration factor.



Mature RBC population  
(red)

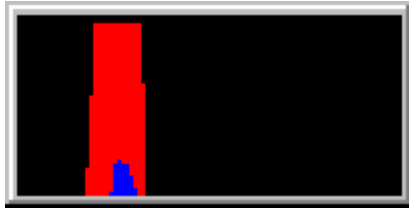
Reticulocyte population  
(blue)

## RETIC HC Histogram Parameters

%HYPERr	Percentage of reticulocyte population with cellular hemoglobin concentration greater than 41 g/dL
%HYPERm	Percentage of mature RBC population with cellular hemoglobin concentration greater than 41 g/dL
%HYPERg	Percentage of gated cell population with cellular hemoglobin concentration greater than 41 g/dL
%HYPOr	Percentage of reticulocyte population with cellular hemoglobin concentration less than 28 g/dL
%HYPOm	Percentage of mature RBC population with cellular hemoglobin concentration less than 28 g/dL
%HYPOg	Percentage of gated cell population with cellular hemoglobin concentration less than 28 g/dL
CHCMr	Cellular Hemoglobin Concentration Mean is the mean of the RETIC HC histogram for the reticulocyte population.
CHCMm	Cellular Hemoglobin Concentration Mean is the mean of the RETIC HC histogram for the mature RBC population.
CHCMg	Cellular Hemoglobin Concentration Mean is the mean of the RETIC HC histogram for the gated cells.
CHCM Delta	$CHCMr - CHCMm$
HDWr	Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC HC histogram for the reticulocyte population.
HDWm	Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC HC histogram for the mature RBC population.
HDWg	Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC HC histogram for the gated cells.
HDW Delta	$HDWr - HDWm$

## RETIC CH Histogram

The RETIC cellular hemoglobin (RETIC CH) histogram represents the overlaid distributions of mature RBCs and reticulocytes by the actual weight or mass of hemoglobin present in each cell. The histogram has a range from 0 pg to 100 pg.



Mature RBC population  
(red)

Reticulocyte population  
(blue)

### RETIC CH Histogram Parameters

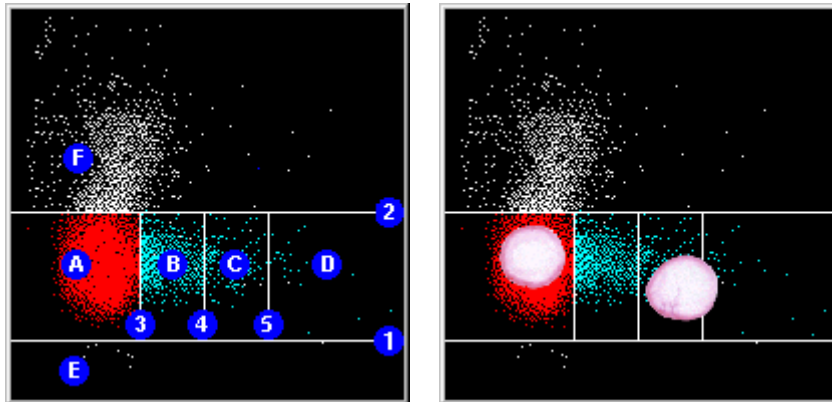
%HIGH CHr	Percentage of reticulocyte population with cellular hemoglobin greater than 31 pg
%HIGH CHm	Percentage of mature RBC population with cellular hemoglobin greater than 31 pg
%HIGH CHg	Percentage of gated cell population with cellular hemoglobin greater than 31 pg
%LOW CHr	Percentage of reticulocyte population with cellular hemoglobin less than 27 pg
%LOW CHm	Percentage of mature RBC population with cellular hemoglobin less than 27 pg
%LOW CHg	Percentage of gated cell population with cellular hemoglobin less than 27 pg
CHr	Cellular Hemoglobin Mean is the mean of the RETIC CH histogram for the reticulocyte population.
CHm	Cellular Hemoglobin Mean is the mean of the RETIC CH histogram for the mature RBC population.
CHg	Cellular Hemoglobin Mean is the mean of the RETIC CH histogram for the gated cells.
CH Delta	$CHr - CHm$
CHDW <sub>r</sub>	Cellular Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC CH histogram for the reticulocyte population.
CHDW <sub>m</sub>	Cellular Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC CH histogram for the mature RBC population.

CHDWg Cellular Hemoglobin Distribution Width is the standard deviation (SD) of the RETIC CH histogram for the gated cells.

CHDW Delta CHDW<sub>r</sub> - CHDW<sub>m</sub>

## RETIC Scatter Abs Cytogram

The RETIC Scatter ABS cytogram is the graphical representation of the absorption and light-scatter measurements: the high-gain, absorption (cell maturation) is plotted along the x axis and the high-angle, low-gain light scatter (cell size) is plotted along the y axis.



- 1 RTC Platelet threshold
- 2 RTC Coincidence threshold
- 3 RTC threshold
- 4 Low/Medium RTC threshold
- 5 Medium/High RTC threshold
- A Mature RBCs
- B Low absorption retics
- C Medium absorption retics
- D High absorption retics
- E Platelets
- F Coincidence events

The two thresholds on the y axis (1)(2) are set as follows:

1. The analyzer scans for the scatter mode between channels 10 and 99 on the y axis.
2. The mean channel and standard deviation (SD) are calculated.
3. The RTC Platelet threshold (1) is set at the mean channel minus 3.5 SD to separate the platelets from the mature RBCs and reticulocytes.
4. The RTC Coincidence threshold (2) is set at the mean channel plus 3.5 SD to separate the coincident cells from the mature RBCs and reticulocytes.

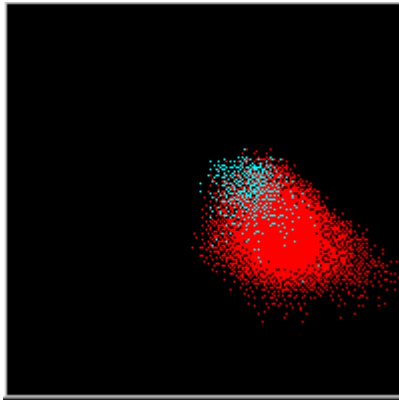
The RTC threshold (3) on the x axis is set as follows:

1. The analyzer scans for the absorption mode between channels 2 and 25 on the x axis.
2. The standard deviation (SD) of the six channels on either side of the mode is calculated.
3. The RTC threshold is set 3.2 SD from the mode channel to separate the mature RBCs from the reticulocytes.

Two additional thresholds (4)(5) are set on the x axis to separate the reticulocyte population by their stages of maturation. The youngest reticulocytes have the highest amounts of RNA (absorption), and appear further out on the x axis.

1. The RTC threshold channel is subtracted from 75, and the resulting difference is divided by three.
2. The Low/Medium RTC threshold (4) is set to the RTC threshold channel plus the value calculated in step 1.
3. The Medium/High RTC threshold (5) is set to the Low/Medium RTC threshold channel plus the value calculated in step 1.

### RETIC V / HC Cytogram



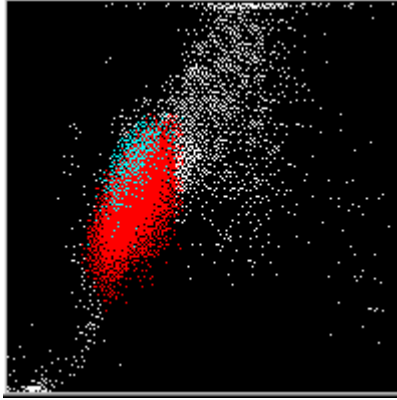
On the V/HC cytogram, hemoglobin concentration is plotted along the x axis, and cell volume is plotted along the y axis.

Cells identified as mature RBCs are red; while cells identified as reticulocytes are cyan.

### RETIC Scatter Cytogram

The RETIC Scatter cytogram is the graphic representation of two light-scatter measurements: the high-angle, low-gain light scatter is plotted along the x axis, and the low-angle, low-gain light scatter is plotted along the y axis. Cells identified as mature RBCs are colored red; while cells identified as reticulocytes are colored cyan.





Using the Mie theory of scattering for homogeneous spheres, the low-angle and high-angle light scatter signals for each cell are transformed into volume and hemoglobin concentration values. RBCs have cell volumes between 30 fL and 180 fL, and hemoglobin concentrations between 19 g/dL and 49 g/dL.

### Bibliography

Tycko DH, Metz MH, Epstein EA, Grinbaum: Flow-cytometric light scattering measurement of red blood cell volume and hemoglobin concentration. *Applied Optics* **24(9)**:1355-1365 (1985)

### Calculating Retic Parameters

#### Reported Parameters

Parameter	Explanation
#Retic	$\text{RBC} \times (\% \text{Retic} \div 100) \times 1000$
%Retic	$100 \times (\text{RETIC Count} \div \# \text{RTC Gated Cells}) \times \% \text{RETIC Cal Factor}$
CHr	Mean of the RETIC CH histogram for the reticulocyte population

#### System Parameters

The following parameters are for research or laboratory use only and are not for patient reporting:

Parameter	Explanation
RTC RBC	RBC Count
RTC Flatness	$\sqrt{\frac{\text{Sum of the Squared Differences}}{9 \times \text{Mean Cell Counting Rate}}}$
RTC % Dead Time	$100 \times (\text{Measured Dead Time} \div \text{Measured Sample Time})$

<b>Parameter</b>	<b>Explanation</b>
RTC % Noise	$100 \times (\text{Outlier Cells} \div \text{\#RTC Cells Analyzed})$
Mean Absorption	Mean of the RETIC Abs histogram for the reticulocyte population
ABS Low Cell Count	Counts in x axis channels 1 to 3 of the RETIC Scatter Abs cytogram
ABS Mode	Mode channel of the Absorption population
RTC Valid Cells	Number of Valid Signals Obtained from Flowcell Events

### **Additional Parameters**

The following parameters are for research or laboratory use only and are not for patient reporting:

<b>Parameter</b>	<b>Explanation</b>
CHCMr	Mean of the Retic HC histogram for the reticulocyte population
MCVm	Mean of the RETIC Volume histogram for the mature population
MCVr	Mean of the RETIC Volume histogram for the reticulocyte population
\#Neg RBC	Number of mature RBCs
\%Neg RBC	$100 \times (\text{\#Neg RBC} \div \text{\#RTC Gated Cells})$
Retic Count	Number of reticulocyte events
\#LRetic	Number of low absorption reticulocytes
\%LRetic	$100 \times (\text{\#LRetic} \div \text{RETIC Count})$
\#MRetic	Number of medium absorption reticulocytes
\%MRetic	$100 \times (\text{\#MRetic} \div \text{RETIC Count})$
\#HRetic	Number of high absorption reticulocytes
\%HRetic	$100 \times (\text{\#HRetic} \div \text{RETIC Count})$
IRF-H	$100 \times (\text{\#HRetic} \div \text{RETIC Count})$

<b>Parameter</b>	<b>Explanation</b>
IRF-M+H	$100 \times ([\#HRetic + \#MRetic] \div RETIC \text{ Count})$
RTC Mean X	Mean x channel of the RETIC Scatter cytogram
RTC Mean Y	Mean y channel of the RETIC Scatter cytogram
#RTC Cells Acquired	Number of Valid Signals Obtained
#RTC Cells Analyzed	Cells on RTC Scatter cytogram with nonzero volume and hemoglobin values, and are not in channel 99
#RTC Gated Cells	#Neg RBC + Retic Count within threshold limits
Slope Negative Cells	Slope of the negative (mature RBC) population relative to y axis of the RETIC Scatter ABS cytogram

### **Parameter Key**

#### **#RETIC**

Absolute number of reticulocytes

#### **%RETIC**

Percent of reticulocytes

#### **CHCMr**

Reticulocyte Cellular Hemoglobin Concentration Mean

#### **CHr**

Reticulocyte Cellular Hemoglobin Content

#### **MCVm**

Mean Cell Volume of mature population

#### **MCVr**

Mean Cell Volume of reticulocyte population

#### **RBC**

The system always uses the RBC count from the RBC / Platelet method, even when a sample has been run with a retic only selectivity.

#### **RTC RBC**

Red blood cell count from the Reticulocyte method. The RTC RBC count is calculated in the same manner as the RBC count from the RBC / Platelet Method.

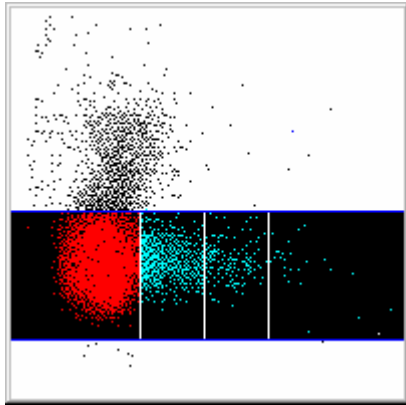
#### **RTC % Dead Time**

Percent of analysis time when the channel is busy and cannot detect flowcell events

**RTC % Noise**

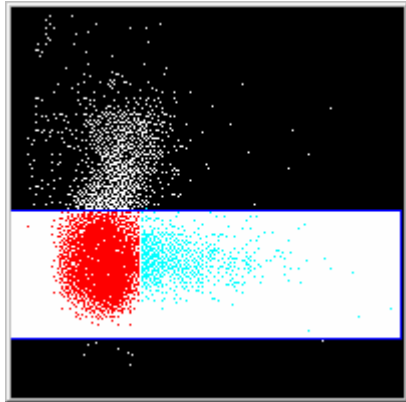
Percent of events from the outlier areas

**Outlier Cells**



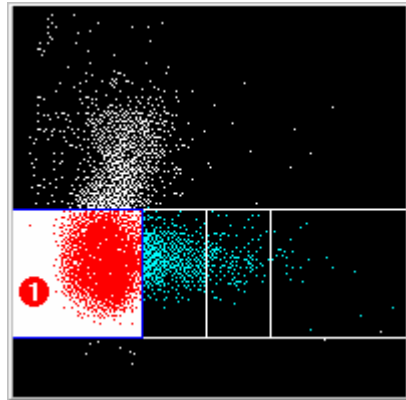
The outlier cell count includes cells with high-scatter values less than the RTC Platelet threshold, and cells with high-scatter values greater than the RTC Coincidence threshold.

**RTC Gated Cells**



The number of cells between the RTC platelet and RTC coincidence thresholds in the Retic Scatter Abs cytogram excluding channel 99.

**Neg RBC**



The number of cells in the mature RBC area (1) of the Retic Scatter Abs cytogram.

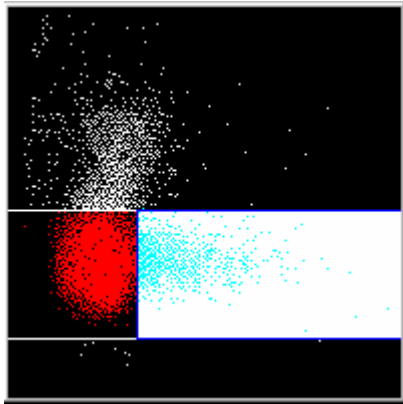
**# Neg RBC**

Count of mature red blood cells

**% Neg RBC**

Percent of mature red blood cells

### Number of Reticulocytes in the gated population

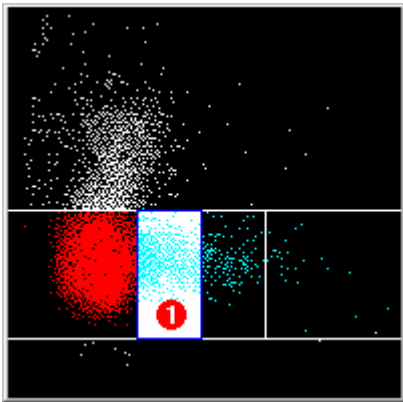


The total number of cells in the three reticulocyte areas of the Retic Scatter Abs cytogram.

### Retic Count

Count of reticulocytes in the gated population

### Number of Low Absorption Reticulocytes



The number of gated cells (1) between the RTC and Low/Medium RTC thresholds of the Retic Scatter Abs cytogram.

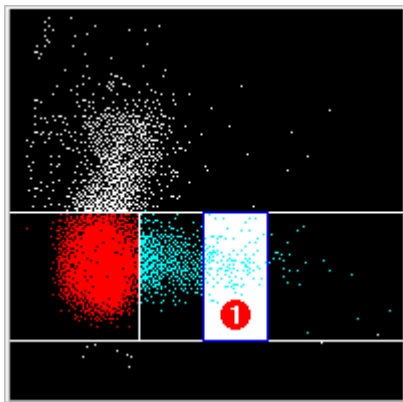
### #LRetic

Count of low absorption reticulocytes

### %LRetic

Percent of low absorption reticulocytes

### Number of Medium Absorption Reticulocytes



The number of gated cells (1) between the Low/Medium RTC and Medium/High RTC thresholds of the Retic Scatter Abs cytogram.

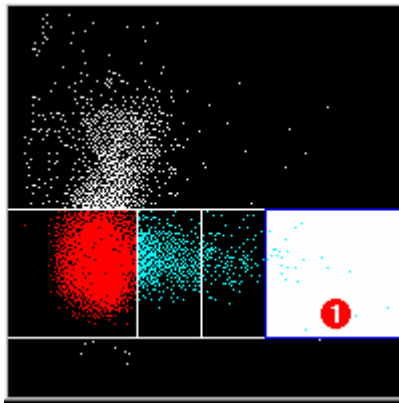
### #MRetic

Count of medium absorption reticulocytes

**%MRetic**

Percent of medium absorption reticulocytes

**Number of High Absorption Reticulocytes**



The number of gated cells (1) to the right of the Medium/High RTC threshold of the Retic Scatter Abs cytogram.

**#HRetic**

Count of high absorption reticulocytes

**%HRetic**

Percent of high absorption reticulocytes



# Regulatory Information

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## Methods Introduction

### Overview

The Methods Introduction describes the types of information contained in the ADVIA 2120/2120i Hematology System testing methods.

**NOTE:** Unless otherwise stated, the performance data for the methods were obtained using ADVIA 2120/2120i instruments, software, reagents, standards, and controls designed for or intended for use on the ADVIA 2120/2120i Hematology System.

### Statement of Content

The Introduction contains information on ancillary reagents, controls, and calibrators for the ADVIA 2120/2120i Hematology System.

The procedures necessary for the preparation, use, and storage of the ADVIA 2120/2120i Hematology System method reagents are provided in the applicable method topics.

### Sample Collection and Preparation



#### BIOHAZARD WARNING

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

Refer to the Information Bulletin titled "Sample Handling Guidelines" (Publication No. TN9-5729-31).

Collect samples in a blood collection tube or microsample blood collection device that contains EDTA as the anticoagulant.

Refrigerate blood samples at 2°C to 8°C if they will not be analyzed within 8 hours of phlebotomy.

**Do not assay cold specimens!**

Allow the specimen to equilibrate to room temperature before mixing.  
*Do not* warm specimen by placing it into a 37°C water bath or incubator.



**CAUTION:** If the whole blood specimen is brought to room temperature quickly, there is a strong tendency for the platelets to clump upon mixing.

Do not use previously frozen whole blood samples.  
Freezing the blood can disrupt the cellular structure, thus resulting in aberrant cell counts.

Unless otherwise stated, no special treatment of the whole blood specimen is required. However, samples must be collected in the specified collection tube and gently, but thoroughly mixed at the time of collection and again before sampling.

**Calibrator and Control Products**



**CAUTION! POTENTIAL BIOHAZARD**

Contains human source material. While each human serum or plasma donor unit used in the manufacture of this product was tested by FDA-approved methods and found nonreactive for hepatitis B surface antigen (HBsAg), antibody to hepatitis C (HCV), and antibody to HIV-1/2, all products manufactured using human source material should be handled as potentially infectious. Because no test method can offer complete assurance that hepatitis B or C viruses, HIV, or other infectious agents are absent, these products should be handled according to established good laboratory practices.

Siemens supplies control and calibrator products for use with the ADVIA 2120/2120i Hematology System.

Refer to the current Price List, and the product package insert for additional information.

**ADVIA 120 TESTpoint 3-in 1 Hematology Control Abnormal 1**

REF	Product Number	Symbol	Contents	Amount (mL)
09459683	T03-4417-54		Hematology Control Abnormal 1	4 x 4.0 mL
-	T03-4417-01		Hematology Control Abnormal 1	4.0 mL

**ADVIA 120 TEST Point 3-in-1Hematology Control Abnormal 2**

REF	Product Number	Symbol	Contents	Amount (mL)
03410380	T03-4418-54		Hematology Control Abnormal 2	4 x 4.0 mL

REF	Product Number	Symbol	Contents	Amount (mL)
-	T03-4418-01	CONTROL ABN 2	Hematology Control Abnormal 2	4.0 mL

**ADVIA 120 TEST Point 3-in-1 Hematology Control Normal**

REF	Product Number	Symbol	Contents	Amount (mL)
01964346	T03-4416-54	CONTROL NORM	Hematology Control Normal	4 x 4.0 mL
-	T03-4416-01	CONTROL NORM	Hematology Control Normal	4.0 mL

**ADVIA 120 TESTpoint Hematology Control High**

REF	Product Number	Symbol	Contents	Amount (mL)
08822644	T03-3688-54	CONTROL HIGH	Hematology Control High	4 x 4.0 mL
-	T03-3688-01	CONTROL HIGH	Hematology Control High	4.0 mL

**ADVIA 120 TESTpoint Hematology Control Low**

REF	Product Number	Symbol	Contents	Amount (mL)
00848547	T03-3686-54	CONTROL LOW	Hematology Control Low	4 x 4.0 mL
-	T03-3686-01	CONTROL LOW	Hematology Control Low	4.0 mL

**ADVIA 120 TESTpoint Hematology Control Normal**

REF	Product Number	Symbol	Contents	Amount (mL)
05147873	T03-3687-54	CONTROL NORM	Hematology Control Normal	4 x 4.0 mL
-	T03-3687-01	CONTROL NORM	Hematology Control Normal	4.0 mL

**ADVIA 120 SETpoint Hematology Calibrator**

REF	Product Number	Symbol	Contents	Amount (mL)
09170071	T03-3685-52	CAL	Hematology Calibrator	2 x 6.1 mL

REF	Product Number	Symbol	Contents	Amount (mL)
-	T03-3685-01		Hematology Calibrator	6.1 mL

#### ADVIA 120 OPTIpoint

REF	Product Number	Contents	Amount (mL)
04408568	T03-3682-54	OPTIpoint	4 x 6.0 mL
-	T03-3682-01	OPTIpoint	6.0 mL

**NOTE:** Control products for the CSF Method and the Reticulocyte method are described in those sections.

#### Calibrator and Control Value Assignment Methods

All assigned target values for ADVIA SETpoint Hematology Calibrator and ADVIA TESTpoint Hematology Controls are traceable to NIST, ICSH, or NCCLS recommended procedures or approved reference procedures and materials.

The reference Red Blood Cell (RBC) and White Blood Cell (WBC) counts are performed using the recommended method with a single-channel aperture impedance counter. Macro-dilutions of 1:500 for WBC and 1:50,000 for RBC are made using Class A glassware. The reference Platelet Count (Plt) is performed using a hemocytometer and phase-contrast microscopy. The macro-dilution for Plt is 1:125 using 1% ammonium oxalate as the diluent. The reference hemoglobin method is performed using the NCCLS H-15A approved standard method with ICSH traceable certified hemoglobin standards. The reference microhematocrit is performed using NCCLS H-7A approved standard method with tripotassium EDTA as the anticoagulant.


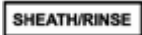
The System Specific Target Values (SSV) are assigned for ADVIA 120 SETpoint Hematology Calibrator and ADVIA 120 TESTpoint Hematology Control products by assaying each lot on an ADVIA 2120/2120i Hematology System that was calibrated using fresh, normal, whole-blood samples that were assigned RBC, WBC, Plt, Hct, and Hgb values using the methods described above.

ADVIA 120 OPTIpoint values are assigned using an ADVIA 2120/2120i Hematology System after standardizing the system with three reference oils. The index of refraction for each oil is determined with a refractometer that is calibrated using NIST standards. The index of refraction is measured at the wavelength of the ADVIA 2120/2120i system's laser as a function of temperature. During OPTIpoint value assignment, the temperature of the effluent is monitored so the correct index of refraction can be used to standardize the ADVIA 2120/2120i system. When stored at 2°C to 8°C, unopened ADVIA OPTIpoint (PN T03-3682-01), ADVIA SETpoint Calibrator (PN T03-3685-01), and ADVIA TESTpoint Reticu are stable until the last day of the month (expiration date) printed on the product label, unless otherwise stated. After being opened, ADVIA OPTIpoint is stable for 7 days when stored closed in its original container at 2°C to 8°C.

### Ancillary Reagents

The following ancillary reagents are necessary to operate the ADVIA 2120/2120i Hematology System. All reagents must be free of particulates and other foreign matter.


#### ADVIA 120 SHEATH/RINSE

REF	Product Number	Symbol	Contents	Amount (L)
02337140	T01-3664-01		SHEATH/RINSE	10 L
01554628	T01-3623-01		SHEATH/RINSE	20 L

#### ADVIA 120 EZ KLEEN

REF	Product Number	Symbol	Contents	Amount (mL)
05101601	T01-3624-54		EZ KLEEN	4 x 810 mL
-	T01-3624-01		EZ KLEEN	810 mL

#### ADVIA 120 DEFOAMER

REF	Product Number	Symbol	Contents	Amount (mL)
09119084	T01-3625-54		DEFOAMER	4 x 125 mL
-	T01-3625-01		DEFOAMER	125 mL

### Operation

To run samples on your ADVIA 2120/2120i Hematology System, refer to the Daily Routine.

## **NOTICE**

Any modification of computer disks and/or the programs contained on such disks can adversely affect the control of instrument performance and thereby invalidate the results obtained as well as the claims that have been made regarding system performance.

In no event shall Siemens be liable for errors that are introduced by, or result from, any modification or alteration of the computer disks and/or the programs contained on such disks by the user, or for any direct or indirect consequences resulting from such modification or alteration.

## **Calculation of Results**

The system automatically performs all calculations necessary for obtaining final results.

Through the use of flagging algorithms, laboratory personnel are alerted to suspected abnormal conditions. These conditions are indicated by the appropriate flag (such as \*, +, and/or color highlighting). Whenever a flag is triggered, the user should review the results and take appropriate action.

**NOTE:** The ADVIA 2120/2120i Hematology System performs all calculations using 64-bit floating point numbers, IEEE standard, as provided by Intel processors. The number of significant digits is 14. The system rounds numbers for display to the specified number of digits in the appropriate unit set. For example, 4.674999999 becomes 4.67, 4.675 becomes 4.68. This means that certain things might appear inconsistent, such as the % diff appearing to add up to 99.9% instead of 100% or the displayed value of derived results such as HCT not appearing to be correct.

**Example:**  $HCT = RBC * MCV / 10.0$

$5.349 * 86.49 / 10 = 46.2635$  is rounded to 46.3.

The system displays the values  $5.34 * 86.4 / 10$  which equal 46.1.

## **Interpretation of Results**

System operators and laboratory supervisors are responsible for operating and maintaining Siemens products in accordance with the procedures described in the applicable Product Labeling (online documentation, package inserts, bulletins), and for determining that product performance conforms to the applicable claims.

If, under these prescribed conditions of operation and maintenance, an aberrant or abnormal result, as defined by the laboratory protocol, occurs, laboratory personnel should first make certain that the system is performing and is being operated in accordance with the Product Labeling; then follow the laboratory protocol for advising the clinician of a result that appears to have deviated from the norms established by the laboratory.



Siemens products do not make diagnoses on patients. Siemens intends its diagnostic products (systems, reagents, software, hardware) to be used to collect data reflecting the patient's chemical, hematological, or immunological status at a certain point in time. Such data must be used in conjunction with other diagnostic information and with the attending physician's evaluation of the patient's condition to arrive at a diagnosis and a clinical course of treatment.

Any malfunction of a Siemens diagnostic product (for example, failure to meet a performance specification or to perform as intended) should be appropriately addressed by laboratory personnel. Various sections of the Product Labeling address malfunctions and their possible effect on results.

## Waste Disposal Requirements

Laws and regulations enacted to protect the environment and to encourage resource conservation require the disposal of hazardous and biohazardous wastes in a specified manner. Some of the wastes from the ADVIA 2120/2120i Hematology System can be classified as hazardous or biohazardous wastes. It is essential that the laboratory take appropriate steps to determine the laws and regulations applicable to their disposal and to effect compliance. If it is necessary to sample instrument effluent in order to evaluate compliance with applicable regulations, the laboratory should contact a local licensed biohazardous waste disposal firm for assistance.

The principal wastes associated with the use of the ADVIA 2120/2120i Hematology system are reagent containers, sample containers, system waste, and customer-replaceable system components. All ADVIA 2120/2120i reagent containers are manufactured of recyclable high-density polyethylene.

Sample containers with human specimens, control materials, and all reagents, should also be handled and disposed of in accordance with the prevailing regulations and guidelines of agencies with jurisdiction over the laboratory. Refer to the product label and to Material Safety Data Sheets for details concerning any special precautions related to the handling of reagents. Material Safety Data Sheets are available from Siemens.

## Waste Analysis

After running the prescribed daily wash procedure and emptying the waste container, waste was collected from an ADVIA 2120/2120i Hematology System operating in three analytical modes: CBC, CBC/diff, and CBC/diff/retic. Using the autosampler, 300 CBC analytical cycles were run on fresh, whole blood samples, followed by the daily wash cycle. The waste was thoroughly mixed and samples were sent for analysis. The process was repeated for both the CBC/diff and CBC/diff/retic analytical modes. All analysis, with the exception of dimethyl formamide (DMF) was done by Tel Labs, Blessington, Ireland.

**NOTE:** For waste management purposes, the system generates approximately 23 mL of waste during a typical CBC/diff/retic cycle, including SHEATH/RINSE.

Concentrations are mg/L (ppm) unless otherwise noted.

< indicates that the concentration is below the limit of detection.

\* indicates a calculated concentration

<b>Analyte</b>	<b>CBC</b>	<b>CBC/Diff</b>	<b>CBC/Diff/Retic</b>
pH	8.5	7.7	7.4
Phosphate as P	460	530	500
Chloride	5445	4268	4273
Barium	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01
Arsenic	<0.01	<0.01	<0.01
Selenium	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001
Nickel	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01
Zinc	0.05	0.05	0.09
Cadmium	<0.005	<0.005	<0.005
Copper	0.02	0.01	0.01
Lead	<0.01	<0.01	<0.01
TOC (g/dL)	0.2	2.1	1.6
Cyanide	2.38	0.33	<0.05
Formaldehyde *	0	896	720
adsorbable organic halide	0.59	1.97	2.32
purgeable organic halide (mg/dL of Cl)	0.52	1.03	2.52
DMF			269

DMF was calculated by Siemens based on the dilution of the autoRETIC reagent in the system waste.

### **Volatile Organic Compounds in System Waste**

Concentrations are µg/L (ppb) unless otherwise noted.

< indicates that the concentration is below the limit of detection.

<b>Determinand</b>	<b>CBC</b>	<b>CBC/Diff</b>	<b>CBC/Diff/Retic</b>
Dichloromethane	<25	<25	<25

<b>Determinand</b>	<b>CBC</b>	<b>CBC/Diff</b>	<b>CBC/Diff/Retic</b>
Chloroform	3	2	27
1,1,1 - Trichloroethane	<5	<5	<5
Carbon tetrachloride	<1	<1	<1
Benzene	<1	<1	<1
1,2 - Dichloroethane	<1	<1	<1
Trichloroethene	<1	<1	<1
Bromodichloromethane	<1	<1	<1
Dibromochloromethane	<1	<1	<1
1,1,2,2 - Tetrachloroethane	<1	<1	<1
Toluene	<1	<1	<1
Freon - 113	<1	<1	<1
Tetrachloroethene	<1	<1	<1
Chlorobenzene	15	5	3
Ethylbenzene	<1	<1	<1
m/p Xylenes	<1	<1	<1
o Xylene	<1	<1	<1
Hexachlorobutadiene	<1	<1	<1
4-Chlorotoluene	<1	<1	<1
2-Chlorotoluene	<1	<1	<1
Isopropyl benzene	<1	<1	<1
Bromoform	<1	<1	<1
Styrene	<1	<1	<1
1,3,5 -Trichlorobenzene	<1	<1	<1
1,2,3 -Trichlorobenzene	<1	<1	<1
1,2,4 -Trichlorobenzene	<1	<1	<1
1,2 - Dichlorobenzene	16	4	2
1,3 - Dichlorobenzene	<1	<1	<1
1,4 - Dichlorobenzene	14	4	2
alpha Methyl styrene	<1	<1	<1

Determinand	CBC	CBC/Diff	CBC/Diff/Retic
1,1 - Dichloroethane	<1	<1	<1
1,1,2 - Trichloroethane	<1	<1	<1
1,1 - Dichloroethene	<1	<1	<1
trans 1,2 - Dichloroethene	<1	<1	<1
cis 1,2 - Dichloroethene	<1	<1	<1
Tert-butyl methyl ether	<1	<1	<1
Vinyl chloride	<25	<25	<25
Methyl methacrylate	<5	<5	<5
Freon-11	<25	<25	<25

### System Method Information

The method information provided for the Reticulocyte Count (RETIC) method, the Complete Blood Count (CBC) method, and the Differential (DIFF) method is consistent with the recommendations described in CLSI Document M29-A3 and by the United States Food and Drug Administration in Title 21 Code of Federal Regulations.

A laboratory procedure manual is mandatory for good laboratory practice and regulatory compliance. To aid in the preparation of a laboratory procedure manual, refer to the cross-reference that compares the organization of our method information with the guidelines for Clinical Laboratory Procedure Manuals (formerly NCCLS) in *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline - Third Edition*. 2005. CLSI Document M29-A3.

Siemens Method information is presented in a consistent format organized into the following categories or section headings:

Intended Use

Principles of the Procedure

Reagents

Storage and Stability

Sample Handling

Materials Required but not Provided

Procedure

Quality Control

Gain Adjustment

Calibration

Results

Limitations of the Procedure

Expected Values

Performance Characteristics

Available from the National Committee for Clinical Laboratory Standards, 940 West Valley Road, Suite 1400, Wayne, PA, 19087-1898

### **System Method Information: Intended Use**

This topic contains a brief statement of intended use for the assay as an *in vitro* diagnostic procedure for quantitating analytes in human whole blood.

### **System Method Information: Principles of the Procedure**

This topic provides a physical, chemical, and/or biological explanation of the assay and a brief description of the reactions, where applicable.

### **System Method Information: Reagents**

These topics describe the reagents required to perform the assay including reagent packaging information, product descriptions, materials required but not provided, and reagent preparation instructions.

The following briefly explains the significance of signal words used throughout these topics:

#### **CAUTION!**

Indicates a hazard that could cause illness, burns, skin reactions, and so on. This hazard is assigned to substances such as diluted acids, mild caustics, minor skin irritants, or combustible materials.

#### **ATTENTION**

Indicates that a specific risk exists to the user or performance.

#### **NOTE**

Indicates additional information that is useful for the proper operation of the system.

**NOTE:** The customer must maintain a constant awareness of the hazards and warnings associated with all reagents. Where necessary, appropriate safety equipment should be used (e.g., eye protection, gloves, lab coats). Users should follow the handling and safety precautions specified in the Material Safety Data Sheets available from Siemens.

### **Reagent and Calibrator Preparation**

Reagents and calibrators are ready-to-use and require no preparation.

## **System Method Information: Storage and Stability**

Reagent and calibrator storage and expiration dates are printed on the product label. When stored unopened these products are stable through the last day of the month stated in the expiration date, unless stated otherwise.

## **System Method Information: Sample Handling**

Whole blood specimens whose parameter values exceed the analytical range may be diluted with autologous plasma or isotonic saline and reassayed unless stated otherwise in the method-specific information.

## **System Method Information: Materials Required but not Provided**

This topic lists the additional materials, other than the reagents, that are required to perform the methods.

## **System Method Information: Procedure**

For general operating instructions, refer to the Daily Routine.

## **System Method Information: Quality Control**

This section specifies recommended quality control material and quality control frequency for the individual method. In general, Siemens recommends that ADVIA 2120/2120i Hematology Systems be monitored using the ADVIA TESTpoint Hematology Controls (Low, Normal, and High) and ADVIA TESTpoint Reticulocyte Control (Low and High). Please refer to page 5 for product descriptions.

Control materials should be assayed at the beginning of each shift or at some other interval chosen by the laboratory, after a reagent lot number change, and after replacement of any part or component of the analytical module that may affect analytical performance.

The laboratory must evaluate all control results before reporting patient results. If control results fail to meet the laboratory's established criteria for acceptability, all patient test results obtained in the unacceptable test run must be evaluated to determine if patient test results were adversely affected. The laboratory should take and document appropriate corrective actions, which may include recalibration and reassaying of patient samples, before reporting patient results.

## **System Method Information: Gain Adjustment**


The gain adjustment procedure is used to adjust the amplification of signals in a channel to properly position the cell signatures within a cytogram.

### **Materials Required for Adjusting Gains**

- **Whole Blood**
- **ADVIA 120 OPTIPOINT**

REF	Product Number	Contents	Amount (mL)
04408568	T03-3682-54	OPTIpoint	4 x 6.0 mL
-	T03-3682-01	OPTIpoint	6.0 mL

• **ADVIA 120 SETpoint Calibrator**

REF	Product Number	Symbol	Contents	Amount (mL)
09170071	T03-3685-52		Hematology Calibrator	2 x 6.1 mL
-	T03-3685-01		Hematology Calibrator	6.1 mL

### System Method Information: Calibration

This topic specifies the calibration type, frequency, and procedure for each method and identifies the calibration material to be used, where appropriate.

#### Calibration Procedure

The system must be calibrated for all parameters except % Retics. Siemens recommends the use of ADVIA SETpoint Calibrator (Prod.No. T03-3685-01).

Calibration should be performed in each of the following cases:

- Upon installation of the system.
- If there is a significant shift in control values after the replacement of a critical hardware component or reagent lot, after checking gains.
- Anytime control results and/or moving averages are out of range and it has been verified that the out-of-control condition is instrument-related.

### System Method Information: Results

This topic describes expected flags or messages associated with analytical results.

### System Method Information: Limitations of the Procedure

This topic describes substances, conditions, and patient states that have been reported to cause actual or apparent changes in the analytical results.

Siemens makes every effort to identify in the Troubleshooting, Maintenance, and Bibliography topics of the Product Labeling, the potential effects caused by instruments, reagents, or endogenous substances, including known interferences on patient results. However, it is impossible to provide information that would be applicable to every clinical situation. This information is provided in lieu of attempting to define the need for additional testing which involves medical judgement in individual cases. The decision whether or not to report a diagnostic result rests with the laboratory.

## **System Method Information: Expected Values**

Ranges of expected values can vary depending on age, sex, diet, location, etc; therefore, it is recommended that each laboratory establish its own range of expected values.

## **System Method Information: Performance Characteristics**

These topics provide technical information related to method performance characteristics, including imprecision, correlation data, analytical range, and carryover.

A description of each statistical parameter and the protocol followed to compute that parameter are as follows:

### **Imprecision**

Imprecision is defined as the degree of variability among repeated measurements of the same sample.

Within-run imprecision refers to the reproducibility of the method when samples are assayed within a single run.

The imprecision values for each method, described on each of their respective Method Sheets, are point estimates of average imprecision that can be expected on the system. Because this is a point estimate, any single system tested with a similar protocol could yield a different estimate of imprecision and yet not be significantly different from the published average imprecision.

### **Correlation Data**

Correlation data were determined using human whole blood samples by comparing the performance of the ADVIA 120 Hematology System with the performance of a reference method or a comparative system, where applicable.

Regression statistics were computed using a protocol similar to that recommended in the CLSI Document M29-A3, *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline - Third Edition*. 2005.

Regression data in each method indicate the linear least squares fit between the ADVIA 120 Hematology System (**y**) and the comparative system/method (**x**), unless noted otherwise.

### **Carryover**

This topic lists the sample carryover for the ADVIA 120 Hematology System.

### **Analytical Range**

This topic describes the concentration range across which acceptable results can be obtained from the method.

Some specimens may exceed the range of the method and produce error flags or messages.



## CLSI Document M29-A3 and Siemens Method Topics Cross Reference

CLSI Approved Guideline M29-A3		Siemens Method Topics
<b>5.1.2</b>	<b>Title</b>	
5.1.2.1	Title	
5.1.2.2	Type of Specimen	Intended Use
5.1.2.3	Method or instrumentation in subtitle	Intended Use
<b>5.1.3</b>	<b>Principle</b>	
5.1.3.1	Type of reaction(s) involved	Principles of the Procedure
5.1.3.2	Clinical reasons for performing the test	Intended Use
<b>5.1.4</b>	<b>Specimen</b>	
5.1.4.1	State the conditions for patient preparation	Sample Handling / Limitations of the Procedure
5.1.4.2	Type of specimen	Intended Use / Sample Handling
5.1.4.3	Special handling conditions	Sample Handling
<b>5.1.5</b>	<b>Reagents</b>	
5.1.5.1	List reagents, supplies, and equipment	Reagents
5.1.5.2	Directions for preparation	Reagents
5.1.5.3	Parameters used to determine acceptable reagent performance	Storage and Stability / Quality Control
5.1.5.4	Storage requirements	Storage and Stability
<b>5.1.6</b>	<b>Calibration</b>	
5.1.6.1	Standard preparation	Not applicable
5.1.6.2	Calibration procedure	Calibration
<b>5.1.7</b>	<b>Quality Control</b>	
5.1.7.1	Identify control materials to be used	Quality Control

<b>CLSI Approved Guideline M29-A3</b>		<b>Siemens Method Topics</b>
5.1.7.2	Instructions for preparing and handling control materials	Control Package Insert
5.1.7.3	Control frequency	Quality Control
5.1.7.4	Description of control tolerance limits	Control Package Insert
5.1.7.5	Corrective actions to be taken when limits are exceeded	According to Individual Laboratory Practice
5.1.7.6	How QC data are recorded and stored	Quality Control / According to Individual Laboratory Practice
5.1.7.7	If no controls are available, list alternatives	Quality Control, if applicable
<b>5.1.8</b>	<b>Procedure - Stepwise</b>	
5.1.8.1	Detailed stepwise instructions	Procedure
5.1.8.2	Centrifugation requirements	Not applicable
5.1.8.3	Specify special glassware	Not applicable
5.1.8.4	Specify the following for photometric measurements:	
	Type of instrument	Not applicable
	Wavelength	
	Cuvette size	
	Solution used as a blank	Procedure
	Linearity	Performance Characteristics
	How the raw data are read	Calculations
	Allowable time intervals	Not applicable
	Stability of final solution	Not applicable
<b>5.1.9</b>	<b>Calculations</b>	
5.1.9.1	Give stepwise instructions	Calculations

<b>CLSI Approved Guideline M29-A3</b>		<b>Siemens Method Topics</b>
5.1.9.2	Give the equation	Calculations
5.1.9.3	Give an example	Calculations
<b>5.1.10</b>	<b>Reporting results</b>	
5.1.10.1	State reference ranges	Expected Values
5.1.10.2	Identify procedures to be used in reporting results to the physician	According to Individual Laboratory Practice
5.1.10.3	Guidelines on acceptable reporting format	Results / According to Individual Laboratory Practice
<b>5.1.11</b>	<b>Procedure Notes</b>	
5.1.11.1	Explain reasons for special precautions	Sample Handling / Limitations
5.1.11.2	List possible sources of error	Sample Handling / Limitations
5.1.11.3	Include helpful hints	Procedure
5.1.11.4	Clinical situations that may influence test validity	Sample Handling / Limitations
5.1.11.5	Acceptable alternative procedures, expected differences	Performance Characteristics
5.1.11.6	Enlarge upon clinical applications	According to Individual Laboratory Practice
<b>5.1.12</b>	<b>Limitation of Procedure</b>	
5.1.12.1	State linearity and/or detection limits	Performance Characteristics
5.1.12.2	State known interfering substances	Interfering Substances / Performance Characteristics
<b>5.1.13</b>	<b>Bibliography</b>	
5.1.13.1	Literature references	Bibliography

### CLSI Approved Guideline M29-A3

### Siemens Method Topics

5.1.13.2	Manufacturer product literature	To obtain the version of the online documentation, click <b>Options</b> on the menu bar of the help window, and then click <b>Version</b> .
5.1.13.3	Textbooks	
5.1.13.4	Standard Publications	
5.1.13.5	Written personal communications	
5.1.13.6	Research including supporting data for validation of methods	

## CBC Method

### Intended Use

The ADVIA 2120/2120i Hematology System Complete Blood Count (CBC) method is intended to quantitatively measure the following hematological parameters:

White Blood Cell count (WBC)

Red Blood Cell count (RBC)

Hemoglobin concentration (HGB)

Hematocrit (HCT)

Mean Corpuscular Volume (MCV)

Mean Corpuscular Hemoglobin (MCH)

Mean Corpuscular Hemoglobin Concentration (MCHC)

Corpuscular Hemoglobin Concentration Mean (CHCM)

Cellular Hemoglobin Content (CH)

Red Cell Volume Distribution Width (RDW)

Hemoglobin Concentration Distribution Width (HDW)

Platelet Count (PLT)

Mean Platelet Volume (MPV)

## Principles of the Procedure

### WBC Count

The whole blood sample is mixed with ADVIA 120 BASO reagent that contains acid and surfactant. The red cells are hemolyzed, and the white blood cells are then analyzed using 2 angle laser light scatter signals.

### Bibliography

Cremins J and Orlik J: Leukocyte differential method. US Patent 5,518,928 (1996)

### RBC / Platelet Count

Both red blood cells and platelets are analyzed by a single optical cytometer after appropriate dilution of the blood sample with ADVIA 120 RBC/PLT reagent. The red blood cells are isovolumetrically sphered and lightly fixed with glutaraldehyde to preserve the spherical shape. Red cells and platelets are counted from the signals from a common detector with 2 different gain settings.

On the ADVIA 2120/2120i Hematology system the platelet signals are amplified considerably more than the RBC signals. Coincidence correction is made to each of the counts so that accurate counts are made over a wide range of each cell type.

### Bibliography

Kim YR and Ornstein L: Isovolumetric sphering of erythrocytes for more accurate and precise cell volume measurement by flow cytometry. *Cytometry* 3(b):419-427 (1983)

Zelmanovic, *et al*: US Patent pending

### RBC / Platelet Size

The method of sizing red cells and platelets uses the simultaneous measurement of laser light scattered at 2 different angular intervals, which eliminates the adverse effect of variation in cellular hemoglobin concentration on the determination of cell volume.

### Bibliography

Kerker M: The Scattering of Light and Other Electromagnetic Radiation. Academic, New York, NY, Chapter 3 (1969)

Groner W and Tycko DH: Characterizing blood cells by biophysical measurements in flow. *Blood Cells* 6:141-157 (1980)

## Hemoglobin Concentration

The hemoglobin method is a modification of the manual cyanmethemoglobin method developed by the International Committee for Standardization in Hematology (ICSH).

### Bibliography

ICSH Recommendations for Reference Method for Hemoglobinometry in Human Blood, ICSH Standard EP 6/2 (1977)

Specifications for international hemoglobincyanide reference preparation ICSH Standard EP 6/e (1977). *J Clin Pathol* **31**:139 (1978)

### Indices

The red cell indices MCH and MCHC are derived from the mathematical calculation of the RBC count, the total hemoglobin, and the MCV determination.

The HCT value is calculated from the RBC count and the MCV.

The RDW and HDW values are calculated from the cell-by-cell measurement of cell volume and hemoglobin concentration.

The CH represents the mean of the cell hemoglobin content histogram.

The CHCM is calculated as the mean of the RBC hemoglobin concentration histogram.

### Bibliography

Wintrobe MM: The size and hemoglobin content of the erythrocyte. *J Lab Clin Med* **17**:899-911 (1932)





Bessman JD: What's an %RDW? *Am J Clin Pathol* **76**:242 (1981)

Mohandas N, *et al*: Accurate and independent measurement of volume and hemoglobin concentration of individual red cells by laser light scattering. *Blood* **68**:506-513 (1986)

### Reagents

The following ready-to-use reagents are required to perform the CBC method and maintain the ADVIA 2120/2120i Hematology System. You must use either the CBC TIMEPAC or the CN-FREE CBC TIMEPAC along with the SHEATH/RINSE.

#### ADVIA 120 CBC TIMEPAC

REF	Product Number	Symbol	Contents	Amount (mL)
09826813	T01-3620-52		CBC TIMEPAC	
-	T01-3625-01		DEFOAMER	1 x 75 mL
-	T01-3627-01		RBC/PLT	2 x 2700 mL
-	T01-3628-01		HGB	2 x 1100 mL
-	T01-3629-01		BASO	2 x 1100 mL

#### ADVIA 120 CN-FREE CBC TIMEPAC

REF	Product Number	Symbol	Contents	Amount (mL)
08008297	T01-3626-52		CN-FREE CBC TIMEPAC	
-	T01-3625-01		DEFOAMER	1 x 75 mL

REF	Product Number	Symbol	Contents	Amount (mL)
-	T01-3627-01	RBC/PLT	RBC/PLT	2 x 2700 mL
-	T01-3629-01	BASO	BASO	2 x 1100 mL
-	T01-4288-01	HGB	CN-FREE HGB	2 x 1100 mL

#### ADVIA 120 SHEATH/RINSE

REF	Product Number	Symbol	Contents	Amount (L)
02337140	T01-3664-01	SHEATH/RINSE	SHEATH/RINSE	10 L
01554628	T01-3623-01	SHEATH/RINSE	SHEATH/RINSE	20 L

#### ADVIA 120 DEFOAMER

(PN T01-3625-01) 1 x 75 mL

ADVIA 120 DEFOAMER contains:

Silicone emulsion, 100%

Shake before use.

For *in vitro* diagnostic use.

#### ADVIA 120 RBC / PLT

(PN T01-3627-01) 2 x 2700 mL

ADVIA 120 RBC/PLT contains:

Sodium dodecyl sulfate, 0.035 mmol/L

Disodium EDTA dihydrate, 4.03 mmol/L

Tetrasodium EDTA dihydrate, 3.36 mmol/L

Sodium chloride, 109.3 mmol/L

Glutaraldehyde, 0.11%

Buffer

For *in vitro* diagnostic use.

### **ADVIA 120 HGB**

(PN T01-3628-01) 2 x 1100 mL

ADVIA 120 HGB contains:

Potassium cyanide, 23 mmol/L

Dimethyl laurylamine oxide, 2.0%



#### **HARMFUL!**

R20/21/22  
S24/25, S29, S36/37, S45

Harmful by inhalation, in contact with skin, and if swallowed. Avoid contact with skin and eyes. Wear suitable protective clothing and gloves. In case of accident, or if you feel unwell, seek medical advice immediately (show the label where possible). Do not empty into drains.

For *in vitro* diagnostic use.

### **ADVIA 120 BASO**

(PN T01-3629-01) 2 x 1100 mL

ADVIA 120 BASO contains

Hydrochloric acid, 9.00 mmol/L

Phthalic acid, 21.49 mmol/L

Preservative

Surfactant

For *in vitro* diagnostic use.

### **ADVIA 120 CN-FREE HGB**

(PN T01-4288-01) 2 x 1100 mL

ADVIA 120 CN-FREE HGB contains:

Dimethyl laurylamine oxide, 2.0%

For *in vitro* diagnostic use.

### **ADVIA 120 SHEATH / RINSE**

(PN T01-3664-01) 1 x 10 L

(PN T01-3623-01) 1 x 20 L

ADVIA 120 SHEATH/RINSE contains:

Preservatives

Buffers

Surfactant



For *in vitro* diagnostic use.

## **Storage and Stability**

### **Reagents**

When stored between 15°C and 30°C:

- All unopened reagents are stable until the expiration date printed on the product label.
- Opened containers of ADVIA 120 BASO reagent, ADVIA 120 HGB reagent, and DEFOAMER are stable for 90 days.
- Opened containers of ADVIA 120 SHEATH/RINSE and ADVIA 120 RBC/PLT reagent are stable for 45 days.

Protect product from freezing.

When stored at 2°C to 8°C, unopened ADVIA OPTIpoint (PN T03-3682-01), ADVIA SETpoint Calibrator (PN T03-3685-01), and ADVIA TESTpoint Hematology Controls (PN T03-3686-01, Low; T03-3687-01, Normal; and T03-3688-01, High, respectively) are stable until the last day of the month of the expiration date printed on the product label unless stated otherwise.

After being opened, ADVIA OPTIpoint is stable for 7 days, ADVIA TESTpoint Hematology Controls are stable for 10 days, and the ADVIA SETpoint Calibrator is stable for 5 days, when stored closed in their original containers at 2°C to 8°C.

### **Gain Adjustment**

The gain adjustment procedure is used to adjust the amplification signals in a channel to properly position the cell signatures within a cytogram.

### **Calibration**

The system must be calibrated for all parameters except %RETIC. Siemens recommends the use of the ADVIA SETpoint Calibrator (PN T03-3685-01).

Calibration procedure should be performed:

- Upon installation of the system.
- If there is a significant shift in control values after the replacement of a critical hardware component or reagent lot, after checking gains.
- Anytime control results and/or moving averages are out of range and it has been verified that the out-of-control condition is instrument-related.

## Sample Handling

### Sample Collection

Collect whole blood in an evacuated blood collection tube containing EDTA as an anticoagulant. Blood samples should be refrigerated at a temperature between 2°C to 8°C if they will not be analyzed within eight (8) hours of phlebotomy. If a specimen has been refrigerated, allow it to equilibrate slowly to room temperature (15°C to 30°C) before mixing.

### Sample Dilution

Whole blood specimens whose parameter values exceed the analytical range may be diluted with autologous plasma or isotonic saline and reassayed.

### Sample Stability

The effect of the aging of blood was studied over a 72-hour period on the ADVIA 120 Hematology System.

Two whole-blood specimens drawn from 15 normal, apparently healthy donors were assayed shortly after phlebotomy and then again at intervals of 8, 24, 36, 48, 56, and 72 hours.

One of the whole-blood specimens from each pair was stored at room temperature while the corresponding specimen was stored at 2°C to 8°C in capped blood-collection tubes that contained EDTA as the anticoagulant.

The results indicate that CBC parameters are stable within two (2) standard deviations (within run precision) of the initial recovery for the specified time interval. The stability of the calculated parameters is limited to the stability of the least stable primary parameter.

Parameter	Room Temperature Stability (hours)	Refrigerated Temperature Stability (hours)
WBC ( $10^3/\mu\text{L}$ )	36	56
RBC ( $10^6/\mu\text{L}$ )	48	72
HGB (g/dL)	72	72
MCV (fL)	8	24
CH (pg)	36	53
CHCM (g/dL)	8	24
RDW (%)	72	72
HDW (g/dL)	72	72
PLT ( $10^3/\mu\text{L}$ )	48	48
MPV (fL)	8	8

## **Materials Required but not Provided**

For the ADVIA 2120/2120i Hematology System, the other materials required to perform the ADVIA 2120/2120i CBC method are the various control materials, calibrators, ADVIA OPTIpoint, and other reagents or equipment specified in the "Methods Introduction" section.

## **Procedure**

To run samples on your ADVIA 2120/2120i Hematology System, refer to the Daily Routine.

## **Quality Control**

It is recommended that the system be controlled using ADVIA TESTpoint Hematology Controls. Please refer to page 5 for product descriptions. These controls are intended to be integrated into a clinical laboratory's own quality control program and procedures.

Control materials should be assayed:

- At the beginning of each shift or at some other interval chosen by the laboratory.
- After a reagent lot number change.
- After replacement of any part or component of the analytical module that may affect analytical performance.

As an option, laboratories may run a retained patient sample periodically to monitor performance trends.

## **Results**

The ADVIA 2120/2120i Hematology System automatically performs all calculations necessary for obtaining final results.

Through the use of flagging algorithms, laboratory personnel are alerted to suspected abnormal conditions. These conditions are indicated by the appropriate flag (such as \*, +, and/or color highlighting). Whenever a flag is triggered, the user should review the results and take appropriate action.

## Limitations of the Procedure

The limitations of the procedure are as listed:

1. Some irreversibly sickled cells that occur in cases of sickle cell anemia may not completely sphere in the system, resulting in an elevated RDW and therefore an underestimation of the MCV. Sickled cells may cause erroneous results in other RBC parameters.
2. Very high WBC counts ( $>200 \times 10^3$  cells/ $\mu\text{L}$ ) elevate the red blood cell count.
3. Samples with cold agglutinins may falsely lower the red blood cell count.
4. Samples with high WBC counts ( $>60 \times 10^3$  cells/ $\mu\text{L}$ ), or platelet clumps, and neonatal samples may interfere with the hemoglobin determination.
5. Samples with extreme lipemia, chylomicrons, or extremely high bilirubin might interfere with and elevate the hemoglobin results obtained from the hemoglobin method, including the MCHC.

Since these interferences do not affect the cell-by-cell hemoglobin concentration values obtained from the RBC method, the CHCM values are unaffected. If the MCHC and CHCM differ by more than 1.9 g/dL, a "Comparison Error" system flag alerts the operator to this condition.

6. Patient specimens with nucleated RBCs (particularly neonate specimens) may falsely elevate the WBC count. When manually correcting the WBC count for the presence of NRBCs, use the WBCB count.
7. Samples from patients receiving total parenteral nutrition (TPN) including high lipid dosage may exhibit falsely elevated platelet counts. These samples can include lipid droplets that appear in the platelet counting region, thus elevating the platelet count.

## Expected Values

The range of expected values can vary depending on age, sex, diet, and location. It is recommended that each laboratory establish its own range of expected values.

The following range of expected values is based upon the duplicate assay of 60 whole-blood specimens obtained from an adult population of assumed healthy individuals.

Parameter	Low Value	High Value
WBC ( $10^3/\mu\text{L}$ )	3.8	8.6
RBC ( $10^6/\mu\text{L}$ )	4.1	6.0
HGB (g/dL)	10	16
HCT (%)	33	57

<b>Parameter</b>	<b>Low Value</b>	<b>High Value</b>
MCV (fL)	76	100
MCH (pg)	24	31
MCHC (g/dL)	28	34
CH (pg)	24	35
CHCM (g/dL)	29	34
RDW (%)	12	15
HDW (g/dL)	1.9	3.0
PLT ( $10^3/\mu\text{L}$ )	140	360
MPV (fL)	7	9

### **Performance Characteristics: Imprecision**

A total of 18 runs were performed using multiple samples.

The following estimates of imprecision were obtained by taking 25 aspirations from each whole-blood sample. Each of the sample selectivity modes was tested by sampling from opened tubes, and with the manual and automated closed-tube samplers.

<b>Parameter</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>CV (%)</b>
WBC ( $10^3/\mu\text{L}$ )	5.91	0.16	2.7
RBC ( $10^6/\mu\text{L}$ )	4.82	0.05	1.0
HGB (g/dL)	13.3	0.11	0.8
MCV (fL)	81.0	0.3	0.4
CH (pg)	26.5	0.05	0.2
CHCM (g/dL)	30.6	0.14	0.5
RDW (%)	12.3	0.07	0.6
HDW (g/dL)	2.56	0.02	0.8
PLT ( $10^3/\mu\text{L}$ )	256	6.9	2.7
MPV (fL)	8.1	0.11	1.4

### **Performance Characteristics: Correlation Data**

The performance of the ADVIA 120 Hematology System was compared with the performance of the Technicon H•3 RTC System (x) using whole blood from 60 normal donors and 70 hospital donors with each sample run in duplicate (n = 260).

The following Regression statistics were computed using a protocol similar to that recommended in the NCCLS document EP9-A, *Method Comparison and Bias Estimation Using Patient Samples*; Approved Guideline (1995).

Parameter	Comparative System or Method	Regression Equation (y=)	r	Sy.x
WBC (10 <sup>3</sup> /μL)	Technicon H•3 RTC	1.06x - 0.74	0.997	1.42
RBC (10 <sup>6</sup> /μL)	Technicon H•3 RTC	0.98x + 0.11	0.997	0.07
HGB (g/dL)	Technicon H•3 RTC	1.01x - 0.2	0.997	0.2
MCV (fL)	Technicon H•3 RTC	0.90x + 9.6	0.994	1.1
CH (pg)	Technicon H•3 RTC	1.00x + 1.2	0.990	0.6
CHCM (g/dL)	Technicon H•3 RTC	1.17x - 6.5	0.974	0.5
RDW (%)	Technicon H•3 RTC	0.86x + 1.3	0.980	0.6
HDW (g/dL)	Technicon H•3 RTC	0.98x + 0.06	0.959	0.13
PLT (10 <sup>3</sup> /μL)	Technicon H•3 RTC	1.08x - 2.0	0.991	27
MPV (fL)	Technicon H•3 RTC	0.76x + 0.9	0.925	0.4

x = Technicon H•3 RTC system

y = ADVIA 120 Hematology system

### Performance Characteristics: Carryover

Sample carryover for the ADVIA 120 Hematology System was measured for WBC, RBC, HGB, and PLT. The performance specification for carryover is ≤ 1% for all parameters.

Carryover was evaluated on the ADVIA 120 Hematology System by the aspiration of a high pool prepared for linearity testing, followed by 3 aspirations of cell-free plasma. Percent carryover was calculated as:

$$\% \text{ Carryover} = [(L1 - L3) / H] \times 100$$

L1 = the count for the first aspiration of cell-free plasma

L3 = the count for the third aspiration of cell-free plasma

H = the count from the high pool

The following results were obtained:

Parameter	Observed Carryover
WBC	0.4%
RBC	0.2%
HGB	0.2%

PLT 0.1%

### Performance Characteristics: Analytical Range

The analytical range for the ADVIA 2120/2120i Hematology System was established by making serial dilutions of samples specially prepared to have high analyte values. Multiple assays of the specially prepared pools were performed on the system.

Parameter	Range Evaluated	Maximum Observed Deviation
WBC ( $10^3/\mu\text{L}$ )	0.02 to 21.83	$0.46 \times 10^3/\mu\text{L}$
	20.48 to 409.55	4.1%
RBC ( $10^6/\mu\text{L}$ )	0.0 to 2.65	$0.03 \times 10^6/\mu\text{L}$
	2.65 to 6.76	1.1%
HGB (g/dL)	0.0 to 8.6	0.2 g/dL
	8.6 to 22.5	2.5%
PLT ( $10^3/\mu\text{L}$ )	5 to 208	$10 \times 10^3/\mu\text{L}$
	205 to 3983	4.9%

## CSF Method

### Intended Use

The ADVIA 2120/2120i Hematology Cerebrospinal Fluid (CSF) assay is intended for *in vitro* diagnostic use in the quantitative determination of blood cells in cerebrospinal fluid (CSF) specimens. The CSF assay provides leukocyte (CSF WBC) and erythrocyte (CSF RBC) counts as well as absolute and percentage counts for the CSF WBC differential. To arrive at a diagnosis and a course of treatment, results from the CSF assay should be used in conjunction with other diagnostic information and the attending health-care professional's evaluation of the patient's condition.

### Principles of the Procedure

Hematological analysis of CSF specimens has historically been performed in laboratories using manual cell counting and differentiation methods. Blood cells in normal CSF samples are usually present in very low numbers. The WBC count can provide important clinical information for the differential diagnosis of various cerebral diseases. The WBC count in CSF is used in the diagnosis of bacterial meningitis, differential diagnosis of viral and fungal meningitis, encephalitis, neurological disorders, the diagnosis of leukemias with CSF involvement, and for monitoring patient therapy for leukemias and lymphomas. An elevated WBC count with increased proportions of polymorphonuclear cells is usually an indication of bacterial meningitis. In viral meningoencephalitis, the cell counts may be lower with a predominance of mononuclear cells. An unusually elevated RBC count can be an indication of cerebral hemorrhage or a traumatic spinal tap.

The ADVIA 120 CSF assay provides a rapid, automated analysis of CSF samples by counting and distinguishing certain cell types. When using the ADVIA 120 CSF assay, the CSF sample is mixed with ADVIA 120 CSF reagent, which spheres and fixes the cells. After a minimum 4-minute to 4-hour incubation period, the prepared sample is then aspirated directly into the ADVIA 120 system. The cells are then detected and enumerated based on light scatter and absorbance measurements using the ADVIA 120 laser optics. A scatter versus scatter and scatter versus absorbance cytogram is displayed with the thresholds and results automatically calculated for each sample. Reportable parameters are WBC and RBC counts along with absolute and percentage counts for neutrophils, lymphocytes, monocytes, polymorphonuclear (PMN), and mononuclear (MN) cells. A research-use-only eosinophil count is also given.



## Bibliography

Lee GR, Bithell TC, Foerster J, Athens JW, Lukens JN. *Wintrobe's Clinical Hematology*, Ninth edition. Malverne, PA, Lea & Febiger, pp 1071, 1809, and 1812 (1993)

Werman HA, Brown CG. White blood cell count and differential count. *Emergency Medicine Clinics of North America* **4**:41-58 (1986)

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## Reagent

### ADVIA 120 CSF Reagent

REF	Product Number	Symbol	Contents	Amount (mL)
04274197	T01-4610-01		CSF Reagent	1 x 8 mL
-	T01-4611-01		CSF Reagent	8 mL

ADVIA 120 CSF Reagent contains a sphering agent and fixatives in a buffered aqueous solution. The ADVIA 120 CSF Reagent (PN T01-4610-01) contains one 8 mL bottle with sufficient reagent to analyze 25 samples or controls.

ADVIA 120 CSF Reagent contains:

Formaldehyde, 2% (Wt)

Glutaraldehyde, 0.28 % (Wt)

Buffer

Surfactants



## **HARMFUL! IRRITANT!**

R40, R43  
S36/37

Contains 2% (Wt) formaldehyde. Limited evidence of a carcinogenic effect. May cause sensitization by skin contact. Wear suitable protective clothing and gloves.

For *in vitro* diagnostic use.

## **Storage and Stability**

### **Reagents**

When stored between 18°C and 30°C:

- All unopened reagents are stable until the expiration date printed on the product label. *DO NOT FREEZE*.
- Opened containers of ADVIA 120 CSF reagent are stable for one month.
- The product should be clear, colorless, and free of visible particulate matter. Do not use if product is cloudy, discolored, or contains visible matter.

### **Controls**

When stored between 2°C and 8°C:

- When stored as directed, unopened controls are stable through the expiration date printed on the product label. *DO NOT FREEZE*.
- Opened containers are stable for 10 days.

## **Gain Adjustment**

The gain adjustment procedure is used to adjust the amplification signals in a channel to properly position the cell signatures within a cytogram. There are no CSF-specific gain adjustments required.

## **Calibration**

Calibration is not required for the CSF Assay. Accurate cell counts are derived through correct RBC gain adjustment.

## **Sample Handling**

### **Sample Dilution**

Samples may be diluted up to 1:10 [1 part sample and 9 parts phosphate buffered saline (PBS) or normal saline] before preparation with CSF reagent. Sample

## Sample Stability

CSF patient samples are not stable and should be assayed as soon as possible after collection. Siemens recommends that CSF patient samples be prepared with CSF reagent within one hour after collection. Once prepared with CSF reagent, the prepared sample is stable between 4 minutes and 4 hours when stored at 18°C – 30°C.

Prepared CSF patient samples and prepared ADVIA 120 TESTpoint CSF controls contain 1% and 1.5% formaldehyde, respectively. These should be disposed of according to local environmental regulations.

## Sample and Control Preparation

Use the following procedure to prepare CSF samples or control products for analysis on the ADVIA 2120/2120i Hematology System.

**NOTE:** The CSF Assay requires a CSF sample volume of 300 µL. Reserve sufficient sample volume for slide preparation or additional analysis if necessary. Samples with high RBC counts may require dilution prior to preparation with CSF Reagent. Phosphate buffered saline (PBS) is the preferred diluent for these samples, although normal saline may be also used. Samples diluted in normal saline should be prepared with CSF reagent immediately after dilution and will require a longer incubation period than undiluted samples or samples diluted in PBS.

1. Add 300 µL of thoroughly mixed CSF sample (patient or control) to 300 µL of CSF Reagent in a labeled glass or plastic test tube.
2. Cap and mix the prepared sample by gently inverting it 5–10 times or vortexing for 5 seconds. Care should be taken to avoid foaming.
3. Incubate it at room temperature for at least 4 minutes. Samples should be assayed within 4 hours of preparation.
4. After preparing the sample, replace the reagent cap and return any quality control materials to refrigerated storage.
5. After appropriate incubation, mix the sample again by inverting it 5–10 times or vortexing it for 5 seconds immediately before aspirating on the ADVIA 2120/2120i Hematology System. Cells in prepared CSF samples will settle quickly due to low viscosity.

## Materials Required but not Provided

For the ADVIA 2120/2120i Hematology System, the other materials required to perform the ADVIA 120 CSF method are the various control materials, calibrators, ADVIA OPTipoint, and other reagents or equipment specified in the "Methods Introduction" section.

## Procedure for Running CSF Samples

To run CSF samples on your ADVIA 120 Hematology System, perform the following procedure:

1. If the Standby indicator is lit, press the Standby button to put the system into Ready to Run mode.
2. Using the Order Entry tab, create a workorder for each CSF sample preparation to be analyzed. Include sample physical characteristics in the Ocom field and, if necessary, the dilution factor in the Dil field. Enter **CSF** as the sample type and select the **Tab** key in order to see the correct menu of tests.
3. At the Routine Operations menu, select the **Manual Sample ID** tab.
4. Select the **Cerebrospinal Fluid** button.
5. Select **Initialize** to wash the pathways and obtain a flow cell background count. After the system has completed the initialization cycle and the sample aspiration light is green, verify that background counts in the flow cell pathway are within acceptable limits. If background counts are not acceptable, perform one aspiration of a 25% bleach solution once, followed by two aspirations of distilled water or saline. The recommended values for these limits are:

**CSF R Count = 0**

**CSF PHA WBC = 0**

**CSF PHA Total <=10**

If background counts are not acceptable, perform one aspiration of a 25% bleach solution once, followed by two aspirations of distilled water or saline.

**NOTE:** The CSF Wash cycle rinses the sample pathways without performing a background count. The CSF Refresh cycle refreshes the flow cell background count without rinsing the sample pathways. The background counts are stored in the startup log.

6. Select **Primer** as the Sample Type and select **OK**. Aspirate a saline primer to verify that background counts in the sample pathway are within acceptable limits. Make sure that **Primer** displays on the status line before aspiration.
7. If background counts are acceptable, proceed to step 8. If not, perform one aspiration of a 25% bleach solution followed by three aspirations of distilled water or saline, and repeat steps 5 and 6.
8. Select the correct sample type and then enter the sample or control information in the Manual Sample ID box or scan the barcode on the sample tube. Do not use sample barcode labels with selectivities encoded in them to enter sample identifications.



**CAUTION:** Make sure the correct sample ID and sample type appears on the status line before aspirating a sample using the manual open-tube sampler.

9. After appropriate incubation, mix the sample again, either by inverting it 5-10 times or by vortexing it for 5 seconds immediately before aspiration on the ADVIA 120 Hematology System. Cells in prepared CSF samples will settle quickly due to low viscosity.

10. Aspirate the sample.
  - a. Position tube so that the sample probe is immersed into the well-mixed sample. The sample probe should not contact test tube surface, which could block the free flow of sample into the probe.
  - b. Press the aspirate plate. The sampling light flashes during aspiration. Complete sample aspiration takes approximately 6 seconds and will consume almost the entire prepared sample. Do not remove sample until sampling light has stopped flashing. There is no Probe Clog message to indicate incomplete sample aspiration in the CSF mode. Carefully observe the sample during aspiration to ensure that the sample probe is below the surface of the sample during the entire aspiration.
  - c. When the sampling light stops flashing, remove the tube.
11. When the analysis of *all* CSF samples is complete and you would like to return to whole-blood operation, select **Exit**. The system automatically returns to the Whole Blood Manual Sample ID window.

When you exit CSF operation after running at least one sample or any cycle, the system asks if you are sure you want to exit. Select **OK** to leave the Cerebrospinal Fluid (CSF) window. Select **Cancel** to keep using the CSF features.



**NOTE:** If any samples were processed or cycles run in the CSF mode, the system will perform a hydraulic exit cycle. If no samples or cycles were run in CSF mode, the system simply exits CSF mode.

 **Tip**

If a system left in CSF mode has made the transition to Standby and you want to exit CSF mode to run whole-blood samples, switch to whole-blood operation *before* exiting standby. This will reduce unnecessary reagent use.

### Quality Control

Quality control of the CSF Assay is performed using ADVIA 120 TESTpoint CSF Controls containing one each of Level 1 and Level 2 controls. These controls are intended to be integrated into a clinical laboratory's own quality control program and procedures. Follow the package insert instructions for assaying the control products.

REF	Product Number	Symbol	Contents	Amount (mL)
00872863	T03-4485-01		CSF Controls	2 x 3 mL
-	T03-4486-01		Control Level 1	3 mL
-	T03-4487-01		Control Level 2	3 mL

Control materials should be assayed:

- At the beginning of each shift or at some other interval chosen by the laboratory.

- After a reagent lot number change.
- After replacement of any part or component of the analytical module that may affect analytical performance.

**NOTE:** Moving Average calculations are not available for CSF results.

## Results

The system automatically performs all calculations necessary for obtaining results for undiluted samples (samples prepared 1:1 with CSF reagent) and displays them on the Run Screen.

ADVIA 2120/2120i results should be reviewed for conditions listed in the Limitations of the Procedure. If a sample displays any of the listed conditions, the results should be confirmed.

The results of samples that have been diluted with PBS or normal saline prior to preparation with CSF reagent must be corrected for the dilution factor. If a sample is diluted, the absolute counts should be multiplied by the dilution factor. Enter the dilution factor in the Dil. field of the Order Entry tab when creating the workorder. The results displayed in the Review \ Edit tab and printed on the final patient report will be automatically corrected by the entered dilution factor. For example, if a sample is diluted 1:5 (1 part sample and 4 parts normal saline or PBS), the absolute counts will be multiplied by 5. The differential percentages are not affected by dilution, and will not be multiplied by the dilution factor when correcting on the Review \ Edit tab. Results on the Run Screen are not corrected for the dilution factor.

The Laser Power Low (PL) system flag is enabled for CSF analysis.

High/Low flagging is provided for all CSF parameters through range definitions set in the Data Manager.

## Limitations of the Procedure

The limitations of the procedure are as listed:

1. CSF WBC percent differential results for samples with WBC counts less than 20 cells/ $\mu$ L should be confirmed using an alternate method.
2. The ADVIA 120 CSF Assay can accurately analyze samples with up to 1500 RBC/ $\mu$ L. Samples that are suspected of containing greater than 1500 RBC/ $\mu$ L may be diluted up to 1:10 with PBS.
3. The ADVIA 2120/2120i Hematology System provides no morphology flagging to indicate the presence of abnormal cells in the CSF Assay. Only High / Low flagging and the Laser Power Low system flag are enabled for the CSF Assay.
4. Improper sample handling or failure to review CSF cytograms for possible interferences/analysis artifacts may produce erroneous results. Examples of improper sample handling include, but are not limited to:
  - ◆ Inadequate mixing of CSF patient sample or prepared sample before

aspiration on the ADVIA 120

- ◆ Incomplete sample aspiration on the ADVIA 120
- ◆ Incomplete incubation time
- Samples with total protein content 500 – 1000 mg/dL should be analyzed within 1 hour after preparation with CSF reagent. Increased protein concentrations may cause precipitation of cells and proteins in the prepared sample.
- The ADVIA 120 CSF RBC count provides no information to distinguish between elevated CSF RBC counts due to cerebral hemorrhage or traumatic spinal tap.

### Interfering Substances

- Samples containing oily or fatty contaminants may interfere with the ADVIA 120 cell counts. Avoid oily contaminants, such as silicon used to lubricate the stoppers of blood collection tubes.
- RBC coincidence events in samples with RBC counts greater than 1500 cells/ $\mu$ L may cause falsely elevated CSF WBC counts and incorrect CSF WBC differentials. Such a sample should be diluted to acceptable RBC limits in PBS before preparation with CSF Reagent and reanalyzed.
- RBCs in samples that have been diluted with normal saline before preparation with CSF reagent require a longer incubation period to sphere the RBCs in the sample. The preferred diluent for CSF samples is PBS. Samples diluted with normal saline must be prepared with CSF reagent immediately after dilution and must be incubated for 10 minutes in order to allow complete RBC sphering.
- Samples containing microcytic and/or hypochromic RBC populations may falsely decrease the CSF RBC count.
- Samples containing RBC populations that fail to sphere completely may give falsely elevated CSF WBC counts and incorrect CSF WBC Differentials.
- Budding yeast forms may overlay both CSF RBC and CSF WBC counting areas, falsely elevating CSF RBC and WBC counts.

### Expected Values

The range of expected values for the CSF Assay can vary depending on patient age or other patient characteristics. It is recommended that each laboratory establish its own range of expected values based on their patient population. The following range of expected values is based on ADVIA 120 results from 52 CSF specimens that were determined to be normal by manual methods.

Parameter	Expected Value
WBC (cells/ $\mu$ L)	0-10

<b>Parameter</b>	<b>Expected Value</b>
MN (cells/ $\mu$ L)	0-10
PMN (cells/ $\mu$ L)	0-4

### **Performance Characteristics: Precision**

Within run precision on the ADVIA 120 CSF Assay was evaluated by performing replicate aspirations of 16 CSF patient samples with adequate volume. Volume permitting, CSF samples were aspirated 2–10 times. Results from the 16 samples were pooled giving a total sample size of n=65.

#### **Precision of CSF WBC Counts (n=65)**

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>	<b>CV</b>
WBC	44.6	5.0	11.2

#### **Precision of CSF RBC Counts (n=65)**

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>	<b>CV</b>
RBC	12.9	4.1	31.7

#### **Precision of CSF WBC Differential (n=65)**

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>	<b>CV</b>
% Neut	12.5	3.2	25.5
% Lymph	74.9	5.1	6.9
% Mono	8.3	3.2	39.3
% MN	83.2	3.6	4.3
% PMN	16.8	3.6	21.2
# Neut	4.8	1.1	23.6
# Lymph	33.8	4.0	11.7
# Mono	4.1	1.2	30.1
# MN	37.9	4.7	12.4
# PMN	6.6	2.0	29.9



## Performance Characteristics: Accuracy

The accuracy of the CSF WBC count was evaluated by comparing manual counts from 90 samples to counts from the ADVIA 120 Hematology System. Accuracy statistics are found in the tables below.

### CSF WBC Count

The accuracy of the CSF WBC count was evaluated by comparing manual counts from 90 samples to counts from the ADVIA 120 Hematology System. Accuracy statistics are found in the table below.

R	Slope	Intercept	Syx	Manual Mean	ADVIA 120 Mean	Bias
0.981	1.38	2	14	20	30	10

### CSF RBC Count

The accuracy of the CSF RBC count was evaluated by comparing manual counts from 78 CSF patient samples to counts from the ADVIA 120 Hematology System. Accuracy statistics are found in the table below.

R	Slope	Intercept	Syx	Manual Mean	ADVIA 120 Mean	Bias
0.989	1.18	-19	481	551	628	77

### Absolute CSF WBC Differential

The accuracy of the CSF absolute WBC differential was evaluated by comparing manual counts from 50 CSF patient samples to counts from the ADVIA 120 Hematology System. Accuracy statistics are found in the table below.

Parameter	R	Slope	Intercept	Syx	Manual Mean	ADVIA 120 Mean	Bias
# MN	0.896	1.07	4	8	9	14	5
# PMN	0.973	1.24	0	11	10	12	2
# Neut	0.971	1.22	0	11	10	12	2
# Lymph	0.859	0.88	4	7	10	8	-2
# Mono	0.849	1.69	1	4	1	4	3

### CSF WBC Differential Relative Percentages

The accuracy of the CSF WBC Differential relative percentages was evaluated by comparing manual counts from 50 CSF patient samples to counts from the ADVIA 120 Hematology System. The WBC differential relative percentages were analyzed by paired t-test and Rümke analysis as recommended in CLSI Document M29-A3. The results below give a p-value for the paired t-test and the percentage of results falling within the binomial limits.

Parameter	Manual Mean	ADVIA 120 Mean	t-test p-value	% Within Binomial Limit
% MN	72.7	72.2	0.992	100%
% PMN	26.9	25.6	0.800	100%
% Neut	26.6	22.3	0.383	98%
% Lymph	63.2	54.6	0.088	96%
% Mono	9.5	17.6	0.15	96%

### Performance Characteristics: Carryover

Because of the low number of cells counted in CSF analysis, the ADVIA 120 hydraulic cycles were designed to eliminate carryover when assaying CSF samples. Prior to assaying each CSF sample, the ADVIA120 rinses all reagent and sample pathways in preparation for the next sample. Carryover for the CSF Assay was evaluated by measuring multiple assays of a highly cellular sample followed by a low cellular sample. The observed carryover was less than 1%, where carryover is expressed as the average percentage of the high level sample that is lost to the trailing low level sample.

### Performance Characteristics: Analytical Range

The analytical range for CSF WBC and RBC counts was established by making serial dilutions of samples prepared to have low analyte values. The dilution studies show that the CSF WBC count is accurate to 5 cells/ $\mu$ L over the range 0–50 cells/ $\mu$ L and accurate to 10% over the range 50–5,000 cells/ $\mu$ L. The CSF RBC count is accurate to 5 cells/ $\mu$ L over the range 0–50 cells/ $\mu$ L and accurate to 10% over the range 50–2880 cells/ $\mu$ L. The results from the study are found in the tables below.

#### CSF WBC Low Level Linearity

Pool (% of reference level)	Observed WBC	Expected WBC	Absolute Deviation	% Deviation
0.00%	0	0	0	
0.05%	2	3	-1	
0.1%	5	5	0	
0.2%	10	10	0	
1.0%	53	50	3	
10.0%	514	501	13	3
100% (reference level)	5009	5009	0	0

### CSF RBC Low Level Linearity

Pool (% of reference level)	Observed RBC	Expected RBC	Absolute Deviation	% Deviation
0.00%	0	0	0	
0.05%	2	1	1	
0.1%	4	3	1	
0.2%	9	6	3	
1.0%	34	29	5	
10.0%	308	288	20	7
100% (reference level)	2880	2880	0	0

**NOTE:** Although RBC linearity has been demonstrated up to 2880 RBC/ $\mu$ L, samples with greater than 1500 RBC/ $\mu$ L should be diluted to ensure the accuracy of the white count.

## WBC DIFF Method

### Intended Use

The ADVIA 2120/2120i Hematology System White Blood Cell Differential (WBC DIFF) methods, consisting of both the Peroxidase method and the Basophil/Lobularity method, are intended to quantitatively measure the following WBC hematological parameters:

**Neutrophils:** percentage of WBC (%NEUT) and absolute count (#NEUT)

**Lymphocytes:** percentage of WBC (%LYMPH) and absolute count (#LYMPH)

**Monocytes:** percentage of WBC (%MONO) and absolute count (#MONO)

**Eosinophils:** percentage of WBC (%EOS) and absolute count (#EOS)

**Large Unstained Cells:** percentage of WBC (%LUC) and absolute count (#LUC)

**Basophils:** percentage of WBC (%BASO) and absolute count (#BASO)

### Principles of the Procedure

#### Peroxidase Method

The peroxidase method was developed by Cremins, Kim, Malin, and Sclafani, based on the principles of differential cellular staining outlined by Ansley and Ornstein. According to these principles, leukocytes are classified by the characteristic properties exhibited by cell-specific constituents when the cells are treated with cytochemical stains. The enzyme peroxidase is present and active in several leukocyte types. In the presence of hydrogen peroxide and an appropriate electron acceptor chromogen, peroxidase develops a darkly colored material which precipitates in the cells. Normal neutrophils and eosinophils possess significant levels of peroxidase activity, with enzyme activity corresponding to cell maturation.

The monocytes were demonstrated to contain lower amounts of peroxidase, which made it possible to define them as a cell population with relatively large light-scatter signals and absorption signals that extend from the unstained cells up to, and partly overlapping, the most weakly-stained neutrophils.

The lymphocyte population analyzed with the Peroxidase Method contains both lymphocytes and basophils. The basophil count (obtained from the Basophil/Lobularity method) is subtracted from the lymphocyte population to obtain the lymphocyte count.

The peroxidase cytochemical reaction consists of 2 steps. In the first step, EDTA anticoagulated whole-blood sample is diluted with ADVIA 120 PEROX 1 reagent. Surfactants and thermal stress cause lysis of the red blood cells. Formaldehyde in ADVIA 120 PEROX 1 reagent fixes the white blood cells.

During the second step, ADVIA 120 PEROX 2 reagent and ADVIA 120 PEROX 3 reagent are added to the peroxidase reaction chamber. The 4-chloro-1-naphthol in ADVIA 120 PEROX 2 reagent and the hydrogen peroxide in ADVIA 120 PEROX 3 reagent stain the sites of peroxidase activity in the granules of neutrophils, eosinophils, and monocytes. Lymphocytes, basophils, and large unstained cells contain no granules with peroxidase enzyme activity.

A constant volume of the cell suspension from the Perox reaction chamber passes through the flowcell. The two fluids flow as independent, concentric streams (no mixing), with the ADVIA 120 PEROX SHEATH stream encasing the sample stream. The absorbance and the forward light-scattering signatures of each blood cell are measured. The optical signals are converted to electrical pulses by photodiodes. After processing, the information is displayed in two histograms. The Perox Y histogram contains the forward-scattering data (cell size). The Perox X histogram contains the absorption data (peroxidase staining). The two histograms are combined to form the Perox cytogram from which cells are identified and counted.

### **Bibliography**

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Groner W, et al: Peroxidase activity of human monocytes as a function of pH and fixation observed with the Hemalog D. Presented at ACHE II (2nd workshop of the Automated Cytochemistry and Hematology Exchange), Marlow-on-Thames, England, May 22-23 (1980)

### **Basophil / Lobularity Method**

The Basophil/Lobularity method was developed by Cremins and Orlik to provide both accurate basophil counts and a measure of cellular lobularity.

This method provides precise, accurate, and rapid recognition of basophils. Cremins and Orlik discovered that basophils are particularly resistant to lysis by a combination of acid and surfactant.

When the EDTA anticoagulated whole blood sample is mixed with ADVIA 120 BASO reagent, the red blood cells are hemolyzed and the cytoplasm is stripped from all white cells except basophils. The sample is then analyzed by two-angle laser light scattering detection using a laser diode. The white cells are classified into three categories: basophils, mononuclear (MN) cells, and polymorphonuclear (PMN) cells.




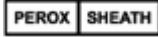
### Bibliography

Cremins J and Orlik J: Leukocyte differential method. US Patent 5,518,928 (1996)

### Reagents

The following ready-to-use reagents are required to perform the DIFF methods and maintain the ADVIA 2120/2120i Hematology System:



#### DIFF TIMEPAC

REF	Product Number	Symbol	Contents	Amount (mL)
00739500	T01-3621-52		DIFF TIMEPAC	
-	T01-3630-01		PEROX 1	2 x 650 mL
-	T01-3631-01		PEROX 2	2 x 305 mL
-	T01-3632-01		PEROX 3	2 x 585 mL
-	T01-3633-01		PEROX SHEATH	2 x 2725 mL

#### ADVIA 120 BASO

REF	Product Number	Symbol	Contents	Amount (mL)
-	T01-3629-01		BASO	2 x 1100 mL

#### ADVIA 120 SHEATH/RINSE

REF	Product Number	Symbol	Contents	Amount (L)
02337140	T01-3664-01		SHEATH/RINSE	10 L
01554628	T01-3623-01		SHEATH/RINSE	20 L

#### ADVIA 120 PEROX 1

(Prod. No. T01-3630-01) 2 x 650 mL

ADVIA 120 PEROX 1 contains:

Sodium dodecyl sulfate, 0.36 mmol/L

Sorbitol, 620 mmol/L

Sodium chloride, 8.35 mmol/L

Formaldehyde, 5.7%

BRIJ-35, 0.100 mmol/L

Buffer



**HARMFUL!**

R20/21/22, R36/37/38, R40, R43  
S26, S36/37, S45, S51

Contains formaldehyde. Potential cancer hazard. Harmful by inhalation, in contact with skin, and if swallowed. Irritating to eyes, respiratory system, and skin. Possible risk of irreversible effects. May cause sensitization by skin contact. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing and gloves. In case of accident, or if you feel unwell, seek medical advice immediately (show label where possible). Use only in well-ventilated areas.

For *in vitro* diagnostic use.

**ADVIA 120 PEROX 2**

(PN T01-3631-01) 2 x 305 mL

ADVIA 120 PEROX 2 contains:

4-Chloro-1-naphthol, 44.8 mmol/L

Diethylene glycol, 99.2%

For *in vitro* diagnostic use.

**ADVIA 120 PEROX 3**

(PN T01-3632-01) 2 x 585 mL

ADVIA 120 PEROX 3 contains:

Stabilizer

Hydrogen peroxide, 0.3%

For *in vitro* diagnostic use.

**ADVIA 120 PEROX SHEATH**

(PN T01-3633-01) 2 x 2725 mL

ADVIA 120 PEROX SHEATH contains:

Propylene glycol, 4.06 mol/L

Surfactant

For *in vitro* diagnostic use.

PEROX SHEATH is also available separately.

<b>REF</b>	<b>Product Number</b>	<b>Symbol</b>	<b>Contents</b>	<b>Amount (mL)</b>
03624240	T01-3633-54		PEROX SHEATH	4 x 2725 mL

## Storage and Stability

### Reagents

When stored between 15°C and 30°C:

- All unopened reagents are stable until the expiration date printed on the product label.
- Opened containers of the ADVIA 120 BASO, ADVIA 120 PEROX 1, ADVIA 120 PEROX 2, ADVIA 120 PEROX 3, and ADVIA 120 PEROX SHEATH reagents are stable for 90 days.

### Calibrators and Controls

Protect product from freezing.

When stored at 2°C to 8°C, unopened ADVIA OPTIpoint (Prod. No. T03-3682-01), ADVIA SETpoint Calibrator (PN T03-3685-01), and ADVIA TESTpoint Hematology Controls (PN T03-3686-01, Low; T03-3687-01, Normal; and T03-3688-01, High, respectively) are stable until the last day of the month of the expiration date printed on the product label unless stated otherwise.

After being opened, ADVIA OPTIpoint is stable for 7 days, ADVIA TESTpoint Hematology Controls are stable for 10 days, and the ADVIA SETpoint Calibrator is stable for 5 days, when stored closed in their original containers at 2°C to 8°C.

### Gain Adjustment

The gain adjustment procedure is used to adjust the amplification signals in a channel to properly position the cell signatures within a cytogram.

### Calibration

The system must be calibrated for all parameters except %RETIC. Siemens recommends the use of ADVIA SETpoint Calibrator (Prod. No. T03-3685-01). Please refer to page 5 for product descriptions.

Calibration procedure should be performed:

- Upon installation of the system.
- If there is a significant shift in control values after the replacement of a critical hardware component or reagent lot, after checking gains.
- Anytime control results and/or moving averages are out of range and it has been verified that the out-of-control condition is instrument-related.



## Sample Handling

### Sample Collection

Collect whole blood in an evacuated blood collection tube containing EDTA as an anticoagulant. Blood samples should be refrigerated at a temperature from 2°C to 8°C, if they will not be analyzed within eight (8) hours of phlebotomy. If a specimen has been refrigerated, allow it to equilibrate slowly to room temperature (15°C to 30°C) before analysis.

### Sample Dilution

Whole-blood specimens with values exceeding the analytical range may be diluted with autologous plasma or isotonic saline and reassayed.

### Sample Stability

The effect of the aging of blood was studied over a 72 hour period on the ADVIA 120 Hematology System.

Two whole-blood specimens drawn from 15 normal, apparently healthy donors were assayed shortly after phlebotomy and then again at intervals of 8, 24, 36, 48, 56, and 72 hours.

One of the whole-blood specimens from each pair was stored at room temperature while the corresponding specimen was stored at 2°C to 8°C in capped blood collection tubes that contained EDTA as the anticoagulant.

The results indicate that WBC DIFF parameters are stable within 2 standard deviations (within run precision) of the initial recovery for the specified time interval.

<b>Parameter</b>	<b>Room Temperature Stability (hours)</b>	<b>Refrigerated Temperature Stability (hours)</b>
%NEUT	36	72
%LYMPH	36	72
%MONO	72	72
%EOS	8	72
%BASO	72	56
%LUC	72	72

### Materials Required but not Provided

For the ADVIA 2120/2120i Hematology System, the other materials required to perform the ADVIA 120 WBC DIFF method are the various control materials, calibrators, ADVIA OPTipoint, and other reagents or equipment specified in the "Methods Introduction" section.

## Procedure

To run samples on your ADVIA 2120/2120i Hematology system, refer to the Daily Routine.

## Quality Control

It is recommended that the system be controlled using ADVIA TESTpoint Hematology Controls. Please refer to page 9-5 for product descriptions. These controls are intended to be integrated into a clinical laboratory's own quality control program and procedures.

Control materials should be assayed:

- At the beginning of each shift or at some other interval chosen by the laboratory.
- After a reagent lot number change.
- After replacement of any part or component of the analytical module that may affect analytical performance.

As an option, laboratories may run a retained patient sample periodically to monitor performance trends.

## Results

The system automatically performs all calculations necessary for obtaining final results.

Through the use of complex flagging algorithms, laboratory personnel are alerted to suspected abnormal conditions. These conditions are indicated by the appropriate flag (such as \*, +, and/or color highlighting). Whenever flags occur, the user should review the results and take appropriate action.

## Limitations of the Procedure

The limitations of the procedure are as listed:

1. Certain abnormal specimens such as those from hemodialysis patients, patient specimens with nucleated RBCs (particularly neonates), as well as specimens exhibiting platelet clumping or incomplete lysis of RBCs, may interfere with white cell differential.
2. Circulating micromegakaryocytes may be counted as white blood cells.
3. Incomplete RBC lysis in the Peroxidase channel may be observed in specimens with elevated serum urea nitrogen (BUN > 75 mg/dL).
4. Interference with the performance of the Peroxidase channel may be noted in specimens obtained from patients with inherited or acquired deficiency of the myeloperoxidase enzyme. Such deficiency has been observed in approximately 0.5% of laboratory specimens.

- In certain abnormal specimens (specifically lymphoid disorders and leukemias), erroneously elevated basophil counts may be observed.

### Expected Values

The range of expected values can vary depending on age, sex, diet, and location. It is recommended that each laboratory establish its own range of expected values.

The following range of expected values is based upon the duplicate assay of 60 whole-blood specimens obtained from an adult population of assumed healthy individuals.

Parameter	Low Value	High Value
%NEUT	40	77
%LYMPH	16	44
%MONO	4	9
%EOS	1	7
%BASO	0	1
%LUC	1	4

**NOTE:** Because of numerical rounding, the Diff results should total  $100\% \pm 0.2\%$ , except when %BASO is  $>5\%$  and the Baso Count Suspect (B-SUSP, BC) flag is triggered. In cases where the total is greater than  $100\% \pm 0.2\%$ , the amount in excess of 100% is due to %BASO.

### Performance Characteristics: Imprecision

A total of 18 runs were performed using multiple samples.

The following estimates of imprecision were obtained by taking 25 aspirations from each whole-blood sample. Each of the sample selectivity modes was tested by sampling from opened tubes and with the manual and automated closed-tube samplers.

Parameter	Mean	Standard Deviation	CV (%)
%NEUT	55.0	0.9	1.6
%LYMPH	31.3	0.9	2.9
%MONO	7.2	0.5	6.9
%EOS	3.4	0.3	8.8
%BASO	0.5	0.1	20.0
%LUC	2.5	0.4	16.0

## Performance Characteristics: Correlation Data

The performance of the ADVIA 120 Hematology System was compared with the performance of the Technicon H•3 RTC System (x) using whole blood from 60 normal donors and 70 hospital donors with each sample run in duplicate (n = 260).

The following regression statistics were computed using a protocol similar to that recommended in the NCCLS document EP9-A, *Method Comparison and Bias Estimation Using Patient Samples; Approved Guideline (1995)*.

Parameter	Comparative System or Method	Regression Equation (y=)	r	Sy.x
%NEUT	Technicon H•3 RTC	1.02x - 0.6	0.997	1.6
%LYMPH	Technicon H•3 RTC	1.00x + 0.8	0.997	1.7
%MONO	Technicon H•3 RTC	0.85x - 0.3	0.943	0.8
%EOS	Technicon H•3 RTC	0.87x + 0.2	0.979	0.4
%BASO	Technicon H•3 RTC	0.67x + 0.0	0.772	0.2
%LUC	Technicon H•3 RTC	0.92x + 0.6	0.944	0.7

x = Technicon H•3 RTC system

y = ADVIA 120 Hematology system

## Reticulocyte Method

### Intended Use

The ADVIA 2120/2120i Hematology System Reticulocyte Count (RETIC) method is intended to quantitatively measure the following reticulocyte parameters:

- Reticulocyte concentration (#RETIC)
- Reticulocyte percentage (%RETIC)
- Reticulocyte Cell Hemoglobin Content (CHr)

### Principles of the Procedure

#### Reticulocyte Cell Count

Historically, reticulocytes have been assayed by manual methods via the microscope, in conjunction with nucleic acid stains such as new methylene blue and brilliant cresyl blue. This method uses a nucleic acid dye (oxazine 750) to stain cellular RNA.

Two microliters (2  $\mu$ L) of an EDTA anticoagulated whole-blood sample are mixed online with the ADVIA 120 autoRETIC reagent. The ADVIA 120 autoRETIC reagent isovolumetrically spheres the erythroid cells and stains cellular RNA. Low-angle laser light scatter, high-angle laser light scatter, and absorption characteristics of all cells are counted and measured. The absorption data are used to classify each cell as a reticulocyte or mature red blood cell based on its RNA content.

#### Reticulocyte Size

The method of sizing reticulocytes uses the simultaneous measurement of laser light scattered at two (2) different angular intervals, which eliminates the adverse effect of variation in cellular hemoglobin concentration on the determination of the MCVr parameter.

#### CHr

The CHr is the mean of cellular hemoglobin content (CH) histogram for the reticulocyte population.

CHr has been shown to be an early indicator of functional iron deficiency. Functional iron deficiency has been shown to occur when erythropoietin (rHuEPO) is employed in the treatment of anemia associated with end stage renal failure and other diseases. Traditional methods for the detection of iron deficiency have been shown not to be as sensitive and specific in the detection of functional iron deficiency.

By providing a direct measure of the hemoglobin content of reticulocytes, the CHr Assay gives health care professionals a new sensitive tool for the early detection of functional iron deficiency and provides additional information that can be used in managing the iron requirements for rHuEPO therapy.

### **Bibliography**

Savage RA, Skoog DD, and Rabinovich A: Analytical inaccuracy and imprecision in reticulocyte counting: A preliminary report from the College of American Pathologist's reticulocyte project. *Blood Cells* **11**:97-112 (1985)

Brugnara C, Colella G, Cremins J, Langley R, Schneider T, Rutherford C, Goldberg M.: Effects of subcutaneous recombinant human erythropoietin in normal subjects: Development of decreased reticulocyte hemoglobin content and iron-deficient erythropoiesis. *J Lab Clin Med* **123**:660-667 (1994)

Fishbane S, *et al*: Reticulocyte hemoglobin content in the evaluation of iron status in hemodialysis patients. *Kidney Intl* **52**:217-222 (1997)

### **Reagents**

The following ready-to-use reagents are required to perform the Reticulocyte method and maintain the ADVIA 2120/2120i Hematology System:

ADVIA 120 autoRETIC

ADVIA 120 SHEATH/RINSE

ADVIA 120 EZ KLEEN

ADVIA 120 DEFOAMER

#### **ADVIA 120 autoRETIC**

<b>REF</b>	<b>Product Number</b>	<b>Contents</b>	<b>Amount (mL)</b>
04296794	T01-3622-54	autoRETIC	4 x 820 mL
-	T01-3622-01	autoRETIC	820 mL

ADVIA 120 autoRETIC contains:

Oxazine 750, 11.4 mg/L



Buffer

N-Tetradecyl-N,N-dimethyl-3-ammonio-1-propane sulfonate, 0.023 mmol/L

N,N-dimethylformamide, 0.38%

For *in vitro* diagnostic use.

### ADVIA 120 EZ KLEEN

REF	Product Number	Symbol	Contents	Amount (mL)
05101601	T01-3624-54		EZ KLEEN	4 x 810 mL
-	T01-3624-01		EZ KLEEN	810 mL

As formulated contains:

Sodium hydroxide, 50 mmol/L

2-(2-Ethoxyethoxy)ethanol, 894 mmol/L

Surfactant

For *in vitro* diagnostic use.

For a product description of SHEATH/RINSE, please refer to page 25. For a product description of DEFOAMER, please refer to page 24.

### Storage and Stability



#### Reagents

When stored between 15°C and 30°C:

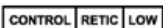
- All unopened reagents are stable until the expiration date printed on the product label.
- Opened containers of the ADVIA 120 autoRETIC reagent are stable for 120 days.
- Opened containers of ADVIA 120 SHEATH/RINSE are stable for 45 days.
- Opened containers of ADVIA 120 EZ KLEEN and DEFOAMER are stable for 90 days.

#### Calibrators and Controls

##### ADVIA 120 RETIC Control High

REF	Product Number	Symbol	Contents	Amount (mL)
09091295	T03-3691-54		Reticulocyte Control High	4 x 4.0 mL
-	T03-3691-01		Hematology Control High	4.0 mL

##### ADVIA 120 RETIC Control Low

REF	Product Number	Symbol	Contents	Amount (mL)
08773805	T03-3690-54		Reticulocyte Control Low	4 x 4.0 mL

<b>REF</b>	<b>Product Number</b>	<b>Symbol</b>	<b>Contents</b>	<b>Amount (mL)</b>			
-	T03-3690-01	<table border="1"><tr><td>CONTROL</td><td>RETIC</td><td>LOW</td></tr></table>	CONTROL	RETIC	LOW	Reticulocyte Control Low	4.0 mL
CONTROL	RETIC	LOW					

Protect product from freezing.

When stored at 2°C to 8°C, unopened ADVIA OPTIpoint (Prod. No. T03-3682-01), ADVIA SETpoint Calibrator (Prod. No. T03-3685-01), and ADVIA TESTpoint Reticulocyte Controls (Prod. No. T03-3690-01, Low; and T03-3691-01, High, respectively) are stable until the last day of the month (expiration date) printed on the product label, unless otherwise stated.

After being opened, ADVIA OPTIpoint is stable for 7 days, ADVIA TESTpoint Reticulocyte Controls are stable for 10 days and the ADVIA SETpoint Calibrator is stable for 5 days, when stored closed in their original containers at 2°C to 8°C.

### **Gain Adjustment**

The gain adjustment procedure is used to adjust the amplification signals in a channel to properly position the cell signatures within a cytogram.

### **Calibration**

The system must be calibrated for all parameters except %RETIC. Properly setting the RETIC gain factor provides sufficient accuracy of the %RETIC result for most laboratories. In such cases, do not change the factory-set %RETIC calibration factor of 1.00.

However, laboratories using a manual counting method other than those recommended by NCCLS or ICSH, or laboratories using certain flow cytometric methods, could observe a significant bias when comparing to the ADVIA 2120/2120i Hematology system method. In this event, use the calibration procedure to obtain agreement with the other method.

Calibration procedure should be performed:

- Upon installation of the system.
- If there is a significant shift in control values after the replacement of a critical hardware component or reagent lot, after checking gains.
- Anytime control results and/or moving averages are out of range and it has been verified that the out-of-control condition is instrument-related.



## Sample Handling

### Sample Collection

Collect whole blood in an evacuated blood collection tube containing EDTA as an anticoagulant. Blood samples should be refrigerated at a temperature from 2°C to 8°C, if they will not be analyzed within eight (8) hours of phlebotomy. If a specimen has been refrigerated, allow it to equilibrate slowly to room temperature (15°C to 30°C) before mixing.

### Sample Dilution

Dilution of whole-blood specimens for RETIC analysis is not recommended.

### Sample Stability

The effect of the aging of blood was studied over a 72-hour period on the ADVIA 120 Hematology System.

Two whole-blood specimens drawn from 15 normal, apparently healthy donors were assayed shortly after phlebotomy and then again at intervals of 8, 24, 36, 48, 56, and 72 hours.

One of the whole blood specimens from each pair was stored at room temperature while the corresponding specimen was stored at 2°C to 8°C in capped blood collection tubes that contained EDTA as the anticoagulant.

The results indicate that RETIC parameters are stable within 2 standard deviations (within run precision) of the initial recovery for the specified time interval. The stability of calculated parameters is limited to the stability of the least stable primary parameter.

Parameter	Room Temperature Stability (hours)	Refrigerated Temperature Stability (hours)
%RETIC	24	72
CHr	24	72

### Materials Required but not Provided

For the ADVIA 2120/2120i Hematology System, the other materials required to perform the ADVIA 120 reticulocyte method are the various control materials, calibrators, ADVIA OPTipoint, and other reagents or equipment specified in the "Methods Introduction" section.

### Procedure

To run samples on your ADVIA 2120/2120i Hematology System, refer to the Daily Routine.

## Quality Control

It is recommended that the system be controlled using ADVIA TESTpoint Reticulocyte Controls. These controls are intended to be integrated into a clinical laboratory's own quality control program and procedures.

Control materials should be assayed:

- At the beginning of each shift or at some other interval chosen by the laboratory.
- After a reagent lot number change.
- After replacement of any part or component of the analytical module that may affect analytical performance.

As an option, laboratories may run a retained patient sample periodically to monitor performance trends.

## Results

The system automatically performs all calculations necessary for obtaining final results.

Through the use of complex flagging algorithms, laboratory personnel are alerted to suspected abnormal conditions. These conditions are indicated by the appropriate flag (such as \*, +, and/or color highlighting). Whenever flags occur, the user should review the results and take appropriate action.

## Limitations of the Procedure

The limitations of the procedure are as listed:

1. When assaying samples with extremely elevated counts, the reticulocyte method may give reticulocyte counts that differ significantly from NCCLS manual counts. Extremely elevated counts are often seen in samples that contain sickled cells or nucleated RBCs.
2. Samples from patients having the following cell types or conditions may interfere with the ADVIA 120 Reticulocyte method:

Malarial parasites

Pappenheimer Bodies

Howell-Jolly Bodies

Heinz Bodies

Inclusions that give rise to basophilic stippling

Macrothrombocytes (giant platelets)

Megaloblastic anemia

Other rare, poorly characterized red cell anomalies

## Expected Values

The range of expected values can vary depending on age, sex, diet, and location. It is recommended that each laboratory establish its own range of expected values.

The following range of expected values is based upon the duplicate assay of 60 whole blood specimens obtained from an adult population of assumed healthy individuals.

Parameter	Low Value	High Value
#RETIC ( $10^9/L$ )	40	79
%RETIC	0.8	2.1
CHr (pg)	24	36

## Performance Characteristics: Imprecision

A total of 18 runs were performed using multiple samples.

The following estimates of imprecision were obtained by taking 25 aspirations from each whole-blood sample. Each of the sample selectivity modes was tested by sampling from opened tubes, and with the manual and automated closed-tube samplers.

Parameter	Mean	Standard Deviation	CV (%)
#RETIC ( $10^9/L$ )	57.8	7.7	13.3
%RETIC	1.2	0.16	13.3
CHr (pg)	28.9	0.2	0.7

## Performance Characteristics: Correlation Data

The performance of the ADVIA 120 Hematology System was compared with the performance of the Technicon H•3 RTC System (x) using whole blood from 60 normal donors and 70 hospital donors with each sample run in duplicate (n = 260).

The following regression statistics were computed using a protocol similar to that recommended in the NCCLS document EP9-A, *Method Comparison and Bias Estimation Using Patient Samples; Approved Guideline* (1995).

Parameter	Comparative System or Method	Regression Equation (y=)	r	Sy.x
#RETIC ( $10^9/L$ )	Technicon H•3 RTC	$0.79x + 7.8$	0.903	13.6
%RETIC	Technicon H•3 RTC	$0.82x + 0.2$	0.925	0.4
CHr (pg)	Technicon H•3 RTC	$0.96x + 4.2$	0.940	1.7

x = Technicon H•3 RTC system

y = ADVIA 120 Hematology system

## Performance Characteristics: Carryover

Sample carryover for the ADVIA 2120/2120i Hematology System is expressed as the percentage of a high-level sample lost to a trailing low-level sample. Carryover was determined for the RBC count obtained from the reticulocyte channel (RTC RBC).

Parameter	Observed Carryover
RTC RBC	1.0%

### **Performance Characteristics: Analytical Range**

The analytical range for %RETIC parameter is:

<b>Parameter</b>	<b>Range Evaluated</b>	<b>Maximum Observed Deviation</b>
%RETIC	0.2 - 24.9	2.6

## Method Data Summary

### CBC Method Data

The sample stability, expected ranges, and performance characteristics for the CBC method are listed in the following Table.

	Sample Stability		Expected	Imprecision			Correlation Data			Observed	Analytical Range	
	Room Temp	Refrigerated	Values	Mean	SD	CV%	y=	r	Sy.x	Carryover	Range	Deviation
WBC (10 <sup>9</sup> /μL)	36 h	56 h	3.8 to 8.6	5.91	0.16	2.7	1.06x - 0.74	0.997	1.42	0.4%	0.02 to 21.83 20.48 to 409.55	0.46 x 10 <sup>9</sup> /μL 4.1 %
RBC (10 <sup>6</sup> /μL)	48 h	72 h	4.1 to 6.0	4.82	0.05	1.0	0.98x + 0.11	0.997	0.07	0.2 %	0.0 to 2.65 2.65 to 6.76	0.03 x 10 <sup>6</sup> /μL 1.1 %
HGB (g/dL)	72 h	72 h	10 to 16	13.3	0.11	0.8	1.01x - 0.2	0.997	0.2	0.2 %	0.0 to 8.6 8.6 to 22.5	0.2 g/dL 2.5 %
MCV (fL)	8 h	24 h	76 to 100	81.0	0.3	0.4	0.90x + 9.6	0.994	1.1	★	★	★
CH (pg)	36 h	53 h	24 to 35	26.5	0.05	0.2	1.00x + 1.2	0.990	0.6	★	★	★
CHCM (g/dL)	8 h	24 h	29 to 34	30.6	0.14	0.5	1.17x - 6.5	0.974	0.5	★	★	★
RDW (%)	72 h	72 h	12 to 15	12.3	0.07	0.6	0.86x + 1.3	0.980	0.6	★	★	★
HDW (g/dL)	72 h	72 h	1.9 to 3.0	2.56	0.02	0.8	0.98x + 0.06	0.959	0.13	★	★	★
PLT (10 <sup>9</sup> /μL)	48 h	48 h	140 to 360	256	6.9	2.7	1.08x - 2.0	0.991	27	0.1 %	5 to 208 205 to 3983	10 x 10 <sup>9</sup> /μL 4.9 %
MPV (fL)	8 h	8 h	7 to 9	8.1	0.11	1.4	0.76x + 0.9	0.925	0.4	★	★	★
Hct (%)	★	★	33 to 57	★	★	★	★	★	n/a	★	★	★
MCH (pg)	n/a	n/a	24 to 31	n/a	n/a	n/a	n/a	n/a	n/a	★	★	★
MCHC (g/dL)	★	★	28 to 34	★	★	★	n/a	n/a	n/a	★	★	★

★ not available or not applicable for this parameter

x= Technicon H•3 RTC System y= ADVIA 120 Hematology System

## WBC DIFF Method Data

The sample stability, expected ranges, and performance characteristics for the WBC DIFF method are listed in the following Table.

	Sample Stability		Expected	Imprecision			Correlation Data		
	Room Temp	Refrigerated	Values	Mean	SD	CV%	y=	r	Sy.x
%NEUT	36 h	72 h	40 to 77	55.0	0.9	1.6	1.02x - 0.6	0.997	1.6
%LYMPH	36 h	72 h	16 to 44	31.3	0.9	2.9	1.00x + 0.8	0.997	1.7
%MONO	72 h	72 h	4 to 9	7.2	0.5	6.9	0.85x - 0.3	0.943	0.8
%EOS	8 h	72 h	1 to 7	3.4	0.3	8.8	0.87x + 0.2	0.979	0.4
%BASO	72 h	56 h	0 to 1	0.5	0.1	20.0	0.67x + 0.0	0.772	0.2
%LUC	72 h	72 h	1 to 4	2.5	0.4	16.0	0.92x + 0.6	0.994	0.7

## RETIC Method Data

The sample stability, expected ranges, and performance characteristics for the RETIC method are listed in the following Table.

	Sample Stability		Expected	Imprecision			Correlation Data			Observed	Analytical Range	
	Room Temp	Refrigerated	Values	Mean	SD	CV%	y=	r	Sy.x	Carryover	Range	Deviation
%RETIC	24h	72 h	0.8 to 2.1	1.2	0.16	13.3	$0.82x + 0.2$	0.925	0.4	★	0.2 to 24.9	2.6
#RETIC ( $10^6/L$ )	★	★	40 to 79	57.8	7.7	13.3	$0.79x + 7.8$	0.903	13.6	★	★	★
CHr (pg)	24 h	72 h	24 to 36	28.9	0.2	0.7	$0.96x + 4.2$	0.940	1.7	★	★	★
RTC RBC Count	★	★	★	★	★	★	★	★	★	1.0%	★	★

★ not available or not applicable for this parameter



# ADVIA Autoslide® Slide Maker Stainer

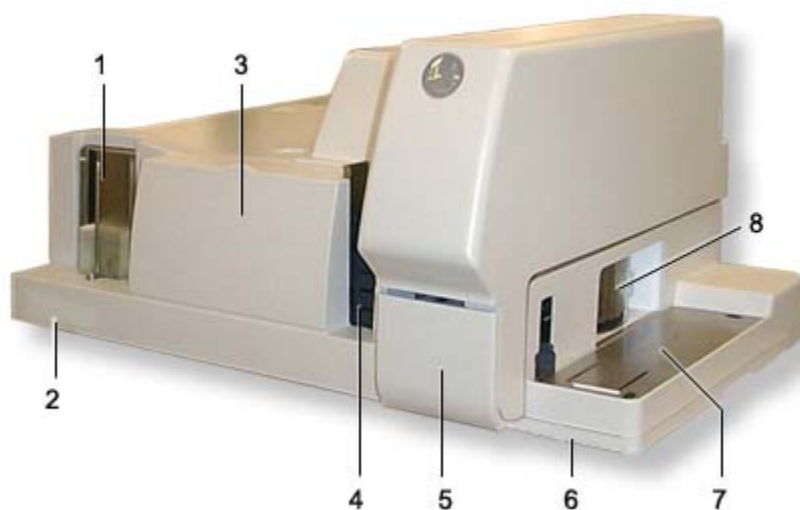
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## Overview

The optional ADVIA® Autoslide Slide Maker Stainer is connected to the ADVIA 2120/2120i Hematology System and controlled by the ADVIA 2120/2120i system software. It can automatically prepare and stain a high-quality blood smear on a microscope slide for white blood cell (WBC) differential analysis and microscope examination. The system makes and stains slides based upon criteria that you can customize in the system software. You can also choose to have slide making occur on all slides or no slides and you have the option for slides to be prepared but not stained.

### IMPORTANT

The system produces slides for samples aspirated in the autosampler mode *only*.



1 Slide dispenser

2 Broken slide tray

3 Front access door

4 Rack loader

5 Manual/STAT inlet door

6 Stain overflow collection tray

7 Rack collection area

8 Stainer access door

### Slide dispenser



Do not try to empty the slide dispenser! Finger injuries may occur if slides are removed from the slide-dispenser assembly. Avoid any unnecessary contact with the slide-dispenser mechanical device. The slide-dispenser cover cannot be removed without using a tool. Do not disable the sensors.

### Broken slide tray



All sharp objects, such as broken slides, should be considered biohazardous and disposed of in an appropriate container. To avoid personal injury, handle broken slides with care. Wear personal protective equipment. Use universal caution. For complete biohazard statement, refer to section on *Autoslide Safety Information and Warnings*.

### Front access door



To avoid operator injury, the access doors on ADVIA Autoslide Slide Maker Stainer are equipped with sensors that stop Autoslide operation when opened.

Wear personal protective equipment. Use universal caution. For complete biohazard statement, refer to section on *Autoslide Safety Information and Warnings*.

When the front access door is opened during Autoslide operation, the slide maker portion of the system stops; slide transfer and staining continue to operate.

### Stain overflow collection tray



Staining reagents contain methanol that is flammable and toxic. For complete methanol safety statement, refer to section on *Autoslide Safety Information and Warnings*.

To avoid personal injury and damage to the instrument, you must check the reagent overflow tray periodically to verify that there are no leaks of the reagents.

If liquid is present, switch the instrument off, discard the liquid into waste container using appropriate safety precautions, and call your local technical service provider or distributor.

Do *not* replace hoses. Contact your local technical service provider or distributor for this procedure.

### Stainer access door

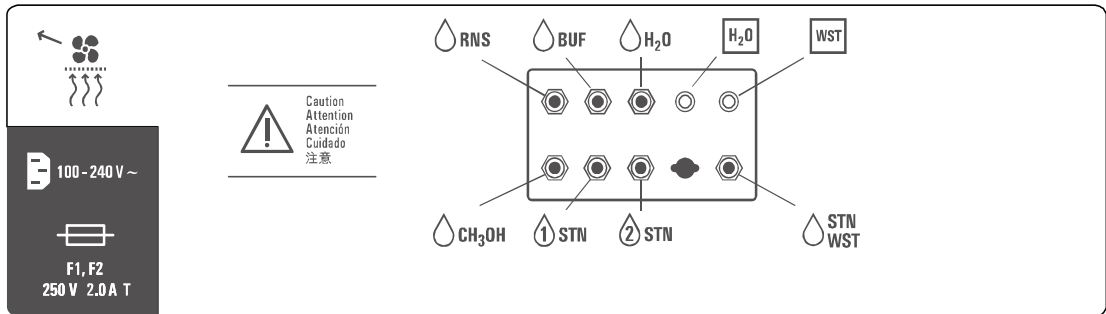


To avoid operator injury, the access doors on ADVIA Autoslide Slide Maker Stainer are equipped with sensors that stop Autoslide operation when opened.

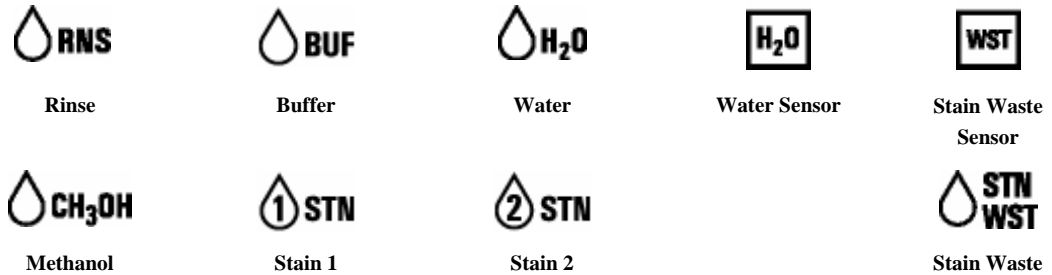
Wear personal protective equipment. Use universal caution. For complete biohazard statement, refer to section on Autoslide Safety Information and Warnings.

When the stainer access door is opened during Autoslide operation, all Autoslide actions stop.

### Autoslide Rear Panel



#### Key:



#### Fan



## Main power switch and power supply connection



### CAUTION

The power switch and input voltage supply connection should always be accessible. When positioning the system for operational use, leave the required amount of space for easy accessibility to these items.

Installation, connection, and disconnection of the ADVIA Autoslide Slide Maker Stainer must be performed by authorized personnel only.

For the main supply, grounding is required. Check that earth wall-plug is correctly connected to the laboratory grounding system. If there is no such system, a ground stake should be used.

Use only main supply cable delivered with the instrument or cable with same characteristics:

- Europ cord type: HO5VV-F
- USA cord type: SVT,AWG 18-3

Main supply voltage fluctuations not to exceed  $\pm 10\%$  of the nominal voltage.

## Fluidic and sensor connections



### BIOHAZARD

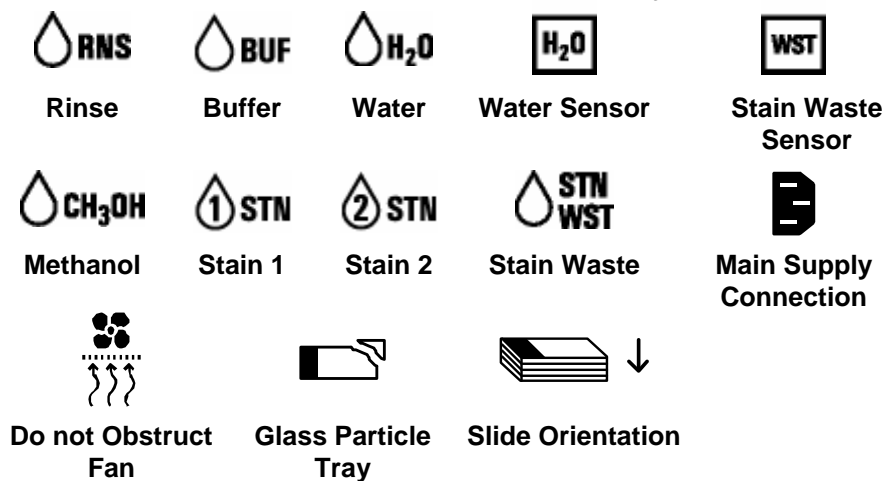
Wear personal protective equipment. Use universal caution. For complete biohazard statement, refer to section on *Autoslide Safety Information and Warnings*.



### METHANOL SAFETY

For complete methanol safety statement, refer to section on *Autoslide Safety Information and Warnings*.

### ADVIA Autoslide Slide Maker Stainer-specific symbols:



## Autoslide Safety Information and Warnings

### IMPORTANT

Installation, connection, and disconnection of the ADVIA Autoslide Slide Maker Stainer must be performed by authorized personnel only.

Before moving the instrument, contact your local service provider or distributor for necessary information.

Use the lifting handles delivered with the instrument to lift or move the instrument.

Before shipping the instrument, whatever the destination, an external decontamination must be carried out.

Perform a general cleaning of the instrument before transporting, disposing of, or temporarily removing it from use.

The Autoslide must be stored and shipped at a temperature of between -20° C and +50° C.



**BIOHAZARD**

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



#### **ELECTRICAL WARNING**

To avoid exposure to shock hazards or damage to the instrument while performing a procedure, power off the analyzer before proceeding.

The following parts must not be handled or checked by the user:

- Electrical power supply
- Electronic circuit boards

Operator injury may occur from an electric shock. Electronic components can shock and injure the user. Do not temper with the instrument and do not remove any components covers, doors, panels, etc.) unless otherwise instructed within this document.



#### **WARNING**

Do not disable sensors. Doing so may result in operator injuries. Do not open the Autoslide doors or covers during instrument operation. This causes the instrument to stop operation and cancel any running slides.



#### **WARNING**

Do *not* disable sensors. Doing so may result in operator injuries. Do *not* open the Autoslide doors or covers during instrument operation. This causes the instrument to stop operation and cancel any running slides.



#### **METHANOL SAFETY**



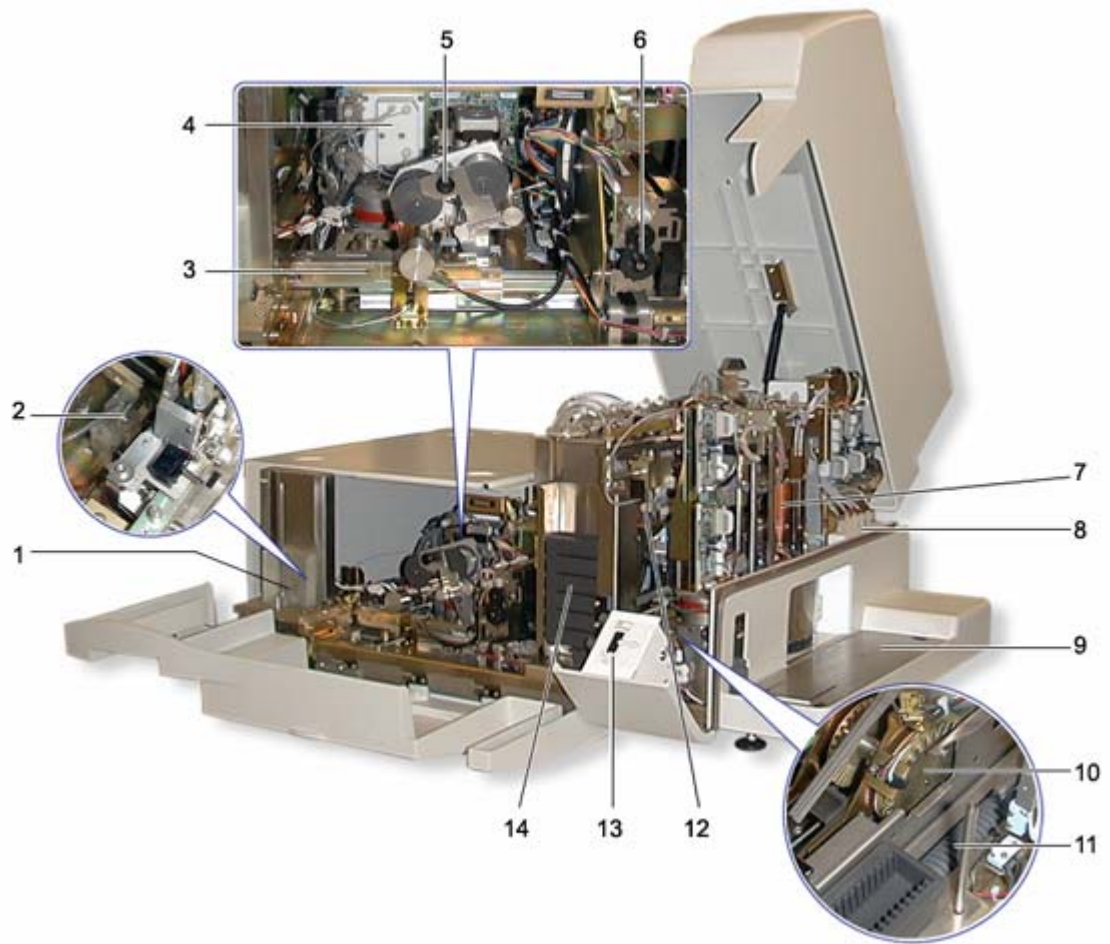
**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).



**Highly Flammable!** Highly flammable. Keep away from sources of ignition.  
No smoking.



## Theory of Operation



**1 Slide dispenser**

**2 Drop needle**

**3 Slide carrier**

**4 Sampling syringes**

**5 Smearer**

**6 Printer**

**7 Stainer assembly**

**8 Reagent syringes**

**9 Rack out queue**

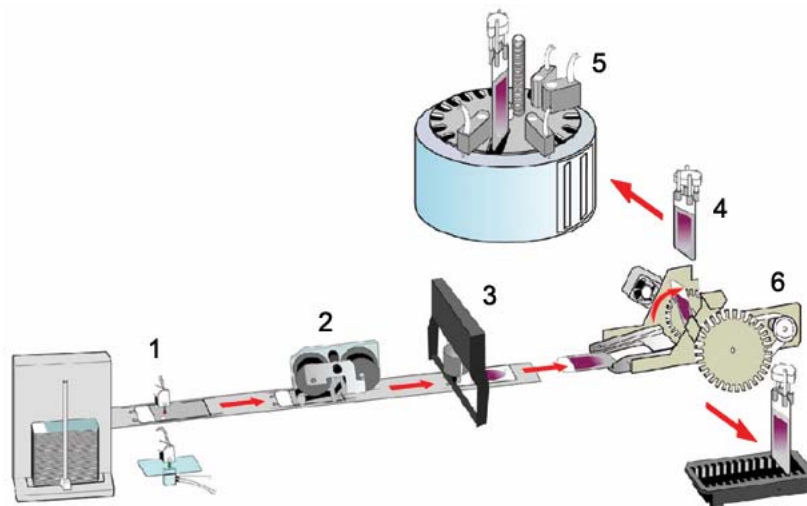
**10 Verticalizer**

**11 Rack transfer**

**12 Slide transfer / grabber**

**13 Manual inlet**

**14 Rack loader**



1. The drop needle dispenses a drop of the sample on a slide. It dispenses the rest of the sample into the drop needle rinse bath and then is rinsed with rinse.
2. The smearing assembly wedge and smearing ribbon create the smear using the surface tension of the blood. The wedge is positioned on the slide before being brought into contact with the blood, waiting for the blood to migrate along the wedge. The waiting time, drop size, smearing speed, and angle of the wedge are all user-adjustable.

The system then pulls the slide back, producing the smear.

After smearing, the system raises the smearing head and the smearing tape moves to ready a clean section for the next slide.

3. The slide enters the printer, which can print patient demographics or other information directly on the slide.
4. After printing, the slide moves into the verticalizer, which transfers it to a staining well or directly to a rack as required.
5. If staining is required, the slide moves into the stainer, a rotating tray containing 32 staining wells. A needle plate supports needles at adjustable locations to dispense liquids into the wells or to aspirate liquid from the wells. The slide is stained according to the staining method in use.
6. Once staining is complete, the slide is transferred to a rack and processing is complete.

## Autoslide Daily Routine

1. Check the level of the stain waste container. Empty the container if necessary.
2. Check the levels and expiration dates of the autoslide reagents. Load reagents if necessary. Remember to prime the lines for any new reagent. Check the water level if your system uses it.
3. Load slides and racks.
4. Check smearing tape status and replace if necessary.
5. If the system is not set to perform the daily startup cycle automatically, perform the daily startup procedure manually.
6. Run samples. The system will automatically prepare slides according to the software settings. You can also request a slide for a sample regardless of the results, or use the Autoslide module to stain manually smeared slides.
7. If the system is not set to perform the daily shutdown cycle automatically, perform the daily shutdown procedure manually.

## Autoslide Operation

### Loading Reagents

If reagent levels are low or the expiration date of a reagent has passed, load additional reagents using the following procedure

1. Detach the appropriate reagent container and replace it with a new one.
2. At the Logs menu, select **Reagent Log** and then select **Autoslide Reagent Log**. The software opens to the Reagent Inventory window.
3. Select **Reagent Installation**.
4. For each new reagent, enter the **Reagent Volume**, **Lot #**, and **Expiration Date**.

#### **IMPORTANT**

Both the Modified Wright and the Wright Giemsa Methods use the same reagent bottle for Stain 1 and Stain 2. In order for the reagent alarms to work properly, you must determine the volumes to enter using the following calculations.

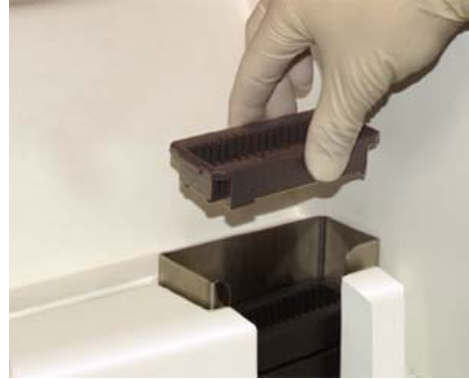
Stain 1	Bottle Volume – Stain 2 Volume
Stain 2	Bottle Volume x Dilution Ratio

**NOTE:** The Dilution Ratio is defined in the staining profile.

5. Select **OK**.
6. When prompted to prime lines, select **Yes**. The system allows only one prime cycles; select **OK**.
7. If bubbles remain in the reagent lines, prime the lines again using the Reagent Inventory window.

## Loading Slide Racks

- Load at least two racks into the rack loader. The rack loader can hold up to 9 racks at a time.
- Load the racks as shown below, with the slide grooves facing upwards.
- You can load racks at any time.



## Loading Slides

When the autoslide startup cycle runs, the slide dispenser must contain slides and there must be racks in the rack loader.



### **WARNING**

Do not try to empty the slide dispenser. Finger injuries and sensor damage can occur if you attempt to remove slides from the slide dispenser.

### Microscope slides - storage and handling

When storing and handling microscope slides, follow these precautions:

- Microscope slides and cover glasses should be rotated when stored.
- To prevent moisture contamination, store the slides off the floor.
- To minimize temperature and humidity changes, keep slides as far away as possible from doors and heating or air conditioning ducts.
- Remember, slides do not have to be old to be affected by moisture.

Slides should be allowed to come to Lab temperature, before they are opened.

- Use slides provided by Siemens approved vendors *only*.  
**Size:** 76 x 26 x 1mm  
**Description:** ground edges, rounded corners, super frost
- Avoid touching slide surfaces with your fingers.
- Control-painted areas of the slides are all facing up.
- Make sure slides are not stuck together before loading.
- Make sure to load the slides in the correct orientation. The painted area must be on the top of the slides and on the left-hand side of the stack.
- Insert a stack of slides as shown above. The stack of slides must reach the stack level detectors. The slide dispenser can hold up to 160 slides.



## Emptying the Stain Waste Container

The stain waste is collected in a container located behind the system. Empty the container periodically or whenever the system indicates that the container is full.

Stain waste must be collected using the tube and container specified by local regulation. Stain waste contains methanol. Methanol is a solvent that may destroy an inappropriate connection and cause leaks that are dangerous for the user and damaging to the instrument.

Dispose of waste according to local regulatory requirements.



**WARNING**

Make sure that the Autoslide module is *not* processing slides while you disconnect the stain waste container

### **IMPORTANT**

Local laws and regulations protect the environment and encourage resource conservation by regulating the disposal of hazardous wastes. Because some of the wastes generated by the analyzer may be classified as hazardous waste, you must be familiar with the applicable hazardous waste handling and disposal laws and regulations in your area.

## Running the Daily Startup Manually

Your system can be set to run the startup procedure at a preset time. However, if the system is not set to do so, or if you are starting it at a different time, perform the following steps.

1. At the Operations menu, select **Autoslide Control**.
2. In the Autoslide Control tab, select **Startup** and then select **Start**.

### Ordering a Slide Manually

You can order a slide for a blood sample that does meet the slide-making criteria set in the software. To manually trigger slide production for a sample, use the Order Entry tab on the Data Manager menu to add the SLIDE "test" to the workorder. You can also create a workorder for a sample that contains no tests other than SLIDE.

1. At the Data Manager menu, select **Order Entry**.
2. In the Order Entry tab, open the existing workorder for the sample or create a new one.
3. Add **SLIDE** to the tests requested in the workorder and then select **OK**.
4. Run the sample using the autosampler. The system will make the slide as ordered.

### Staining manually smeared slides

You can use the Autoslide module to stain slides that have been manually smeared away from the system.

1. Make sure the ADVIA 2120/2120i system is not processing samples and is idle.
2. At the Operations menu, select **Autoslide Control**.
3. In the **Autoslide Control** tab, select the **Manual/STAT Door** option and then select **Start**.
4. When the door opens, insert the slide into the holder door with blood smear on the right with the frosted end up. Make sure the slide is fully seated in the holder; if the slide does not rest on the bottom peg, it may break.
5. Close the manual/STAT inlet door.  
When the system is ready to process the slide, the manual cycle starts; this may take up to 30 seconds. The slide is transferred to the staining assembly and the staining operation begins. At the end of the cycle, the slide is loaded into a rack and the manual inlet door opens.
6. Insert the next manually smeared slide. If you have no more slides to stain, close the manual/STAT inlet door.
7. Return to normal analyzer and autoslide operation.

### Resetting the Autoslide Module

The Reset Autoslide button displays on some autoslide-related software tabs and windows, most notably the Autoslide Control tab at the Operations menu.

Click this button to reset the Autoslide module. This function is intelligent and will reset only those autoslide mechanisms that require resetting. This may be necessary when troubleshooting Autoslide module errors.

Depending on the state of the system, this may take up to 16 minutes.

### **Stopping the Autoslide Module (Fast Stop)**

The **Fast Stop** button displays on some autoslide-related software tabs and windows, most notably the Autoslide Control tab on the Operations menu.

Click this button to immediately stop the Autoslide module.

Any slides that are in the stainer will be lost when a Fast Stop occurs.

When a Fast Stop occurs, you must perform a Stainer Evacuation before returning to normal system operation.

### **Running the Daily Shutdown Manually**

Your system can be set to run the shutdown procedure at a preset time. However, if the system is not set to do so, or if you are shutting down at a different time, perform the following steps.

1. At the Operations menu, select **Autoslide Control**.
2. In the Autoslide Control tab, select **Shutdown** and then select **Start**.

#### **IMPORTANT**

Once the Daily Shutdown has occurred, you must perform a Daily Startup before resuming Autoslide operation.

### **Disconnecting an Autoslide 90° Configuration**

The following procedure explains how to disconnect the ADVIA Autoslide system when it is in a 90° configuration for lab automation or a stand alone system.



All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.



Do not move the support structure that the ADVIA Autoslide resides on more than 0.3 m (1 ft). Make sure that the interface cable and ground strap has enough slack when you move the support structure.

1. Make sure all system activity is complete before you disconnect the 90° configuration.

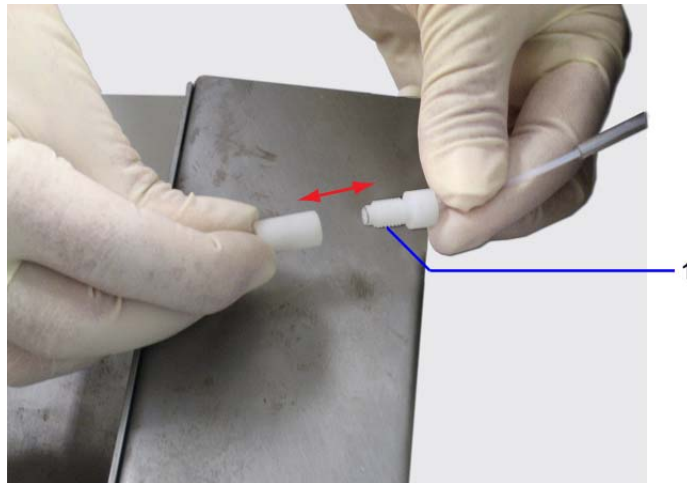
**NOTE:** Make sure that no slides are present in the Autoslide Stainer.

2. Place the ADVIA 2120/2120i system in Standby.
3. Select Off on the control panel to shut off the ADVIA 2120/2120i system.

This prevents any further system function. The system displays the following message, “communication error with autoslide”. The Autoslide icon remains green.

**NOTE:** The Autoslide system can remain on.

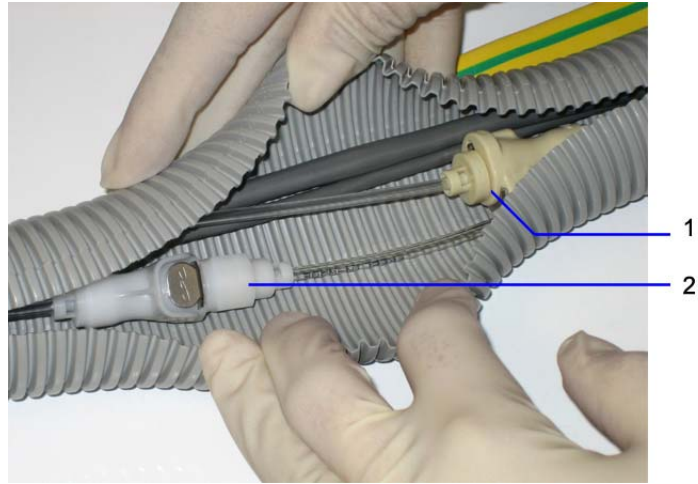
4. Unscrew the Austoslide sample blood line (1).



**Figure 1. Sample Blood Line**

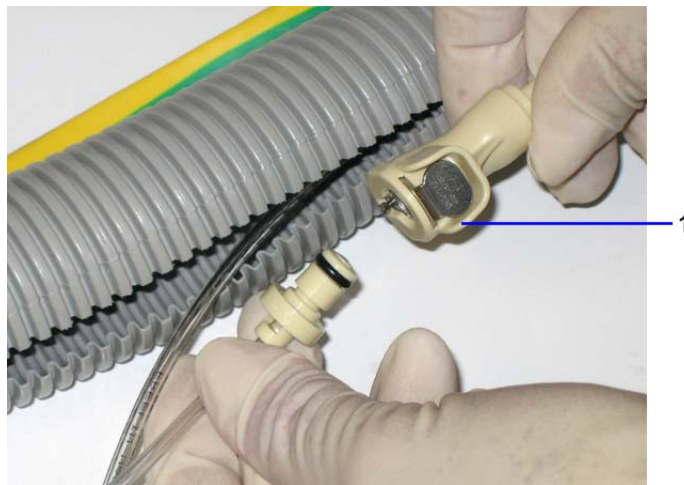


5. Pry open the protective conduit tubing where the vacuum (1) and pressure (2) lines reside.



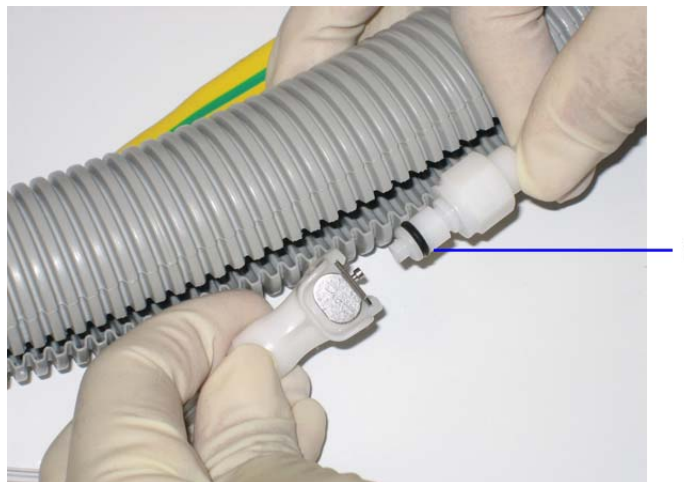
**Figure 2. Vacuum and Pressure Lines**

6. Push the metal lever and pull the vacuum line (1) to disconnect.



**Figure 3. Vacuum Line**

7. Push the metal lever and pull the pressure line (1) to disconnect.



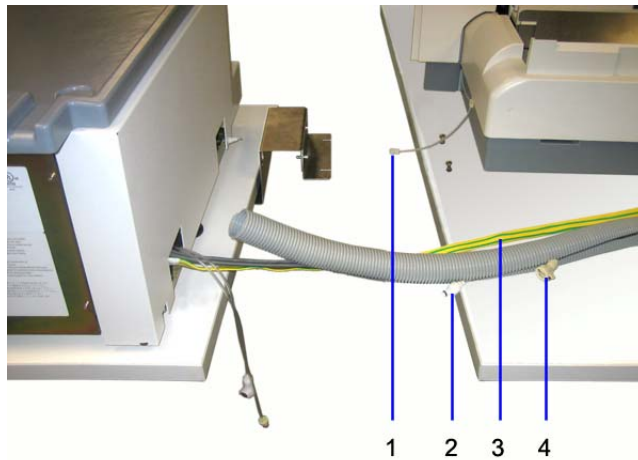
**Figure 4. Pressure Line**

- Loosen the 2 screws where the slots are on the Autoslide cart bracket so you can move the support structure.



**Figure 5. Autoslide cart bracket with loosened screws**

- Move the support structure forward up to 0.3 m (1 ft), ensuring that the electrical cables are not stretched to far.



- Blood sample line
- Pressure line
- Ground strap
- Vacuum line

**Figure 6. Moved Support Structure**

**NOTE:** The ground strap and interface cable remain connected to the Autoslide. Disconnecting the sample blood line, pressure line, and vacuum lines allows you to move the Autoslide approximately 0.3 m (1 ft).

- To reconnect the Autoslide, move the Autoslide module back into position.
- Tighten the clamp screws.

12. Replace and connect all lines disconnected in steps 4-8.
13. When the reconnection is complete turn the ADVIA 2120/2120i system back on.

The Autoslide icon turns grey. Wait until the Autoslide established communication with the analyzer. The icon goes from grey to orange, and then to green. Do not initiate any command until communication is established and the icon for the Autoslide is green.

## Autoslide Methods

### May-Grünwald Giemsa Method

#### Intended Use

The May-Grünwald Giemsa method is for *in vitro* diagnostic use in the differential staining of blood, bone marrow and body fluid smears on the ADVIA Autoslide Slide Maker Stainer. Stained smears are evaluated to identify and quantify cells in whole blood and other specimens to aid clinicians in the assessment of various clinical conditions.

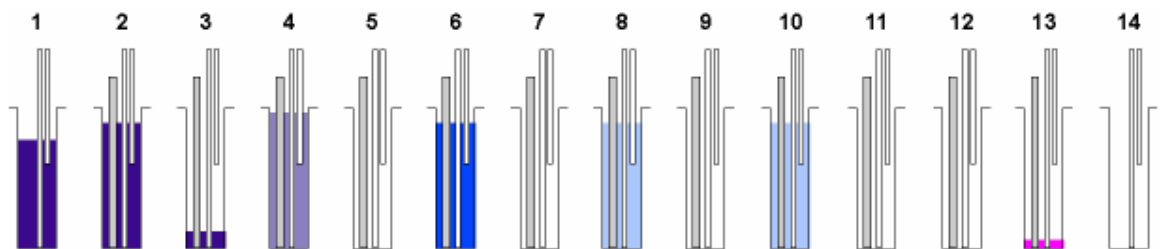
#### Summary and Explanation

The reagent protocol for the ADVIA Autoslide Slide Maker Stainer consists of a modified methylene blue-eosin stain and is based on the original stain proposed by Pappenheim.

The ADVIA Autoslide Slide Maker Stainer is a smart, fully automated system. It is capable of producing stained smears on all specimens run on the ADVIA 2120/2120i or only on samples with predefined criteria (*i.e.* flags or parameter threshold). The autoslide module also provides a direct access port to the stainer for pre-smear slides.

#### Staining Protocol

The following is a brief description of the staining protocol:



1. Dispensing May-Grünwald Stain (Stain 1) (DN1).
2. Slide introduction.

3. Partial draining of May-Grünwald Stain (Stain 1) (AN2).
4. Dispensing Buffer to dilute May-Grünwald Stain (Stain1) (DN3).
5. Draining (AN3).
6. Dispensing diluted Giemsa Stain (Stain 2) (DN3).
7. Draining (AN7).
8. Dispensing rinsing solution (distilled water) (DN7).
9. Draining (AN7).
10. Dispensing rinsing solution (distilled water) (DN7).
11. Draining (AN7).
12. Draining (AN4).
13. Dispensing methanol (DN4).
14. Slide removal

<b>Needle</b>	<b>Position</b>	<b>Action</b>
DN1 (Undil. Stain 1)	32	1
DN2 (Buffer)	8	1
DN3 (Dil. Stain 2)	13	1
DN4 (Methanol)	31	0
DN7 (Rinse)	18	2
AN2	8	1
AN3	13	1
AN4	31	1
AN7	18	3

Methanol Volume (mL)	1.6
Stain Volume (mL)	3.6
Dilution Ratio (%)	5
Duration	Long

### **Principle of the Procedure**

The 2 staining mixtures used by this protocol have very distinct proprieties. The May-Grünwald (STAIN 1) stains acidophilic sites of cells and the neutrophilic granulations of leukocytes, whereas the Giemsa (STAIN 2) stains the cytoplasm of the monocytes and lymphocytes, as well as the nuclear chromatin. The stained smear is examined microscopically and cells are then manually differentiated and quantified.

<b>Cell Type</b>	<b>Cell Component</b>	<b>Color</b>
Neutrophils	Nuclei	Deep purple

<b>Cell Type</b>	<b>Cell Component</b>	<b>Color</b>
	Cytoplasm	Pink
	Granules	Light purple-violet
Lymphocytes	Nuclei	Deep purple
	Cytoplasm	Blue
Monocytes	Nuclei	Light purple
	Cytoplasm	Blue-gray
	Granules	Fine pink to violet
Eosinophils	Nuclei	Pale purplish-blue
	Cytoplasm	Bluish-pink
	Granules	Orange
Basophils	Nuclei	Purplish-blue,
	Cytoplasm	Faint pink
	Granules	Deep purple
Platelets	Cytoplasm	Light blue
	Granules	Blue to violet-blue
Red Blood Cells	Biconcave disks	Pink
Howell-Jolly bodies		Dark purple
Dohle bodies		Blue-gray
Promyelocyte and Auer Rods	Granules	Dark blue to Purplish-red






### **Causes of RBC Artifacts**

- Post-stain rinsing too short
- Reagents expired
- May-Grünwald Stain open for extended period
- Dirty stainer
- Room temperature too high
- Humidity too high
- Slide not dry before examination

### **Reagents and Supplies**

For *in vitro* diagnostic use.

Reagents are ready to use and require no preparation.

REF	Contents	Symbols	Amount
00283949 00327415 (Japan)	May-Grünwald Stain 1	 1 STN	4 x 2.5 L
00283167 00327733 (Japan)	Giemsa Stain 2	 2 STN	6 x 0.5 L
00284988	May-Grünwald Giemsa Buffer	 BUF	4 x 2.5 L
00286794 00326788 (Japan)	Methanol	 CH <sub>3</sub> OH	4 x 2.5 L
06837687	ADVIA Autoslide Rinse	 RNS	10 L

#### Stain 1 - May- Grünwald Stain

- Methanol, 99.65 %
- Methylene blue – Eosin, 0.35 %



**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**

**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

#### Stain 2 - Giemsa Stain

- Methanol, 56 %
- Glycerol, 43 %
- Methylene blue – Eosin, 1 %



**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**

**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

### **May- Grünwald Buffer**

- Phosphate buffer
- Preservative

### **Methanol**

- Methyl Alcohol  $\geq 99.8\%$



**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**

**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

### **Reagent Storage and Stability**

Store Stains, Buffer, and Methanol tightly closed between 15°C and 25°C.

Cover open reagent bottles with Parafilm or equivalent to avoid excessive evaporation.

When unopened, reagents are stable until the expiration date printed on the product label when stored at room temperature between 15°C and 30°C.

Once opened, reagents are stable for 45 days.

Do not refrigerate.

Refer to the online ADVIA 2120/2120i Operator's Guide for information on specimen collection.



## **Material required but not provided**

Microscope slides (26 x 76 x 1 mm)

**Size:** 76 x 26 x 1mm

**Description:** ground edges, rounded corners, super frost

Use slides provided by Siemens approved vendors only.

## **Limitations**

May-Grünwald Giemsa reagents produce high quality stained blood films. However, there may be personal preferences in shades and intensities of staining not satisfied by the system.

## **Results**

When used with the ADVIA Autoslide Slide Maker Stainer, the May-Grünwald Giemsa reagents will produce a consistent stain quality to facilitate accurate and reliable interpretation.

## **Technical Assistance**

For customer support, please contact your local technical support provider or distributor.

## **Bibliography**

1. White WL, Erickson MM, Stevens SC. *Practical Automation for the Clinical Laboratory*. St. Louis, MO, CV Mosby Co., pp 476-487 (1972)
2. Moss ED. Automated Slide Staining in Haematology. *Can. J. Med. Tech.* **30** (5): 169 (1968)
3. Langeron M., *Precis de microscopie, Masson*, Paris 6eme ed., pp 566-585 (1942)

## **Modified Wright Method**

### **Intended Use**

The Modified Wright method is for in vitro diagnostic use in the differential staining of blood, bone marrow and body fluid smears on the ADVIA Autoslide Slide Maker Stainer. Stained smears are evaluated to identify and quantify cells in whole blood and other specimens to aid clinicians in the assessment of various clinical conditions.

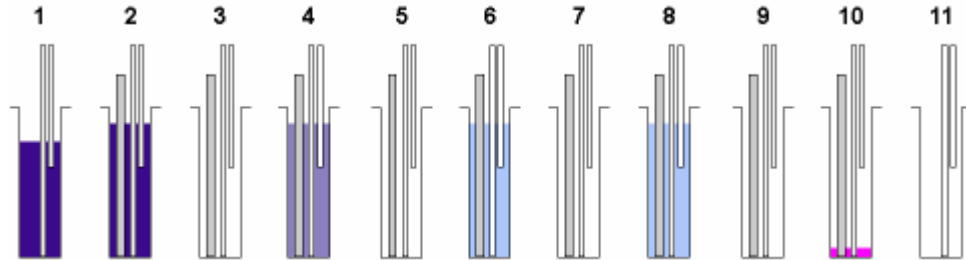
### **Summary and Explanation**

The reagent protocol for the Autoslide Slide Maker Stainer consists of a modified polychrome methylene blue-eosin stain and is based on the original stain proposed by Romanowsky.

The ADVIA Autoslide Slide Maker Stainer is a smart, fully automated system. It is capable of producing stained smears on all specimens run on the ADVIA 2120/2120i or only on samples with predefined criteria (*i.e.* flags or parameter threshold). The Autoslide provides also a direct access port to the stainer for pre-smear slides.

## Staining Protocol

The following is a brief description of the staining protocol:



1. Dispensing Modified Wright or Wright-Giemsa Stain (DN1).
2. Slide introduction.
3. Draining Modified Wright or Wright-Giemsa Stain (AN3).
4. Dispensing diluted Modified Wright or Wright-Giemsa Stain (DN3).
5. Draining (AN7).
6. Dispensing rinsing solution (distilled water) (DN7).
7. Draining (AN7).
8. Dispensing rinsing solution (distilled water) (DN7).
9. Draining (AN4).
10. Dispensing methanol (DN4).
11. Slide removal.

Needle	Position	Action
DN1 (Undil. Stain 1)	32	1
DN2 (Buffer)	22	0
DN3 (Dil. Stain 2)	8	1
DN4 (Methanol)	31	0
DN7 (Rinse)	24	2
AN2	22	0
AN3	8	1
AN4	31	1
AN7	24	2

**NOTE:** Needles AN2 and DN2 in position 22 are unused in this protocol.

Methanol Volume (mL)	1.6
Stain Volume (mL)	3.6
Dilution Ratio (%)	25

Duration Long

### Principle of the Procedure

The stained smear is examined microscopically; the nucleus and the cytoplasm of neutrophils, lymphocytes, monocytes, eosinophils, and basophils show a characteristic blue or red coloration. Cells are then manually differentiated and quantified.

<b>Cell Type</b>	<b>Cell Component</b>	<b>Color</b>
Neutrophils	Nuclei	Vibrant deep purple
	Cytoplasm	Pink background
	Granules	Light purple-violet
Lymphocytes	Nuclei	Distinct deep purple
	Cytoplasm	Sky blue to deep blue
Monocytes	Nuclei	Light purple with distinct spaces between chromatin strands
	Cytoplasm	Dull blue-gray with lightly stained
	Granules	Fine pink to violet and evenly distributed
Eosinophils	Nuclei	Pale purplish-blue and well defined
	Cytoplasm	Bluish-pink
	Granules	Reddish-orange, large and spherical in shape
Basophils	Nuclei	Purplish-blue, can have reddish tone
	Cytoplasm	Faint pink
	Granules	Distinct deep purplish-blue to purplish-black
Platelets	Cytoplasm	Distinct light blue
	Granules	Small blue to violet-blue, tend to aggregate in center
Red Blood Cells	Biconcave disks	Reddish to reddish-pink in color, intensity of stain is less in central area where cell is thinnest.
Howell-Jolly bodies		Dark purple
Dohle bodies		Pale Blue to pale blue-gray

Promyelocyte	Granules	Dark blue to reddish blue
Auer Rods		Purplish-red





### Causes of RBC Artifacts

- Post-stain rinsing too short
- Reagents expired
- Stain open for extended period
- Dirty stainer
- Room temperature too high
- Humidity too high
- Slide not dry before examination

### Reagents and Supplies

For *in vitro* diagnostic use.

Reagents are ready to use and require no preparation.

REF	Contents	Symbols	Amount
08100142 0097053 (Japan)	Modified Wright Stain	 <b>STN</b>	4 x 3.8 L (1 gallon)
08100290	Modified Wright Buffer	 <b>BUF</b>	4 x 3.8 L (1 gallon)
08096412 00096669 (Japan)	Methanol	 <b>CH<sub>3</sub>OH</b>	4 x 3.8 L (1 gallon)
06837687	ADVIA Autoslide Rinse	 <b>RNS</b>	10 L

### Modified Wright Stain

- Methanol, > 99 %
- Polychrome methylene blue-eosin stain, 0.3 %



**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**

**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

#### **Modified Wright Buffer**

- Phosphate buffer
- Surfactant

#### **Methanol**

- Methyl Alcohol  $\geq 99.8\%$



**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**

**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

### **Reagent Storage and Stability**

Store Stain, Buffer, and Methanol tightly closed between 15°C and 30°C.

Cover open reagent bottles with Parafilm or equivalent to avoid excessive evaporation.

When unopened, reagents are stable until the expiration date printed on the product label when stored at room temperature between 15°C and 30°C.

Once opened, reagents are stable for 45 days.

Do not refrigerate.

Refer to the online ADVIA 2120/2120i Operator's Guide for information on specimen collection.

### **Material required but not provided**

Microscope slides (26 x 76 x 1 mm)

**Size:** 76 x 26 x 1mm

**Description:** ground edges, rounded corners, super frost

Use slides provided by Siemens approved vendors only.

### **Limitations**

Modified Wright reagents produce high quality stained blood films. However, there may be personal preferences in shades and intensities of staining not satisfied by the system.

### **Results**

When used with the ADVIA Autoslide Slide Maker Stainer, the Modified Wright reagents will produce a consistent stain quality to facilitate accurate and reliable interpretation.

### **Technical Assistance**

For customer support, please contact your local technical support provider or distributor.

### **Bibliography**

1. Romanowsky DL. On the Question of Parasitology and Therapy of Malaria. *St. Petersburg Medical Weekly* **16**:297-302 (1891)

2. White WL, Erickson MM, Stevens SC. Practical Automation for the Clinical Laboratory. St. Louis, MO, CV Mosby Co., pp 476-487 (1972)
3. Moss ED. Automated Slide Staining in Haematology. *Can. J. Med. Tech.* **30** (5): 169 (1968)

## Wright Giemsa Method

### Intended Use

The Wright Giemsa method is for in vitro diagnostic use in the differential staining of blood, bone marrow and body fluid smears on the ADVIA Autoslide Slide Maker Stainer. Stained smears are evaluated to identify and quantify cells in whole blood and other specimens to aid clinicians in the assessment of various clinical conditions.

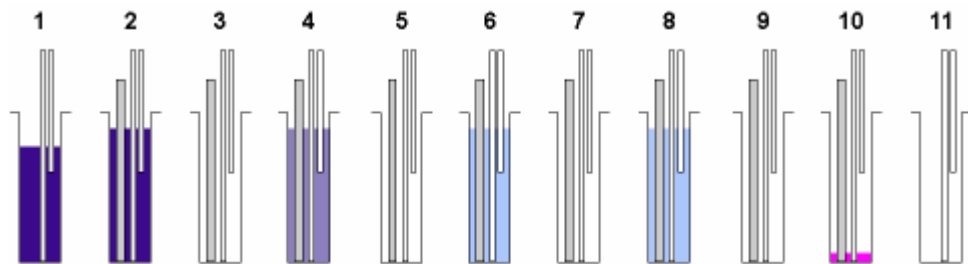
### Summary and Explanation

The reagent protocol for the Autoslide Slide Maker Stainer consists of a modified polychrome methylene blue-eosin stain and is based on the original stain proposed by Romanowsky.

The ADVIA Autoslide Slide Maker Stainer is a smart, fully automated system. It is capable of producing stained smears on all specimens run on the ADVIA 2120/2120i or only on samples with predefined criteria (i.e. flags or parameter threshold). The Autoslide also provides a direct access port to the stainer for pre-smear slides.

### Staining Protocol

The following is a brief description of the staining protocol:



1. Dispensing Modified Wright or Wright-Giemsa Stain (DN1).
2. Slide introduction.
3. Draining Modified Wright or Wright-Giemsa Stain (AN3).
4. Dispensing diluted Modified Wright or Wright-Giemsa Stain (DN3).
5. Draining (AN7).
6. Dispensing rinsing solution (distilled water) (DN7).



7. Draining (AN7).
8. Dispensing rinsing solution (distilled water) (DN7).
9. Draining (AN4).
10. Dispensing methanol (DN4).
11. Slide removal.

Needle	Position	Action
DN1 (Undil. Stain 1)	32	1
DN2 (Buffer)	22	0
DN3 (Dil. Stain 2)	8	1
DN4 (Methanol)	31	0
DN7 (Rinse)	24	2
AN2	22	0
AN3	8	1
AN4	31	1
AN7	24	2

**NOTE:** Needles AN2 and DN2 in position 22 are unused in this protocol.

Methanol Volume (mL)	4
Stain Volume (mL)	3.6
Dilution Ratio (%)	25
Duration	Long

### Principle of the Procedure

The stained smear is examined microscopically; the nucleus and the cytoplasm of neutrophils, lymphocytes, monocytes, eosinophils, and basophils show a characteristic blue or red coloration. Cells are then manually differentiated and quantified.

Cell Type	Cell Component	Color
Neutrophils	Nuclei	Vibrant deep purple
	Cytoplasm	Pink background
	Granules	Light purple-violet
Lymphocytes	Nuclei	Distinct deep purple
	Cytoplasm	Sky blue to deep blue
Monocytes	Nuclei	Light purple with distinct spaces between chromatin strands
	Cytoplasm	Dull blue-gray with lightly stained
	Granules	Fine pink to violet and evenly distributed
Eosinophils	Nuclei	Pale purplish-blue and well defined

Cell Type	Cell Component	Color
	Cytoplasm	Bluish-pink
	Granules	Reddish-orange, large and spherical in shape
Basophils	Nuclei	Purplish-blue, can have reddish tone
	Cytoplasm	Faint pink
	Granules	Distinct deep purplish-blue to purplish-black
Platelets	Cytoplasm	Distinct light blue
	Granules	Small blue to violet-blue, tend to aggregate in center
Red Blood Cells	Biconcave disks	Reddish to reddish-pink in color, intensity of stain is less in central area where cell is thinnest.
Howell-Jolly bodies		Dark purple
Dohle bodies	Cytoplasm	Pale Blue to pale blue-gray
Promyelocyte	Granules	Dark blue to reddish blue
Auer Rods	Cytoplasm	Purplish-red


### Causes of RBC Artifacts




- Post-stain rinsing too short
- Reagents expired
- Stain open for extended period
- Dirty stainer
- Room temperature too high
- Humidity too high
- Slide not dry before examination

### Reagents and Supplies

For *in vitro* diagnostic use.

Reagents are ready to use and require no preparation.

REF	Contents	Symbols	Amount
08096536	Wright Giemsa Stain	 STN	4 x 3.8 L (1 gallon)
00097185 (Japan)			

08097532	Wright Giemsa Buffer		4 x 3.8 L (1 gallon)
08096412	Methanol		4 x 3.8 L (1 gallon)
00096669 (Japan)			
06837687	ADVIA Autoslide Rinse		10 L

### Wright Giemsa Stain

- Methanol, > 99 %
- Polychrome methylene blue-eosin stain



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**R39/23/24/25**  
**S7, S24,**  
**S36/37, S45**



**Highly Flammable!** Highly flammable. Keep away from sources of ignition – No smoking. **Contains methanol.**

**R11**  
**S16**

### Wright Giemsa Buffer

- Phosphate buffer
- Surfactant
- Preservative

### Methanol

- Methyl Alcohol = 99.8 %



**Toxic!** Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed. Keep container tightly closed. Avoid contact with skin. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). **Contains methanol.**

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## Reagent Storage and Stability

Store Stain, Buffer, and Methanol tightly closed between 15°C and 30°C.

During the system run, cover each reagent with Parafilm or equivalent to avoid excessive evaporation.

When unopened, reagents are stable until the expiration date printed on the product label when stored at room temperature between 15°C and 30°C.

Once opened, reagents are stable for 45 days.

Do not refrigerate.

Refer to the online ADVIA 2120/2120i Operator's Guide for information on specimen collection.

## Material required but not provided

Microscope slides (26 x 76 x 1 mm)

**Size:** 76 x 26 x 1mm

**Description:** ground edges, rounded corners, super frost

Use slides provided by Siemens approved vendors only.

## Limitations

Wright Giemsa reagents produce high quality stained blood films. However, there may be personal preferences in shades and intensities of staining not satisfied by the system.

## Results

When used with the ADVIA Autoslide Slide Maker Stainer, the Wright Giemsa reagents will produce a consistent stain quality to facilitate accurate and reliable interpretation.

## Technical Assistance

For customer support, please contact your local technical support provider or distributor.

## Bibliography

1. Romanowsky DL. On the Question of Parasitology and Therapy of Malaria. *St. Petersburg Medical Weekly* **16**:297-302 (1891)
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3. Moss ED. Automated Slide Staining in Haematology. *Can. J. Med. Tech.* **30** (5): 169 (1968)

## Periodic Maintenance

To ensure the operating efficiency of your Autoslide, be sure to follow the simple maintenance procedures scheduled below:

### Weekly

- Clean glass particle waste
- Clean the stain overflow tray
- Perform Weekly shutdown and startup

### After processing 3000 Slides

- Clean the stainer wells and plate
- Clean the power supply fan filter

### As Needed

- Replace the smearing tape and cleaning the smearing wedge
- Replace the printer ribbon

## Removing glass particle waste

Small particles of glass may be chipped off the slides during transfer from the slide dispenser to the slide carrier. These particles are collected in a tray beneath the slide dispenser.

### To remove glass particle waste



Use caution when handling or troubleshooting objects with sharp edges. The edges may cut and cause injury.

1. Using both hands, carefully pull the tray beneath the slide dispenser toward you and remove it.



2. Discard the glass particles according to your standard laboratory procedures.
3. Replace the tray securely under the slide dispenser.

## Cleaning the Stain Overflow Tray



### BIOHAZARD

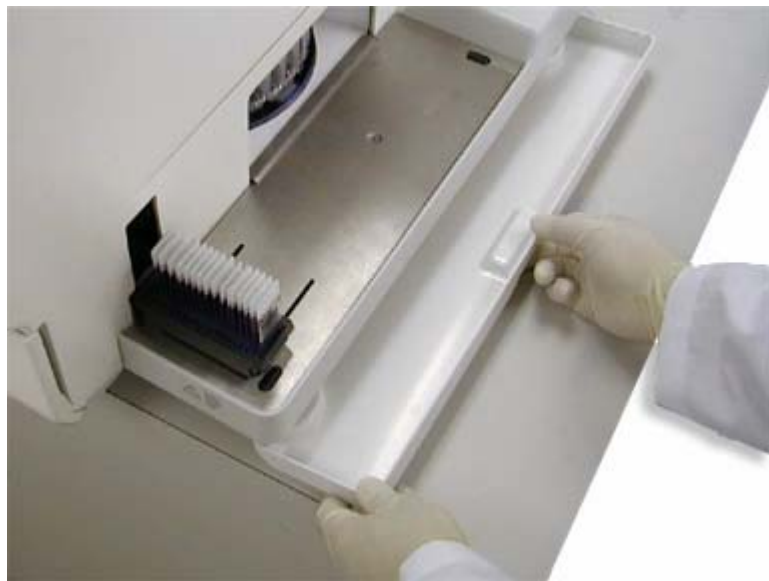
All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

Small amounts of stain may overflow from the stainer wells. This overflow is collected in a tray located on the side of the Autoslide beneath the stainer module.

### To clean the stain overflow tray

1. Using both hands, carefully pull out the tray, located under the stainer module, and remove it.



2. Using a cloth or paper towels, dampen with a 10% solution of bleach and wipe the tray clean.
3. Let the tray air dry, then replace it securely under the stainer module.

## Performing Weekly Shutdown and Startup

The weekly shutdown provides a thorough cleaning of the fluidics circuit and must be performed once a week. Failure to perform the shutdown procedure regularly can result in line clogs.



### TOXIC

Methanol is toxic. To avoid serious irreversible effects do not inhale, do not contact with skin and do not swallow. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately.



### FLAMMABLE

Methanol is flammable. Keep away from sources of ignition - no smoking.

### To perform a weekly shutdown

1. On the ADVIA 2120/2120i software menu, select **Procedures**, then select **Clean Autoslide**.  
The Clean Autoslide window opens.
2. Select **Weekly Shutdown** and follow the instructions displayed on the window to perform a weekly shutdown.
3. When the weekly shutdown completes, you must perform a weekly startup before slide production can resume. If you want turn the system off after the Weekly Shut Down, wait until you are ready to run more samples before performing the Weekly Startup.
4. At the Clean Autoslide window, select **Weekly Startup**.
5. Follow the instructions displayed on the window to perform a weekly startup.

## Cleaning the Stainer Wells and Plate



### BIOHAZARD

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Materials required:

- Methanol
- Laboratory tray
- Paper towels

Time: 15 minutes

Analyzer mode: Standby

#### NOTE

It is recommended that the stainer wells be replaced once a year. Check the Replaceable Parts section of the Operator's Guide for ordering information.



**TOXIC**

Methanol is toxic. To avoid serious irreversible effects do not inhale, do not contact with skin and do not swallow. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately.



**FLAMMABLE**

Methanol is flammable. Keep away from sources of ignition - no smoking.



**CAUTION**

Make sure *all* slides are processed and transferred to the output queue, *before* turning off the Autoslide. Turning off the autoslide while slides are processing can cause unreliable results and possibly damage Autoslide components.

1. Put the analyzer in Standby mode and turn off the Autoslide.
2. Slide open the stainer tray door.



3. While manually rotating the stainer plate, remove the stainer wells by gently sliding each out of the stainer.



 **CAUTION**

Do not put too much force on the staining wells, when removing them. Pulling up or out too hard may damage the wells. They should be clipped gently into and out of place on the stainer plate.

Place the stainer wells in a tray with enough methanol to completely cover them. Agitate the tray to remove any air bubbles.

4. While the wells are soaking, use a soft cloth or paper towel to clean the stainer plate. Rotate the plate manually to clean the entire surface.



5. After the wells have soaked in the methanol for ten minutes, remove them from the tray and dry them with paper towels.

6. While manually rotating the stainer plate, replace each stainer well with the notch on the bottom closest to the edge of the plate.

Make sure that the wells are seated properly, all at the same level, in the stainer tray.

7. Slide the stainer tray door closed.
8. Put the analyzer in Ready mode and turn off the Autoslide.

### **Cleaning the Fan Filter**

1. At the back of the Autoslide, turn off the power.
2. Remove the fan cover and separate the filter.



3. Using a vacuum or air canister, clean all dust and dirt from the filter.
4. Assemble the clean filter with the cover and replace it on the rear of the unit.

### **Replacing the Smearing Tape and Cleaning the Smearing Wedge**



**BIOHAZARD**

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The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended for potentially infectious specimens in *Protection of Laboratory Workers from Infectious Disease Transmitted by Blood, Body Fluids, and Tissue*, 2d edition; Approved Guideline (1997) Document M29-A, National Committee for Clinical Laboratory Standards (NCCLS). This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.

Materials required:

- New smearing tape
- Paper towels

Time: 2 minutes

Analyzer mode: Standby

### To replace the smearing tape

1. At the Operations menu select **Autoslide Control**.  
The Autoslide Control window opens.
2. Under the Special Functions section, select **Smearing Tape**.
3. Under Smearing Tape Options, select **Replace Tape**.
4. Open the Autoslide lower front cover.
5. Using the black magnetic knob, open the tape holder plate.



6. Remove the upper and lower bobbins from their holders.
7. Each time the smearing tape is replaced, wipe the wedge using a soft cloth to remove any dust.



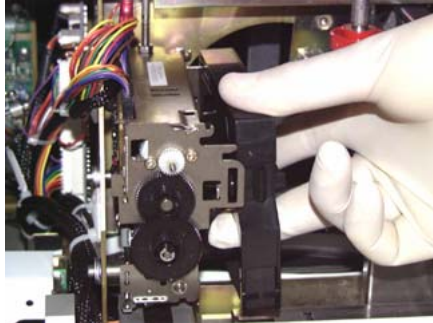
8. Place the new smearing tape bobbin on the upper holder and the take up bobbin on the lower holder. Be careful not to twist or crimp the tape. Thread it through the spindles as shown in the diagram on the inside of the front cover.



**NOTE**

Removing the slide rack loader will cause an **ASL Stop** condition. This message will clear when you perform an Autoslide Mechanical Initialization at the end of this procedure.

3. Holding both sides of the printer cartridge, press toward the inside of the Autoslide and pull the cartridge out of its holder. Be careful not to tangle the ribbon when removing it.



4. Install the new printer cartridge securely in its holder. Make sure the notches on the cartridge are positioned correctly in the holder.
5. Replace the slide rack loader, close the lower front cover.
6. Place the analyzer in Ready mode, then turn the Autoslide on. Wait a few seconds. The Autoslide will perform a Mechanical Initialization. You *must* wait for the initialization to execute automatically.

**Replacing the Autoslide Fuses****IMPORTANT**

*Do not* attempt to replace the Autoslide fuses.

For replacement of all Autoslide fuses, call your Siemens technical support provider or distributor.

## Error Messages and Suggested Actions

The list below contains explanations and actions for the Autoslide errors which may occur. In some cases, the suggested action will refer you to the troubleshooting tip(s) below to help you resolve the problem and restore your system to normal operating status.

A **Failure** status indicates that intervention is required to continue using the Autoslide. The **Warning** status indicates intervention is required to prevent an eventual failure

If the suggested actions described below do not resolve the problem, call your technical support provider or distributor.

### TIP # 1

The Autoslide may not respond immediately to a command, under certain circumstances, it may take up to 30 seconds for a response from the system. This is due to communication restraints between the ADVIA 2120/2120i system and the Autoslide. It is important to allow time for the system to respond - **DO NOT** keep clicking the mouse.

### TIP # 2

In addition to clearing the source of the problem (such as removing a jammed rack etc.), check the Autoslide Status Screen when an error occurs. If both the stainer and smearer are RED, and there are no slides in the stainer, a **MECHANICAL INITIALIZATION** (homes both smearer and stainer) must be performed. If only the smearer is RED, a **RESET SMEARER** restores the system to "Ready" (GREEN) and allow any slides currently being stained to continue processing.

### TIP # 3

If the Autoslide status screen shows RED for the stainer, and slides were being processed, a **RESET AUTOSLIDE** performs a mechanical initialization then drains and removes the slides.

### TIP # 4

Autoslide Error Messages are logged to the message log in the order they occur. If a critical error is displayed, go to the postings just before the critical error and click on Details for additional information about the problem.

### TIP # 5

If, for any reason, the power needs to be cycled to the Autoslide, allow the instrument reconnect the communication link with the ADVIA 2120/2120i system, do not interrupt.

**IMPORTANT:** The table below Event/cause/suggested actions supercedes the table currently displayed in the Operator's Guide.

Event Text	Severity	Probable Cause	Suggested Action
ASL - Aspiration needle retract timeout	Failure	Aspiration needle failed to retract in time.	Perform Mechanical Initialization to reset autoslide, check autosampler - if necessary, perform an autosampler reset or power the ADVIA 2120/2120i system off/on.
ASL - Command Timeout - Stop	Failure	Command timeout on autoslide. Run stopped if Alarm/Stop criteria set for critical error.	Perform Mechanical Initialization to reset autoslide, Cycle power to Autoslide if problem persists, call Siemens.
ASL - Communications error	Failure	Communication lost between Analytical Module and Autoslide.	Check serial I/O cable between instrument and autoslide, and cycle autoslide power, perform a mechanical initialization.
ASL - Configuration / Parameter error	Failure	An invalid parameter was used to configure the Autoslide.	Perform Mechanical Initialization to reset autoslide, and report problem to Siemens.
ASL - Critical Error - Stop	Failure	General autoslide critical error (software error, unrecognized version, emergency stop, communications, bad parameter, EEPROM error, not initialized, sync error, sample may be diluted, hardware error, autoslide interface error, command timeout, command status...). Run stopped if Alarm/Stop criteria set.	Check message log for other errors, correct problem, reset autoslide - see Tip # 2.
ASL - Dispenser error	Failure	Mechanical problem on dispenser	Inspect dispenser area. Look for stuck or broken slide. Ensure sufficient slides are loaded to cover both slide sensors, proceed to Tip # 2
ASL - EEPROM error	Failure	EEPROM read or write error during initialization.	Call Siemens.
ASL - EEPROM IO error	Failure	An error occurred when reading or updating the EEPROM.	Perform Mechanical Initialization to reset autoslide, Cycle power to Autoslide if problem persists, and call Siemens.
ASL - Emergency stop cycle	Failure	Cover may have been opened while autoslide was busy.	Close cover, and reset autoslide. See Tips # 2 & 3.
ASL - Hardware error	Failure	A hardware error has occurred.	Check message log for other errors, correct problem, reset autoslide - see Tip # 2. Call Siemens.



Event Text	Severity	Probable Cause	Suggested Action
ASL - Impossible to rinse	Failure	Unable to rinse sample or drop deposit lines; Other command is processing.	Perform a mechanical initialization; If problem persists, call Siemens.
ASL - Internal software error	Failure	Software initialization problem or incorrect data entered.	Enter correct information; Run a mechanical initialization cycle. Call your Siemens Representative if not resolved.
ASL - Internal synchronization error	Failure	Autoslide internal synchronization error.	Perform a mechanical initialization. If problem persists, call Siemens.
ASL - Needle plate error	Failure	Staining needle positioning problem.	Open the covers and identify the problem. Close covers. Refer to Tips 2 & 3. If needles hitting slides, call Siemens.
ASL - Operation completed in error	Failure	Run Stopped - Autoslide command completed with an error.	Check Message Log - Detail screen for cause, correct and perform Mechanical Initialization.
ASL - Printer error	Failure	Printer ribbon not advancing or jammed.	Open front panel, inspect printer ribbon - clear jam or replace ribbon as needed. Ensure that there are no glass particles in the printer area. Run a Mechanical Initialization cycle. Cycle autoslide power if necessary.
ASL - Rack Error - Stop	Failure	General rack problem, could be low on racks.	Replenish racks in dispenser, check for jammed rack or full ejection tray. Run a reset smearer. (See Tips above)
ASL - Rack Handling error	Failure	Hardware failure in rack handler track.	Check for jammed racks or debris. Run a reset smearer. (See Tips above)
ASL - Slide Carrier error	Failure	Slide did not make it to the carrier in time, or loaded incorrectly.	Clear slide and inspect area for glass particles or debris then refer to Troubleshooting Tip # 2.
ASL - Smearing Error - Stop	Failure	Smearer door was open. Run stopped if Alarm/Stop criteria set.	Close smearer door, reset smearer (see Tip #2).
ASL - Smearing module door is open	Failure	Smearing module door is open.	Close the smearing module door, reset smearer if necessary.
ASL - Smearing module not primed	Failure	Smearing module is not primed.	Run prime smearer hydraulic cycle and reset smearer. Perform Daily Startup if necessary.

Event Text	Severity	Probable Cause	Suggested Action
ASL - Smearing module not ready	Failure	Smearing module problem.	Reset smearer. Call Siemens.
ASL - Smearing tape is loose	Failure	Smearing film empty, broken or incorrectly threaded.	Perform the smearing film replacement procedure. Be sure to check smearing wedge for cleanliness.
ASL - Stainer error	Failure	Stainer error.	Reset autoslide (see Tips # 2 & 3).
ASL - Stainer module door is open	Failure	Stainer module door is open.	Close the stainer module door. Perform a mechanical initialization, if necessary
ASL - Stainer not primed	Failure	Stainer is not primed.	Check message log to see if daily startup has been done, perform a daily startup or Stainer Prime (if daily startup was completed) followed by a mechanical initialization if necessary.
ASL - Stainer not ready	Failure	The stainer subsystem is not rinsed.	Reset autoslide.
ASL - Stainer under methanol	Failure	Stainer wells are full with methanol	Run the daily or weekly startup procedure to drain the methanol.
ASL - Staining Error - Stop	Failure	Stainer door was open. Run stopped if Alarm/Stop criteria set.	Close stainer door, reset autoslide, resume run.
ASL - Staining waste is full ASL - Staining Waste Full - Stop	Failure	Staining Waste is full - stainer enabled.	Dispose of staining waste according to local regulations; Perform a Reset Autoslide if necessary.
ASL - Unknown error	Failure	Autoslide reported an error unrecognized by the ADVIA 2120/2120i system.	Call Siemens.
ASL - In Pre-smear slide mode	Information	An operation is rejected because STAT slide mode is in effect.	Wait for Stat slide to be completed, close manual slide entry door and try again.
ASL - Autoslide aspiration hardware unavailable on autosampler	Warning	The autosampler hardware for the second aspiration position is inoperable or unavailable	If system has a dual sampler, perform an autosampler reset. If not successful, power the ADVIA 2120/2120i system off/on. Call Siemens.
ASL - Autoslide is not available to make slides	Warning	Autoslide is not ready for use.	Perform daily/weekly maintenance as required, and try again.
ASL - Please Close manual door	Warning	Stat door is open.	Close the manual inlet /stat door.

Event Text	Severity	Probable Cause	Suggested Action
Autoslide Command Error	Warning	Autoslide command error, or EEPROM failed.	Retry the command.
Autoslide Daily Shutdown Incomplete	Warning	An error occurred that prevented the autoslide daily shutdown from completing.	Check message log for errors, correct any problems, and retry the daily shutdown. If still not successful, perform a Mechanical Initialization and then retry the daily shutdown.
Autoslide Daily Startup Incomplete	Warning	An error occurred that prevented the autoslide daily startup from completing.	Check message log for errors, correct any problems, and retry the daily startup. If still not successful, perform a Mechanical Initialization and then retry the daily startup
Autoslide is Processing Slides	Warning	Attempt was made to go to a configuration screen while slides were being processed.	Wait until all slides are completed before attempting to change configuration.
Autoslide Manual Inlet Door Cannot be Opened	Warning	The manual inlet door cannot be opened because the stainer is not enabled for use or the ADVIA 2120/2120i Autosampler is active.	Enable the stainer in the Autoslide options menu or stop Autosampler if appropriate, and try again.
Autoslide Manual Inlet Door Failed to Open	Warning	An error occurred while attempting to open the manual inlet door.	Check for something blocking the Stat door, and try again.
Autoslide operation cannot proceed as Compressor is Not Ready	Warning	Instrument is in standby, so compressor is off.	Take instrument out of Standby mode.
Autoslide Rejects Command Execution	Warning	The Autoslide is unable to execute the command at this time.	Action depends on the situation. Generally no action is required.
Autoslide Weekly Shutdown Incomplete	Warning	An error occurred during the weekly shutdown.	Check message log for other errors, correct problem, reset Autoslide, and repeat weekly shutdown.
Autoslide Weekly Startup Incomplete	Warning	An error occurred during the weekly startup.	Check message log for other errors, correct problem, reset Autoslide, and repeat weekly startup.
Autoslide Weekly Startup Needed	Warning	Weekly startup is now required.	Perform weekly startup.

## **Autoslide Specifications**

The Autoslide is for indoor use only. Operation of the instrument at altitudes of over 2000 meters (6000 feet) is not recommended.

### **Throughput**

Up to 108 slides per hour

### **Dimensions**

Weight: 60 kg (approx.)

Width: 91 cm

Depth: 70 cm

Height: 50 cm

### **Operating Temperature Range**

20 – 30°C

### **Relative Humidity**

30 – 60%

### **Noise Level**

65 decibels

### **Electrical Requirements**

From 100V to 240V  $\pm$  10%

Maximum: 200 VA

### **Slide Requirements**

super frost, rounded corner, ground edges

76 mm x 26 mm x 1 mm

Use slides provided by Siemens approved vendors *only*.

### **Sample Requirement**

75  $\mu$ L whole blood

## Legal Information

<b>LIMITED INSTRUMENT WARRANTY AND SERVICE DELIVERY POLICY ..</b>	<b>2</b>
WARRANTY PERIOD .....	2
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This section provides the following information:

- address of the Siemens authorized representative, which is the Siemens contact within the European community
- addresses for obtaining service and technical information and for ordering supplies
- system warranty and service delivery policy information

## **Limited Instrument Warranty and Service Delivery Policy**

Siemens and its authorized distributors may provide customers who acquire new Siemens instruments with a limited warranty either in a specific agreement or in standard language on their invoices. This limited warranty is designed to protect customers from the cost associated with repairing instruments that exhibit malfunctions due to defects in materials and/or workmanship during the warranty period.

Siemens, at its election, provides warranty service either by providing repair service of the instrument on site, or by exchanging the defective instrument or component, subject to the limitations and exclusions set forth in *Replacement of Parts and Warranty and Service Exclusions* below. Repairs, replacements or exchanges of instruments or components provided during the warranty or any additional service period, does not extend the warranty or service period beyond the initially agreed upon period.

When the customer calls for service, the Siemens representative or authorized distributor informs the customer of the type of service available for the customer's instrument, and instructs the customer as to how to obtain that service.

### **Warranty Period**

The limited warranty period generally commences upon installation of the original instrument at the customer's location and extends for a period of 1 year thereafter, unless otherwise specifically agreed to by and between Siemens (or its authorized distributors) and customer in a writing signed by duly authorized representatives of both parties (sales representatives are generally not authorized representatives of Siemens for these purposes).

### **Additional Service Period**

The customers, with some exceptions, may purchase additional service coverage beyond any initial warranty period as part of the original instrument acquisition for second or subsequent years beyond the original installation date. The customer's original Purchase Invoice or appropriate Agreement Addendum must indicate the term in months for additional service coverage.

## **Service During Normal Hours**

The customer may obtain service for instruments during normal business hours by contacting the nearest Siemens location or authorized distributor. Refer to the list of Siemens locations in this section.

## **Extent of a Service Call**

Warranty or service calls generally include onsite repair or exchange of instruments or components, travel to the location of the instrument, and onsite labor during normal business hours. A warranty or service call is initiated by the customer by following the instructions on how to obtain service for the customer's instrument. The service call is considered complete when any defects in material or workmanship have been corrected by repair or replacement and the instrument conforms to the applicable specifications. When service is complete, the customer receives a copy of the documentation detailing all work performed by the Siemens representative or authorized distributor.

## **Service Outside Normal Hours**

Customers, with some exceptions, may also request service to be delivered or an exchange to be initiated outside normal business hours, including evenings, weekend days, or nationally observed holidays, by contacting the nearest Siemens location or authorized distributor. Service performed outside normal hours is subject to a surcharge unless the customer has in place a service product option that provides service at the time requested.

## **Replacement of Parts**

In performing service, Siemens or its authorized distributors provide appropriate parts to repair the instrument, or arranges for the exchange of the instrument or affected parts, at no charge with the exception of certain parts or subassemblies that are considered Customer Maintenance Items. Customer Maintenance Items include, but are not limited to, the following items: lamps, electrodes or sensors (which are covered by a separate warranty), reagents, calibrators, controls, paper, and pens. Consult the appropriate system operator's manuals for a complete list of Customer Maintenance Items for any specific model of instrument.

## **Design Changes and Retrofitting of Instruments**

Siemens reserves the right to change the design or construction of specific models of instruments at any time without incurring any obligation to make such changes available to individual customers or instruments. If Siemens notifies customers of a change that improves the performance or reliability of their instrument, and requests to retrofit that instrument, the customer must agree to allow Siemens or an authorized distributor, at Siemens' expense, to retrofit components or make design changes, which does not adversely affect the instrument's performance characteristics.

## **Key Operator Designation**

Each customer designates a key operator who is available to Siemens representatives to describe instrument malfunctions by telephone and/or to perform simple adjustments and corrections as requested. If a key operator is not designated or is unavailable when the customer requests service, the delivery of service may be delayed.

## **OSHA Requirements (US only)**

When service is required at a customer location, the customer must provide the Siemens representative with adequate facilities that comply with the regulations of the Secretary of Labor under the Occupational Safety and Health Act (OSHA) of 1970, as amended.

## **Warranty and Service Exclusions**

The following exclusions are in addition to any exclusions provided for in any written warranty or service agreement.

**IF ANY OF THE FOLLOWING EVENTS OCCUR, THE WARRANTY OR SERVICE PROVISIONS DO NOT APPLY:**

1. Repairs or modifications have been made to the instrument by someone other than an authorized Siemens representative.
2. The instrument has been operated using accessories and supplies other than Siemens brand accessories, or consumable supplies and/or reagents not having the same grade, quality, and composition as defined in the system operator's manuals.
3. Siemens has notified customers of a change that improves the performance or reliability of their instrument and customer has not agreed to retrofit or make design changes to the instrument.
4. Customer did not purchase the instrument from Siemens or one of its authorized distributors.
5. The instrument has not been installed within 90 days of shipment to the customer's facility unless otherwise specified.
6. The customer has not performed appropriate customer maintenance procedures, as outlined in the system operator's manuals.
7. The instrument has been misused or used for a purpose for which it was not intended.
8. The instrument has been damaged in transit to the customer or damaged by the customer while moving or relocating it without supervision by a Siemens representative.
9. Damage was caused by floods, earthquakes, tornados, hurricanes, or other natural or man-made disasters.
10. Damage was caused by Acts of War, vandalism, sabotage, arson, or civil commotion.



11. Damage was caused by electrical surges or voltages exceeding the tolerances outlined in the system operator's manuals.
12. Damage was caused by water from any source external to the instrument.
13. The customer has purchased an alternative agreement whose terms of warranty or service supersede these provisions.

Siemens or its authorized distributors can invoice customers, at current standard labor and parts rates, for instruments repaired to correct damage or malfunctions due to any of the reasons listed above.

OTHER THAN AS STATED ABOVE, THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE INSTRUMENT, ITS SALE TO THE CUSTOMER, ITS LEASE TO THE CUSTOMER, OR THE SALE OF THE INSTRUMENT TO THE CUSTOMER AT THE EXPIRATION OR TERMINATION OF THE LEASE AGREEMENT.

SIEMENS HEALTHCARE DIAGNOSTICS SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE.

SIEMENS HEALTHCARE DIAGNOSTICS' LIABILITY FOR BREACH OF ANY WARRANTY OR SERVICE AGREEMENT SHALL BE LIMITED ONLY TO THE REPAIR OR REPLACEMENT OF DEFECTIVE EQUIPMENT AND SHALL NOT INCLUDE ANY DAMAGES OF ANY KIND, WHETHER DIRECT, INDIRECT, INCIDENTAL, CONTINGENT, OR CONSEQUENTIAL. SIEMENS SHALL NOT BE LIABLE FOR DELAY FROM ANY CAUSE IN PROVIDING REPAIR OR EXCHANGE SERVICE.

ANY LIMITATIONS OR OTHER PROVISIONS NOT CONSISTENT WITH APPLICABLE LAW IN PARTICULAR JURISDICTIONS OR A SPECIFIC WRITTEN AGREEMENT DO NOT APPLY TO CUSTOMERS IN THOSE JURISDICTIONS OR SUBJECT TO THOSE AGREEMENTS.

### **Information for Technical Assistance**

Refer to the procedures in this appendix to provide system information that you may need when you call for technical assistance.

### **Contact Information**

This section provides the following information:

- the address of the Siemens authorized representative, which is the Siemens contact within the European community
- the Siemens addresses for obtaining service and technical information and for ordering supplies

### **Siemens Authorized Representative**

Siemens Healthcare Diagnostics Ltd.  
Sir William Siemens Sq., Frimley, Camberley, UK GU16 8QD.

## Addresses

For technical assistance contact your local technical support provider. For customer service or additional information contact your local technical support distributor.



Siemens Healthcare Diagnostics Inc.  
Tarrytown, NY 10591-5097 USA



Siemens Healthcare Diagnostics Ltd.  
Sir William Siemens Sq.  
Frimley, Camberley, UK GU16 8QD

[www.siemens.com/diagnostics](http://www.siemens.com/diagnostics)

Siemens Healthcare  
Diagnostics Pty Ltd  
885 Mountain Highway  
Bayswater Victoria 3153  
Australia

シーメンスヘルスケア・  
ダイアグノスティクス株式会社  
東京都品川区東五反田 3-20-14  
Siemens Healthcare Diagnostics

輸入

## Warnings and Safety Information

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## Warnings



### ELECTRICAL WARNING

To avoid exposure to shock hazards and/or damage to the instrument while performing this procedure, power off the analyzer before proceeding.



### BIOHAZARD

All products or objects that come in contact with human or animal body fluids should be handled, before and after cleaning, as if capable of transmitting infectious diseases. Wear facial protection, gloves, and protective clothing.

The operator should follow the recommendations to prevent the transmission of infectious agents in health-care settings as recommended by the Clinical and Laboratory Standards Institute (formerly NCCLS) in *Protection of Laboratory Workers from Occupationally Acquired Infections; Approved Guideline - Third Edition*. 2005. CLSI Document M29-A3. This document contains complete information on user protection and it can be used as reference material for instructions on laboratory safety.



### LASER WARNING

To avoid damage to the eyes, never look directly at the laser beam or at its reflection from a shiny surface. All field service procedures must be followed precisely. Only Siemens-trained field service personnel should perform procedures related to laser assemblies.

For more safety information and laser specifications, refer to **Safety Information, Protecting yourself from lasers**.



### WARNING

When handling **EZ KLEEN**, wear protective clothing, gloves, and safety glasses. It is harmful if swallowed and may cause eye or skin irritation.



### WARNING

Regular strength household bleach is 5% sodium hypochlorite. Extra-strength household bleach is 6% sodium hypochlorite. Either strength may be used with the ADVIA 2120/2120i Hematology System. When handling bleach, which can be used as a cleaning and antiviral agent, wear protective clothing, gloves, and safety glasses. It is harmful if swallowed and may cause eye or skin irritation.

Use household bleach that is free of heavy metals, such as Clorox.

To prepare a 25% solution of household bleach, dilute one part of bleach with three parts of clean distilled water, or clean deionized water. The prepared solution is stable for one week when stored at room temperature.

## Safety Information

Safety features have been incorporated into the ADVIA 2120/2120i system to protect the operator from injury, the analyzer from damage, and the test results from inaccuracies.

## Regulatory Compliance

### Standards or regulations

The ADVIA 2120/2120i conforms to the following safety standards or regulations:

EN61010-1: 1993	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1
EN60825-1	Safety of Laser Products; Part 1
UL 3101-1	Electrical Equipment for Laboratory Use; Part 1: General Requirements.
CAN/CSA C22.2 No. 1010.1 - 92	Safety requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements
CFR 47: Chapt. 1 FCC Subpart B Part 15.103 Exempted Devices (C) Part 15.105 (A)	This equipment has been tested and found to comply with the limits of a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

### CE mark requirements

The ADVIA 2120/2120i conforms to the following standard. It therefore meets the EMC conformity requirements for “CE” marking according to the European IVDD Directive 98/79 EC.

EN 61326-1 1997+ A1:1998 + A2:2001 (Class "A")	Electrical Equipment for measurement, control, and laboratory use - EMC requirements
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## Noise-limit requirement

The ADVIA 2120/2120i conforms to the following noise-limit requirement:

EN27779: 1989    Measurement of Airborne Noise Emitted By Computer and Business Equipment (61 dBA)

## Documentation

In the printed and online documentation, all hazards (except those associated with reagents) are categorized as follows:

- WARNING**        Indicates the risk of personal injury or loss of life if operating procedures and practices are not correctly followed.
- CAUTION**        Indicates the possibility of damage to or destruction of equipment if operating procedures and practices are not strictly observed.
- IMPORTANT**      Indicates that system functions, including test results, may be adversely affected if operating procedures and practices are not correctly followed.

Hazards associated with the presence, handling, or use of required reagents are categorized as follows:

- CAUTION !**        Indicates a hazard that could cause illness, burns, skin reactions, and so on. Substances such as diluted acids, mild caustics, minor skin irritants, and combustible materials are assigned to this category.
- ATTENTION**      Indicates that a specific risk exists to the user or performance.

Refer to the labels on the reagent containers and to the Material Safety Data Sheets for information about the hazards and precautions associated with the reagents.

## System Symbols

This section describes the symbols that can appear on the exterior of the ADVIA 2120/2120i system or on the system packaging. The symbols on the system provide you with the location of certain components and with warnings for proper operation. The symbols on the system packaging provide you with other important information.

## Warnings and Cautions



- A Warning indicates the risk of personal injury or loss of life if operating procedures and practices are not correctly followed.
- A Caution indicates the possibility of loss of data or damage to or destruction of equipment if operating procedures and practices are not strictly observed.



When this symbol appears on the system without additional information, you must consult the instructions for use.



Biohazard.

The biohazard warning label mounted on the front of the analyzer alerts you to the possibility of exposure to a biohazard during the sampling process or through contamination of the analyzer.



This symbol identifies a product that may contain an infectious agent.



This symbol alerts you to a potentially harmful substance.



These symbols together alert you to a waste biohazard.



Laser hazard






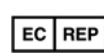




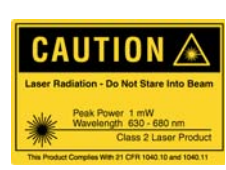

Electrical hazard



This symbol indicates an *in vitro* diagnostic device or an *in vitro* diagnostic medical device.



This symbol indicates that you should consult the operating instructions for necessary information.

<b>REF</b>	This symbol indicates the number used for ordering a part or product.
<b>SN</b>	This symbol indicates the serial number of a part or product.
	This symbol indicates the batch code for a product.
	This symbol indicates the name and location of the product manufacturer.
	This symbol indicates the date of manufacture of the product.
	This symbol indicates the manufacturer's authorized representative within the European community.
	This symbol indicates that the product complies with the applicable directives of the European Union.
	This symbol indicates that the product was IEC 61010-1 safety tested by TUV for conformity to global markets including Canada, US, and EU.
	This symbol indicates that the colorimeter conforms with DIN standard 58 960 developed by the Working Committee on Photometers of the Standards Committee on Medicine (NAMed) in the DIN Deutsches Institute für Normung e.V.
	This symbol indicates that the product is a Class 1 laser product, with no laser exposure during normal operation.
	This symbol indicates that the product is a Class 2 laser product, with potential exposure to a laser beam.
	This is the On symbol.





This is the Off symbol.



This is the Start symbol.



This is the Standby symbol.



This symbol indicates the switch position for normal system operation of the waste container.



This symbol indicates the switch position for emptying the waste container.



This symbol indicates the need to empty the waste container.



This symbol indicates the open and closed positions for a spigot.



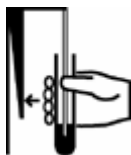
This symbol indicates liquid waste.



This symbol indicates pressure. In this example, the symbol indicates 20 PSI.



This symbol indicates vacuum. In this example, the symbol indicates a vacuum of 20" Hg.



This symbol indicates the manual open-tube sampler.



This symbol indicates the manual closed-tube sampler.



This symbol indicates that there is a rack in the sampler.




This is the eject rack symbol.

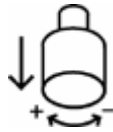


This is the network symbol.



This is the monitor symbol.

 This symbol indicates the maximum level.



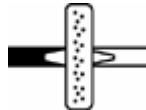
This is the knob symbol.



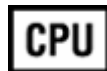
This is the fuse symbol.



This is the filter symbol.



This is the vacushield symbol.



This is the CPU symbol.



This symbol indicates a protective terminal.



This is the barcode scanner symbol.



This symbol indicates that moving the component can cause injury.



This symbol identifies a product that contains recyclable material.



This symbol indicates the top of the package.



This symbol indicates the acceptable temperature range for storage of the product.




















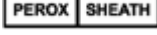




使用期限

This symbol identifies the date by which the product should be used.



This is the Setpoint Calibrator symbol.

	This is the TESTpoint 3-in-1 Hematology Control Abnormal 1 symbol.
	This is the TESTpoint 3-in-1 Hematology Control Abnormal 2 symbol.
	This is the TESTpoint 3-in-1 Hematology Control Normal symbol.
	This is the TESTpoint High Control symbol.
	This is the TESTpoint Low Control symbol.
	This is the TESTpoint Normal Control symbol.
	This is the CSF Control 1 symbol.
	This is the CSF Control 2 symbol.
	This is the ADVIA RETIC High Control symbol.
	This is the ADVIA RETIC Low Control symbol.
	This is the DEFOAMER symbol.
	This is the EZ KLEEN symbol.
	This is the BASO Reagent symbol.
	This is the CSF Reagent symbol.
	This is the HGB Reagent symbol.
	This is the CN-FREE HGB Reagent symbol.
	This is the PEROX 1 Reagent symbol.
	This is the PEROX 2 Reagent symbol.
	This is the PEROX 3 Reagent symbol.
	This is the PEROX SHEATH symbol.
	This is the RBC/PLT Reagent symbol.
	This is the SHEATH/RINSE symbol.

## Interpretation of Results

System operators and laboratory supervisors are responsible for operating and maintaining Siemens products in accordance with the procedures described in the applicable Product Labeling (online documentation, package inserts, bulletins), and for determining that product performance conforms to the applicable claims.

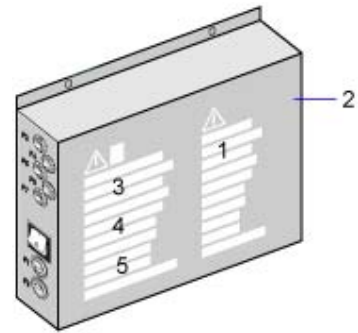
If, under these prescribed conditions of operation and maintenance, an aberrant or abnormal result, as defined by the laboratory protocol, occurs, laboratory personnel should first make certain that the system is performing and is being operated in accordance with the Product Labeling; then follow the laboratory protocol for advising the clinician of a result that appears to have deviated from the norms established by the laboratory.

Siemens products do not make diagnoses on patients. Siemens intends its diagnostic products (systems, reagents, software, hardware) to be used to collect data reflecting the patient's chemical, hematological, or immunological status at a certain point in time. Such data must be used in conjunction with other diagnostic information and with the attending physician's evaluation of the patient's condition to arrive at a diagnosis and a clinical course of treatment.

Any malfunction of a Siemens diagnostic product (for example, failure to meet a performance specification or to perform as intended) should be appropriately addressed by laboratory personnel. Various sections of the Product Labeling address malfunctions and their possible effect on results.

## Explanation of the warning labels on the AC power box

- 1 The AC power box must be opened by qualified personnel only. The only operator serviceable parts in the AC power box are fuses F1 through F7, which are replaced without opening the module.
- 2 The two electrical outlets on the side of the AC power box are intended only for the computer and monitor supplied with the system. These outlets are designed to ensure proper operation of the system devices and to maintain the system safety certifications. Do not connect other devices to them.
- 3 Since electrical power is still applied to some system components even after the power switch is turned off, you must unplug the main power before servicing the system (for example, when replacing fuses).
- 4 Always replace fuses F1 and F2 at the same time. Any high-current event that causes one of these fuses to fail can damage the other one and shorten its service life.
- 5 Always replace a fuse with one of the same type and rating. If the fuse label is missing or illegible, refer to the fuse information table. Be sure to select the fuse requirements appropriate for your system's input voltage.



AC power box location

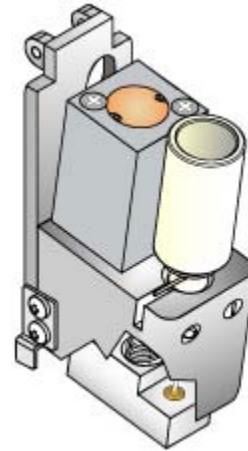
## Explanation of the warning labels on the manual closed-tube sampler

Sampler Door



Never put your finger into the manual closed-tube sampler centering collar.

Manual Closed-Tube Sampler



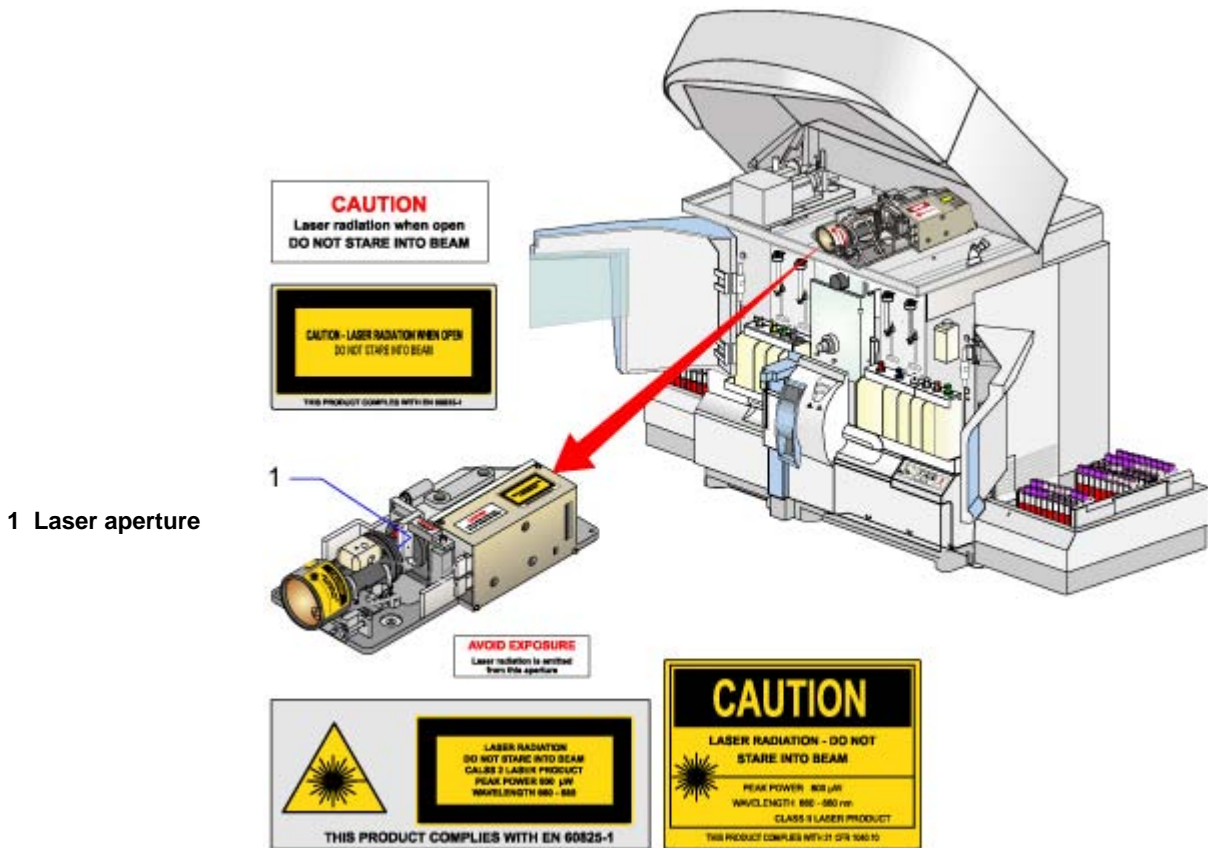
To avoid injury when removing or replacing the manual closed-tube sampler needle or centering collar, the system must be off. You must place a protective cover over the needle immediately after removing the centering collar.

## Protecting yourself from lasers

The ADVIA 2120/2120i Hematology System is classified as a Class I laser product as defined by the National Center for Devices and Radiological Health (CDRH) regulations 21 CFR 1040 and by EN-60825.

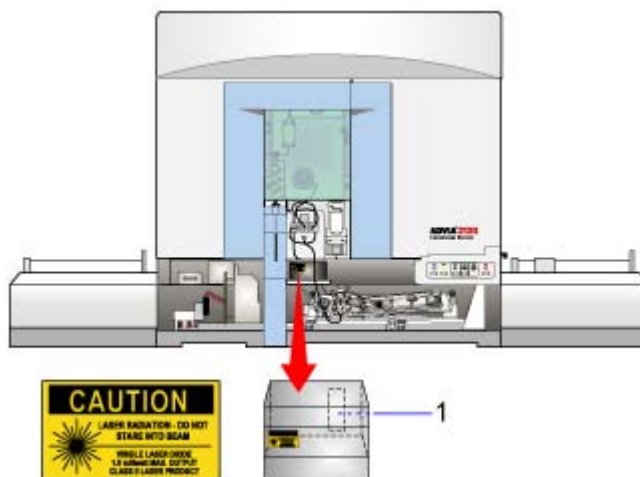
### RBC laser optical assembly

The RBC laser optical assembly is classified as a Class II laser device which has a maximum power output of 800  $\mu\text{W}$  at 670 nm (nominally) and a continuous wave output. The RBC laser assembly is set internally to have a maximum output of  $290 \pm 58 \mu\text{W}$ . The laser beam path is enclosed in a series of non-interlocked protective housings that prevent human access to laser radiation during operation and maintenance of the laser product.



## Autosampler Barcode Reader

The autosampler barcode reader is classified as a Class II laser device. It has a maximum power output of 1 mW at a wavelength of 670 nm, a pulse duration of 90 ns, and 3.6 mr units of beam divergence.



- 1 Laser aperture in back of barcode reader



### LASER WARNING

Some field service procedures require the removal of the protective housings that prevent human access to the laser radiation. All field service procedures must be followed precisely to prevent possible eye injury from the laser radiation. Only Siemens-trained field service personnel should perform procedures related to the ADVIA 2120/2120i laser optics bench.

### Laser Hazard Precautions

The following list of precautions must be observed when servicing the ADVIA 2120/2120i laser optics:

- Remove all jewelry from hands and wrists.
- Do not look directly at the laser beam.
- Do not look at specular reflections from the laser beam.
- Do not place reflective objects, such as screwdrivers or jewelry, into the beam path.
- Always ensure that the laser beam is terminated with a beam stop.

