

ABL800 FLEX

Operator's manual

Table of Contents

1. Introduction

2. What is what

3. Installation and setup

4. Sample measurements

5. Quality control

6. Calibration

7. Replacements

8. Disk functions

9. Data management

10. Analyzer shutdown

11. Troubleshooting

12. Sampling

13. Specifications

14. Ordering information

15. Radiometer settings

Index - Date of Issue

SYSTEM PERFORMANCE AND WARRANTY DISCLAIMER

Radiometer cannot provide or verify instrument performance characteristics and accept warranty claims or product liability claims if the recommended procedures are not carried out, if accessories other than those recommended by Radiometer are used, or if instrument repairs are not carried out by authorized service representatives.

The instructions given in the Operator's Manual for the ABL800 FLEX analysers must be observed in order to ensure proper instrument performance, and to avoid electrical hazards.

DATA STORAGE DISCLAIMER

Radiometer Medical ApS is not liable for any damage to or loss of stored data or for indirect or consequential damage caused by such damage, such as, but not limited to, damage for loss of profit or loss of business.

LICENSE AGREEMENT

The software installed and provided with the instrument is comprised of Microsoft® Windows®XP Embedded, VxWorks®, Sybase®, SQL Anywhere®, and Radiometer - developed software. The purchaser of the analyzer is referred to the terms of the general End-User License Agreement provided in the analyzer start up picture and to the terms of the Microsoft® Windows®XP Embedded End-User Agreement included in this Operator's Manual.

If the purchaser does not accept or agree to the terms of the End-User License Agreements the purchaser should promptly contact the supplier of the analyzer (his Radiometer representative or other supplier) for a return of the analyzer and a refund of his money.

TRADEMARKS

AutoCheck™, CLINITUBES™, DATACHECK™, PICO™, QUALICHECK™, RADIANCE™, Red System™ and Radiometer™ are trademarks of Radiometer Medical ApS, Denmark.

ABL is registered in the USA.

QUALICHECK is registered in the USA and in some other countries.

Microsoft® Windows®XP is a registered mark of the Microsoft Corporation.

VxWorks® is a registered trademark of WindRiver Systems Incorporated.

Sybase® SQL Anywhere® is a registered trademark of Sybase Incorporated.

COPYRIGHT

The contents of this document may not be reproduced in any form or communicated to any third party without the prior written consent of Radiometer Medical ApS.

While every effort is made to ensure the correctness of the information provided in this document Radiometer Medical ApS assumes no responsibility for errors or omissions which nevertheless may occur.

This document is subjected to change without notice.

©Radiometer Medical ApS, DK-2700 Brønshøj, Denmark, 2006. All Rights Reserved.

The software is owned by Radiometer Medical ApS, The Microsoft Corporation, WindRiver Systems Incorporated, and Sybase Incorporated and is protected by copyright laws and treaties.

End User License Agreement for the ABL800 FLEX Analyzers

You have acquired a device ("DEVICE") THAT INCLUDES SOFTWARE LICENSED BY Radiometer Medical ApS from Microsoft Licensing Inc. or its affiliates ("MS"). Those installed software products of MS origin, as well as associated media, printed materials, and "online" or electronic documentation ("SOFTWARE") are protected by international intellectual property laws and treaties. The SOFTWARE is licensed, not sold. All rights reserved.

IF YOU DO NOT AGREE TO THIS END USER LICENSE AGREEMENT ("EULA"), DO NOT USE THE DEVICE OR COPY THE SOFTWARE. INSTEAD, PROMPTLY CONTACT THE SUPPLIER OF THE INSTRUMENT FOR INSTRUCTIONS ON RETURN OF THE UNUSED DEVICE(S) FOR A REFUND. **ANY USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO USE ON THE DEVICE WILL CONSTITUTE YOUR AGREEMENT TO THIS EULA (OR RATIFICATION OF ANY PREVIOUS CONSENT).**

GRANT ON SOFTWARE LICENSE. This EULA grants you the following license:

- You may use the SOFTWARE only on the DEVICE.
- **NOT FAULT TOLERANT.** THE SOFTWARE IS NOT FAULT TOLERANT. RADIOMETER MEDICAL ApS HAS INDEPENDENTLY DETERMINED HOW TO USE THE SOFTWARE IN THE DEVICE, AND MS HAS RELIED UPON RADIOMETER MEDICAL ApS TO CONDUCT SUFFICIENT TESTING TO DETERMINE THAT THE SOFTWARE IS SUITABLE FOR SUCH USE.
- NO WARRANTIES FOR THE SOFTWARE. **THE SOFTWARE is provided "AS IS" and with all faults. THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCURACY, AND EFFORT (INCLUDING LACK OF NEGLIGENCE) IS WITH YOU. ALSO, THERE IS NO WARRANTY AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE SOFTWARE OR AGAINST INFRINGEMENT.** IF YOU HAVE RECEIVED ANY WARRANTIES REGARDING THE DEVICE OR THE SOFTWARE, THOSE WARRANTIES DO NOT ORIGINATE FROM, AND ARE NOT BINDING ON, MS.
- **Note on Java Support.** The SOFTWARE may contain support for programs written in Java. Java technology is not fault tolerant and is not designed, manufactured, or intended for use or resale as online control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft, navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of Java could lead directly to death, personal injury, or severe physical or environmental damage. Sun Microsystems, Inc. has contractually obligated MS to make this disclaimer.
- No Liability for Certain Damages. **EXCEPT AS PROHIBITED BY LAW, MS SHALL HAVE NO LIABILITY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES ARISING FROM OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE SOFTWARE. THIS LIMITATION SHALL APPLY EVEN IF ANY REMEDY FAILS OF ITS ESSENTIAL PURPOSE. IN NO EVENT SHALL MS BE LIABLE FOR ANY AMOUNT IN EXCESS OF US. TWO HUNDRED FIFTY DOLLARS (U.S.\$250.00).**
- **Limitations on Reverse Engineering, Decompilation and Disassembly.** You may not reverse engineering, decompile, or disassemble the SOFTWARE, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.
- **SOFTWARE TRANSFER ALLOWED BUT WITH RESTRICTIONS.** You may permanently transfer rights under this EULA only as a part of a permanent sale or transfer of the DEVICE, and only if the recipient agrees to this EULA. If the SOFTWARE is an upgrade, any transfer must also include all prior versions of the SOFTWARE.
- **EXPORT RESTRICTIONS.** You acknowledge that SOFTWARE is of US-origin. You agree to comply with all applicable international and national laws that apply to the SOFTWARE, including the U.S. Export Administration Regulations, as well as end-user, end-user and country destination restrictions issued by U.S. and other governments. For additional information on exporting the SOFTWARE, see <http://www.microsoft.com/exporting/>.

Contents

This manual contains the following topics.

1. Introduction	1-1
Overview	1-1
Names and intended use	1-2
Limitations of use and known interfering substances	1-4
Warning/Caution and Notes	1-7
2. What is what	2-1
Overview	2-1
Analyzer - front	2-2
Analyzer - rear	2-4
Measuring section.....	2-5
Inlet module.....	2-7
FLEXQ module	2-8
Thermal printer.....	2-10
Communication ports	2-11
Barcode reader.....	2-13
AutoCheck module.....	2-14
Screen elements	2-15
Menu structure.....	2-24
Analyzer status	2-28
Online aid facilities	2-35
Sample counter	2-38
3. Installation and setup.....	3-1
Overview	3-1
Installation	3-2
Setup menu structure	3-3
Operators and Passwords.....	3-6
Analysis setup	3-12
Patient reports.....	3-24
Calibration setup.....	3-30
Quality control setup	3-33
Replacement setup.....	3-44

Parameters and input setup.....	3-51
Analyzer settings.....	3-58
Communications.....	3-62
Printers.....	3-70
Disk Functions setup.....	3-73
Corrective actions.....	3-76
Miscellaneous setup.....	3-79
4. Sample measurements.....	4-1
Overview.....	4-1
General information.....	4-2
Immediately before analysis.....	4-7
Measurements with FLEXQ.....	4-8
Introducing a blood sample.....	4-10
Introducing an expired air sample.....	4-13
Patient identification.....	4-14
Patient result.....	4-18
Calculation of F_{Shunt} and $ctO_2(a-\bar{v})$	4-22
Patient result messages.....	4-23
5. Quality control.....	5-1
Overview.....	5-1
General information.....	5-2
Preparing a control solution.....	5-4
Manual quality control measurement.....	5-6
AutoCheck measurement.....	5-7
Quality control identification.....	5-8
Quality control result.....	5-10
Quality control result messages.....	5-14
6. Calibration.....	6-1
Overview.....	6-1
General information.....	6-2
Unscheduled calibrations.....	6-4
Interrupted, pending or expired calibrations.....	6-5
tHb calibration.....	6-6
Calibration result.....	6-8
Calibration result messages.....	6-10
7. Replacements.....	7-1

Overview	7-1
General information	7-2
Replacing membranes or electrodes	7-6
Replacing pump tubes	7-8
Replacing inlet gasket unit and inlet probe	7-11
Replacing waste container, fan filter, printer paper.....	7-13
Replacing solutions and gases	7-15
Refilling the AutoCheck carousel	7-17
Automatic auxiliary programs	7-18
Decontamination and Protein Removal programs.....	7-19
Cleaning Additive.....	7-21
Cleaning the analyzer	7-22
8. Disk Functions	8-1
Overview	8-1
General information	8-2
Creating a WDC report.....	8-4
Backing up all data.....	8-6
Restoring all data.....	8-8
Exporting data logs.....	8-9
Importing/exporting archives	8-11
Saving setup	8-13
Loading/restoring setup.....	8-14
9. Data management.....	9-1
Overview	9-1
General information	9-2
Patient Results log.....	9-4
Patient Profiles log	9-7
Quality Control log.....	9-11
Calibration log.....	9-15
Activity log.....	9-18
Archived data logs.....	9-21
RADIANCE browser (optional).....	9-23
10. Analyzer shutdown.....	10-1
Overview	10-1
General information	10-2
Standby mode.....	10-3
Full waste container.....	10-5

Temporary Shutdown.....	10-6
Long Term Shutdown.....	10-8
11. Troubleshooting.....	11-1
Overview	11-1
General information	11-2
Forced Hold causes	11-5
Analyzer messages	11-7
Fluid transport troubleshooting procedure	11-55
Inlet probe troubleshooting procedure	11-56
Inlet troubleshooting procedure.....	11-57
Leak troubleshooting procedure.....	11-58
Electrode troubleshooting procedures	11-59
Pump troubleshooting procedure.....	11-61
Fluid transport system description	11-62
12. Sampling	12-1
Overview	12-1
Causes of errors in preanalytical phase	12-2
Preparation prior to arterial/venous sampling	12-5
Preparation prior to capillary sampling	12-7
Sampling devices.....	12-8
Storage and preparation prior to analysis	12-9
Sampling procedures	12-12
References	12-14
13. Specifications	13-1
Overview	13-1
Measured parameters.....	13-2
Input parameters.....	13-5
Derived parameters.....	13-6
Sample handling.....	13-8
Calibration and maintenance programs	13-11
Analyzer requirements	13-12
Analyzer specifications	13-13
Approvals and patents	13-15
14. Ordering information	14-1
Overview	14-1

Analyzer accessories 14-2

Quality control..... 14-5

Sampling devices..... 14-8

Symbols overview 14-10

15. Radiometer settings..... 15-1

 Overview 15-1

 Radiometer default settings 15-2

 Contents of setup settings..... 15-14

 Calibration verification..... 15-17

 Interfacing facilities..... 15-19

Index

Date of Issue

1. Introduction

Overview

Introduction The chapter briefly describes the intended use of the analyzer, lists all measured parameters and the substances known to interfere with the measurements, and summarizes all the **WARNING/CAUTION** notices that appear throughout the manual.

Contents This chapter contains the following topics.

Names and intended use.....	1-2
Limitations of use and known interfering substances	1-4
Warning/Caution and Notes	1-7

Names and intended use

Names

Proprietary name:	ABL800 FLEX blood gas, oximetry, electrolyte and metabolite analyzer.
Common name:	Blood gas, oximetry, electrolyte and metabolite measuring system.

Intended use

The ABL800 FLEX analyzers are designed for use on undiluted whole human blood and expired air.

The following parameters can be measured on blood:

Parameter group	Parameters
pH/blood gas:	pH (acidity)
	$p\text{CO}_2$ (carbon dioxide tension)
	$p\text{O}_2$ (oxygen tension)
Oximetry:	ctHb (total hemoglobin concentration)
	$s\text{O}_2$ (oxygen saturation)
	$F\text{O}_2\text{Hb}$ (fraction of oxyhemoglobin in total hemoglobin)
	$F\text{COHb}$ (fraction of carboxyhemoglobin in total hemoglobin)
	$F\text{HHb}$ (fraction of deoxyhemoglobin in total hemoglobin)
	$F\text{MetHb}$ (fraction of methemoglobin in total hemoglobin)
	$F\text{HbF}$ (fraction of fetal hemoglobin)
Electrolytes:	$c\text{K}^+$ (potassium ion concentration)
	$c\text{Na}^+$ (sodium ion concentration)
	$c\text{Ca}^{2+}$ (calcium ion concentration)
	$c\text{Cl}^-$ (chloride ion concentration)
Metabolites:	$c\text{Glu}$ (D-glucose concentration)
	$c\text{Lac}$ (L(+)-lactate concentration)
	ctBil (concentration of total bilirubin in plasma)

The following parameters can be measured on expired air samples:

Parameter group	Parameters
Measured values	$p\text{CO}_2$ (carbon dioxide tension)
	$p\text{O}_2$ (oxygen tension)

Derived parameters are listed in *chapter 13: Specifications* and described in detail in the Reference Manual, *chapter 6*.

Continued on next page

Names and intended use, *Continued*

Requirement to the operator The analyzer should be used by personnel who have received special education and training with regard to procedures utilizing in vitro diagnostic medical devices.

Measurements on animal blood Animal blood has not been tested on the ABL800 FLEX analyzer. Some components in animal blood differ from those in human blood, and variations in the composition of blood from different animal species may also exist.

FLEXMODE This mode allows you to analyze a blood sample of 35 μL and higher – up to the maximum volume accepted by your analyzer. Depending on the available sample volume, the FLEXMODE provides the highest number of parameters: from all available to as many as reliably possible.

Other fluids mode All parameters available on your ABL800 FLEX analyzers can be measured on fluids other than heparinized human whole blood.

***NOTE:** Before using this mode you must establish "user-defined corrections" specified for the fluid in question. The corrections assume a linear correlation between the measured value and the reference instrument. The data used for establishing "user-defined corrections" have to cover the desired measuring range; an evaluation of the linearity within the range is necessary as well. If no user-defined corrections are entered, you will measure in this mode as if on heparinized whole human blood.*

FLEXQ module The FLEXQ module can accommodate up to three samplers simultaneously. It reads a sampler's barcode, mixes the sample and transports the sampler to the inlet for aspiration and analysis without any further assistance from the operator. Results are delivered via FLEXLINK (for information refer to the *RADIANCE Installation and Setup Manual*).

NOTE: *The model ABL810 can also be ordered without oximetry parameter: as ABL810 BG only.*

Limitations of use and known interfering substances

Limitations of use

The following limitations should be taken into consideration:

The ABL800 FLEX analyzers are designed to measure HbA and HbF hemoglobins, not any other hemoglobin types.

WARNING/CAUTIONs:

- *The user should review the analyzer performance data to assure that the performance fulfills the user-specific analytical needs.*
- *The validity of the test results from this instrument must be carefully examined by a clinician and related to the patient's clinical condition, before any clinical decisions are taken on the basis of the test results.*
- *Bilirubin measurement in plasma requires a special capillary mode where all other parameters are deselected (see Analysis Setup in chapter 3) as only bilirubin has specifications for measurement on plasma.*

FHbF measurement:

The uncertainty in *FHbF* measurements exceeds the level required to measure normal HbF levels in the adult range (*FHbF* reference range is 0-1 %).

Known interfering substances

The following substances are known to affect or interfere with measurements on the ABL800 FLEX analyzers.

Substance	Interference
Halothane (anesthetic)	May give unreliable pO_2 results.
Lipid therapy, protamine sulphate (treatment)	In OXI measurements. After measurement on blood from a patient who has received lipid therapy or protamine sulphate it may be necessary to clean the analyzer using the Cleaning program.
Methylene Blue, HiCN (medication)	In OXI measurements.
Anions: Br^- , I^- , S^{2-} and ClO_4^- (drugs)	Erroneously high cCl^- results.

Continued on next page

Limitations of use and known interfering substances, *Continued*

Known interfering substances *(continued)*

Substance	Interference
Anticoagulants (sampling)	Anticoagulants that contain sodium salts will give erroneously high cNa^+ results. Sodium fluoride with or without EDTA and oxalate (di Na) influence $cGlu$ results. Sodium fluoride gives erroneously high cNa^+ and low cCa^{2+} , $cGlucose$ and $cLactate$ results. Tri sodium citrate influences cNa^+ , cK^+ and $cGlu$ results. Thus Radiometer recommends the exclusive use of heparin as anticoagulant. Solutions containing organic preservatives may damage the ion-selective membranes of the K and Glu electrodes when introduced into the analyzer.
Thiocyanic acid (degradation product from treatment with nitroprussid. Also produced in thiosulphate treatment of cyanide poisoning)	Erroneously high $cGlu$ and $cLac$ measurements.
Glycolic acid (ethyleneglycol degradation product)	Erroneously high $cLac$ measurements.
Insufficiently stabilized blood. Caustic fluids (e.g. strong acids or bases, detergents, etc.). Fluids that precipitate. Fluids that affect the sensor enzymes. Fluids that form complexes with the analyzer solutions (calcium). High viscosity fluids. Hydrophobic fluids. Reactive fluids.	Other fluids mode allows you to measure on fluids other than heparinized human blood. WARNING/CAUTION: <i>Be aware that some substances, such as listed in the left column, measured in the Other fluids mode may damage the instrument or the electrodes. This can affect the subsequent measurement on human blood or quality control solutions.</i>
Carboxymethyl cellulose (CMC)	Some auto-venting arterial blood samplers contain carboxymethyl cellulose (CMC) in the porous vent. CMC can dissolve into the sample and give erroneously low cCa^{2+} results. Therefore we recommend Radiometer accessories together with our analyzers, e.g., the PICO70 arterial blood sampler which is specifically designed to minimize sample contamination with CMC.

Continued on next page

Limitations of use and known interfering substances, *Continued*

**Known
interfering
substances
(*continued*)**

Substance	Interference
Galactose, glucosamine, maltose, mannose, xylose	Erroneously high cGlu measurements.

For detailed information – see *Interference Tests* in *chapter 5* of the ABL800 FLEX *Reference Manual*.

Warning/Caution and Notes

Definitions Throughout the manual, the various procedures may contain operational cautions and warnings.

Notice	Definition
WARNING	Warning alerts users to potential serious outcomes to themselves or the patient (such as death, injury or serious adverse events).
CAUTION	Caution alerts users to exercise special care necessary for the safe and effective use of the device. Caution may include actions to be taken to avoid effects on patients or users that may not be potentially life threatening or result in serious injury, but about which the user should be aware. Caution may also alert users to adverse effects on the device by use or misuse, and the care necessary to avoid such effects.
NOTE	Notes give practical information.

**WARNING/
CAUTION** In this manual a distinction between a warning and a caution is not made. Any notice that alerts the user to possible dangers of any kind is given the title **WARNING/CAUTION**.

**List of
WARNING/
CAUTION
Notices** All **WARNING/CAUTION** notices are listed here in the order they appear in the manual.
(**NOTES** are not presented in list form.)

Chapter 1:

- *The user should review the analyzer performance data to assure that the performance fulfills the user-specific analytical needs.*
- *The validity of the test results from this instrument must be carefully examined by a clinician and related to the patient's clinical condition, before any clinical decisions are taken on the basis of the test results.*
- *Bilirubin measurement in plasma requires a special capillary mode where all other parameters are deselected (see Analysis Setup in chapter 3) as only bilirubin has specifications for measurement on plasma.*
- *Be aware that some substances, such as listed in the left column, measured in the Other fluids mode may damage the instrument or the electrodes. This can affect the subsequent measurement on human blood or quality control solutions.*

Continued on next page

Warning/Caution and Notes, *Continued*

**List of
WARNING/
CAUTION
Notices
(continued)**

Chapter 2:

- *Install only software which is strictly intended for use with the analyzer. Installation of other types may affect analyzer performance.*
- *Fire hazard. Replace fuse as marked.*

Chapter 3:

- *Changing a control solution assigned to a slot will delete all current quality control statistics obtained on that slot. If you want a copy of the statistics for the last QC month, create a WDC Report disk – see chapter 8: Disk Functions.*
- *User-defined corrections will influence the measurement results from blood and QC analyses and change the specific performance characteristics unless “Apply parameter corrections to QC” was disabled in Miscellaneous Setup.*

Chapter 4:

- *Never use analyzer for lactate measurements if there is any suspicion of presence of glycolic acid in blood as e.g. in case of ethylene glycol poisoning or xylitol infusion. Glycolic acid interferes with the lactate sensor, resulting in erroneously high lactate readings.*
- *After performing a measurement on a blood sample of high protein content, perform the Cleaning Program. Protein build-up in the analyzers and on electrode membranes can influence future results.*
- *Visually inspect the measuring chambers for blockages when lifting the inlet flap prior to performing a measurement. If there is a blockage, close the flap and the analyzer will perform a rinse. If repeated visual inspection shows blockages in the measuring chamber, clean the electrodes and the measuring chamber according to step 7 in chapter 11: Troubleshooting, section “Fluid Transport Troubleshooting Procedure” in this manual.*
- *During measurement, use the sample path view to observe the sample in the measuring chambers. If any bubbles are seen, disregard the result and repeat the measurement.*
- *Use capillary tubes with a volume relevant for the selected measuring mode. Too small volume will give the “Insufficient sample” error. Too large a volume will render the internal analyzer corrections invalid and the results inaccurate.*
- *The Expired Air mode is exclusively used for samples of expired air. Injection of blood or other liquid in this mode may cause damage to the analyzer.*
- *The information provided by the Acid-Base Chart should only be used as a guideline for interpreting the patient’s condition. The patient results must always be examined carefully by a clinician before a proper diagnosis is made.*

Continued on next page

Warning/Caution and Notes, *Continued*

List of WARNING/ CAUTION Notices (*continued*)

Chapter 5:

- *In cases where the first blood sample measurement after a measurement on a QUALICHEK3+/5+ or AutoCheck3+/5+ control solution is to be performed with HbF correction (either set up for all levels or for FHbF > 20 %), a rinse must be called prior to the blood measurement to ensure accurate oximetry results.*

Chapter 7:

- *Do not perform the Decontamination Program without first replacing the Cl, Glucose and Lactate electrodes with dummy electrodes, unless the membranes are to be replaced at this time. The Hypochlorite solution used in decontamination will damage the membranes.*
- **Gas mixtures:** *Pressurized container. Non-flammable compressed gas. Do not breathe gas. Gas mixtures containing less than 19.5 % oxygen may cause suffocation. Protect from sunlight and do not expose to temperatures exceeding 50 °C (122 °F). Store and use with adequate ventilation. Keep away from oil and grease. Do not refill.*
- **Electrolyte solution in E1001 Reference Electrode:** *Irritating to eyes, respiratory system and skin. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.*
- *Avoid contact of paper with direct sunlight, water, high temperature and humidity, alcoholic and organic solvents, PVC-containing materials, freshly developed diazo copy sheets, extensive pressure and scratching. For storage, use folders and cases made of polyethylene, polypropylene, polyester, etc.*
- *Before discarding an empty cylinder remove the safety valve using the Valve Key (order code number 922-509).*
- **Cleaning additive:** *Very toxic by inhalation, in contact with skin and if swallowed. Danger of cumulative effects. May cause sensitisation by inhalation and skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. After contact with skin, wash immediately with plenty of water. Wear suitable protective clothing. In case of accident or if you feel unwell seek medical advice immediately (show the label if possible). The material and its container must be disposed of as hazardous waste.*
- *The use of rubber gloves is recommended when cleaning the analyzer.*

Chapter 8:

- *When restoring all data, any existing data will be overwritten by the data obtained from the backup file.*
- *When restoring all data is completed, the analyzer will automatically and without warning shut down and restart.*

Continued on next page

Warning/Caution and Notes, *Continued*

**List of
WARNING/
CAUTION
Notices
(continued)**

Chapter 10:

- *Do not lift analyzer by the gas regulator. Damage to the analyzer can occur.*

Chapter 12:

- *Blood sampling should be performed by authorized personnel only. Always handle blood and the collection devices with care. Avoid direct contact with the sample by using certified rubber gloves. Sterile techniques are required at all times to avoid infection.*
- *In general, results obtained from capillary samples, particularly pO_2 values, should be interpreted with caution.*
- *Discard the waste as infectious waste.*
- *Do not add sodium fluoride to the blood samples, as it gives erroneously high cNa^+ and low cCa^{2+} , $cGlucose$ and $cLactate$ results. Sodium fluoride also damages the Glucose and Lactate electrodes.*

Chapter 13:

- *Fire hazard. Replace fuse as marked.*

2. What is what

Overview

Introduction The ABL800 FLEX analyzer is a complete unit comprised of several different modules each performing a specific function and controlled by comprehensive software. The modules are collected into well-defined sections according to their related function.

This chapter describes the basic parts of the ABL800 FLEX analyzer and its software.

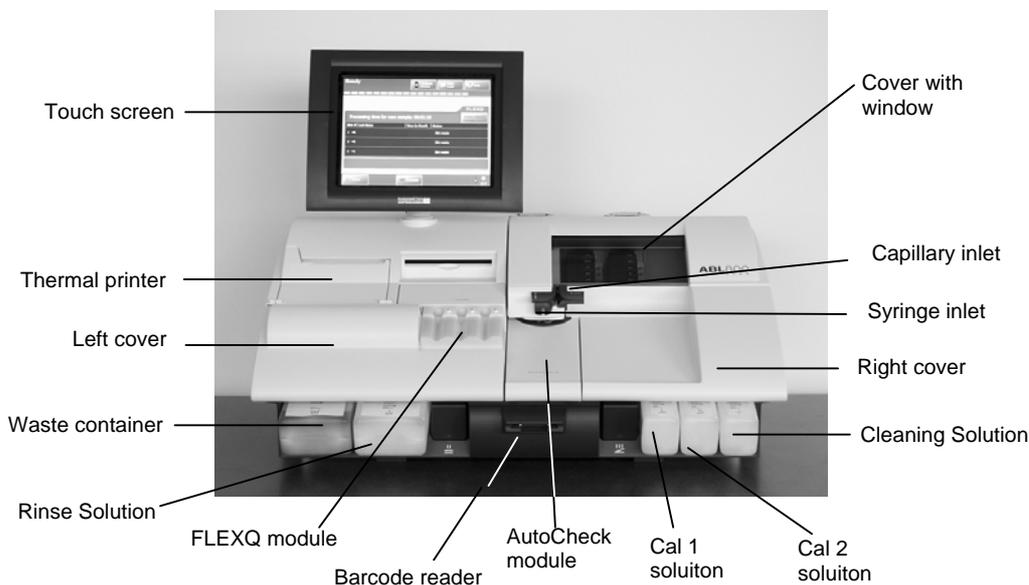
Contents This chapter contains the following topics.

Analyzer - front	2-2
Analyzer - rear	2-4
Measuring section	2-5
Inlet module	2-7
FLEXQ module	2-8
Thermal printer	2-10
Communication ports	2-11
Barcode reader	2-13
AutoCheck module.....	2-14
Screen elements.....	2-15
Menu structure	2-24
Analyzer status.....	2-28
Online aid facilities	2-35
Sample counter.....	2-38

Analyzer - front

Parts and functions

The components of the analyzer front (with covers) is shown below.



Color touch screen	10.4" LCD for operation and management of the analyzer.
Thermal printer	For automatic printout of data.
Left cover	To access the waste container/Rinse Solution.
Waste container	For waste collection. A sensor detects when container is full, and a message is displayed on the screen.
Rinse Solution	For rinsing the liquid transport system after various analyzer activities.
FLEXQ module	See <i>FLEXQ module</i> in this chapter.
Barcode reader	See <i>Barcode reader</i> in this chapter.
AutoCheck module	See <i>AutoCheck module</i> in this chapter.
Cal 1 Solution	For performing 1-point calibrations.
Cal 2 Solution	For performing 1- and 2-point calibrations.
Cleaning Solution	For cleaning the liquid transport system of lipid deposits.
Right cover	To access solutions and pumps – see overleaf.
Syringe inlet flap	Lift to introduce syringe samples and quality control solutions.
Capillary inlet flap	Lift to introduce capillary samples.
Cover with window	See <i>Measuring Section</i> in this chapter.

Continued on next page

Analyzer - front, *Continued*

Parts and functions (*continued*)

The components of the analyzer front (without covers) is shown below.



Part	Function
Inlet module	Accepts samples from a syringe/test tube or a capillary – see <i>Inlet Module</i> in this chapter.
CD-ROM drive	For storing data on a CD-RW disk or retrieving data from a CD (e.g. installation software). WARNING/CAUTION: <i>Install only software which is strictly intended for use with the analyzer. Installation of other types may affect analyzer performance.</i>
pH/Blood Gas (BG) module	Measures pH, pO_2 , pCO_2 and cCl^- . See measuring component detail.
Electrolyte/Metabolite (EM) module	Measures cCa^{2+} , cK^+ , cNa^+ , $cGlucose$ and $cLactate$. See measuring section detail.
Oximetry (Oxi) module	Measures $ctHb$, sO_2 , $FHHb$, FO_2Hb , $FCOHb$, $FMetHb$, $FHbF$ and $ctBil$. See measuring component detail.
Solution pump	Transports solutions through the liquid transport system.
Waste pump	Transports liquid to the waste container.
Magnets	Hold the covers in place.

Analyzer - rear

Parts and functions

The parts and components of the analyzer's rear panel are shown below.

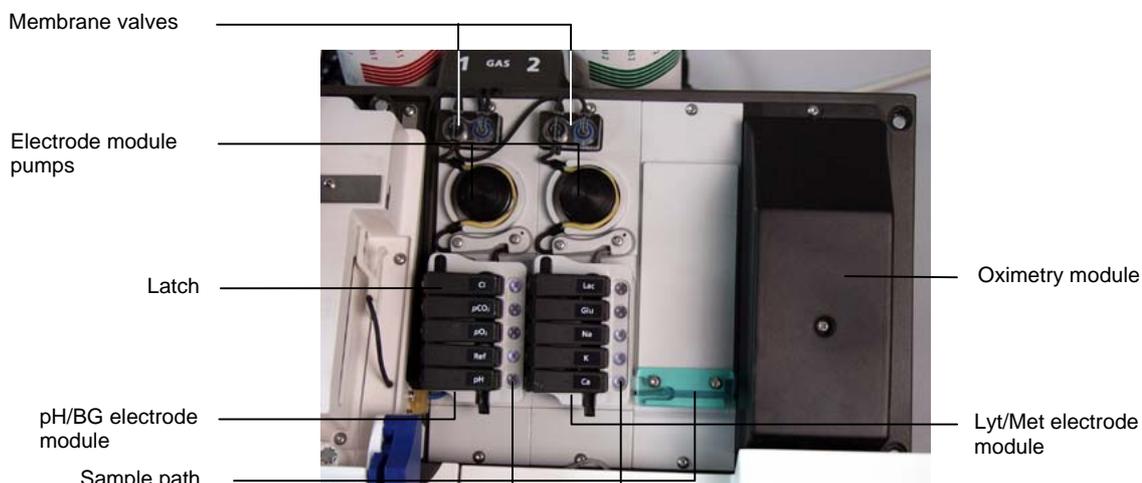


Part	Function
Gas 1 cylinder	Contains a gas mixture of 5.61 % CO ₂ , 19.76 % O ₂ ; balance 74.64 % N ₂ .
Gas 2 cylinder	Contains a gas mixture of 11.22 % CO ₂ , < 0.04 % O ₂ ; balance > 88.74 % N ₂ .
Fan	For cooling internal components.
Gas cylinder socket	For mounting the gas cylinders.
Communication ports	See section <i>Communication Ports</i> in this chapter.
Power switch	For turning the analyzer on (position I) and off (position O).
Power socket	For connecting the power cord. In USA: If source is 120 V, use Radiometer cord 615-403 with parallel blade attachment plug. If source is 240 V, use Radiometer cord 615-405 with tandem blade attachment plug.

Measuring section

Parts and functions

The modules and components of the measuring section are shown below.



Part	Function
Membrane valves	Control the flow of gas and solutions into the measuring modules.
Electrode module pumps	Transport solutions and gas mixtures through the measuring modules.
Latch	Establishes electric contact between the electrode in the measuring chamber and the electrode amplifier. To access an electrode, push inwards on the upper portion of the latch, and lift upwards.
pH/BG electrode module	Contains the measuring chamber with the pH, reference, $p\text{CO}_2$, $p\text{O}_2$ and Cl electrodes.
Sample path	Transports samples, solutions and gas mixtures.
Oximetry module	Contains the hemolyzer with glass cuvette, spectrophotometer for measuring $ct\text{Hb}$, $s\text{O}_2$, $F\text{HHb}$, $F\text{O}_2\text{Hb}$, $F\text{COHb}$, $F\text{MetHb}$, $F\text{HbF}$, $ct\text{Bil}$ on 128 wavelengths, and the lamp unit.
Lyt/Met electrode module	Contains the measuring chamber with the Ca, K, Na, Glucose, and Lactate electrodes (a filter is installed for the Glucose and Lactate electrodes).

Continued on next page

Measuring section, *Continued*

Electrode locations

The electrodes are located in the electrode modules as follows:



The table below describes each electrode.

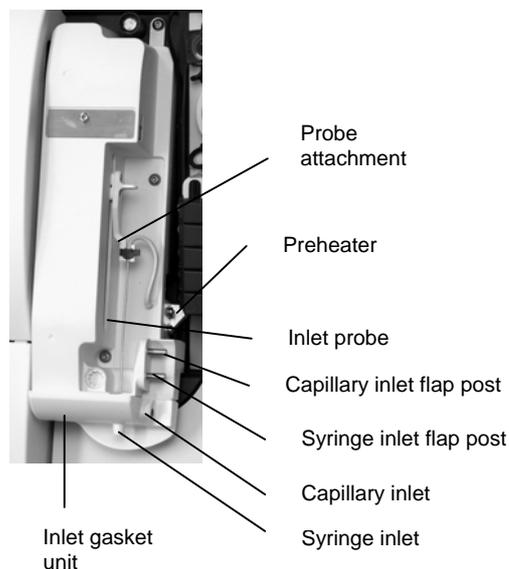
Module	Electrode	Type
pH/BG	Cl	E744
	$p\text{CO}_2$	E788
	$p\text{O}_2$	E799
	Reference	E1001
	pH	E777
Lyt/Met	Lactate	E7077
	Glucose	E7066
	Na	E755
	K	E722
	Ca	E733

NOTE: An orange filter is placed in the measuring chambers for the Glucose and Lactate electrodes.

Inlet module

Parts and functions

The inlet module accepts samples from a syringe/test tube or a capillary (the syringe and capillary inlet flaps are removed on the picture). Syringe and capillary inlet flaps are interlocked so that only one may be opened at a time.



Part	Function
Probe attachment	Secures inlet probe. Open the clip to remove probe.
Preheater	Heats all samples and gases to 37 °C.
Inlet probe	Automatically moves into the syringe to aspirate the required sample.
Capillary inlet flap post	Holds the inlet flap for capillary samples.
Syringe inlet flap post	Holds the inlet flap for syringe samples.
Capillary inlet	Receives sample from a capillary.
Syringe inlet	Receives sample from a syringe and test tube.
Inlet gasket unit	Provides transfer of samples from a sampling device to the inlet probe; can be removed.

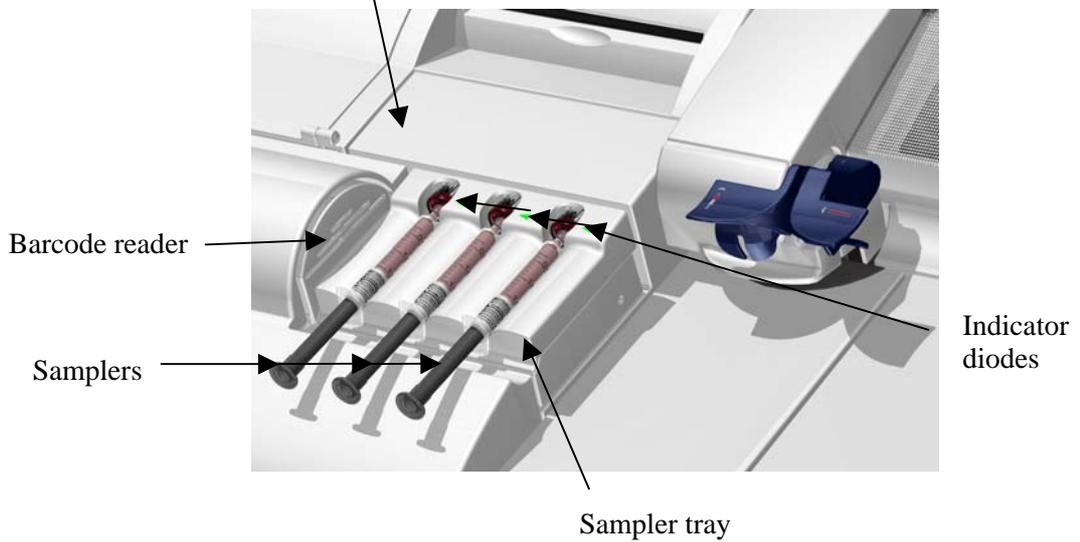
FLEXQ module

Parts and functions

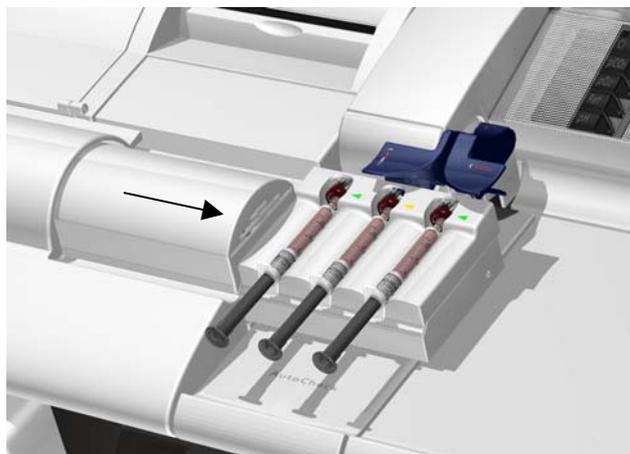
FLEXQ module for automatic transport of samplers to the inlet is shown below.



FLEXQ position before or after analysis:



FLEXQ position during analysis:



Continued on next page

FLEXQ module, *Continued*

Parts and functions (*continued*)

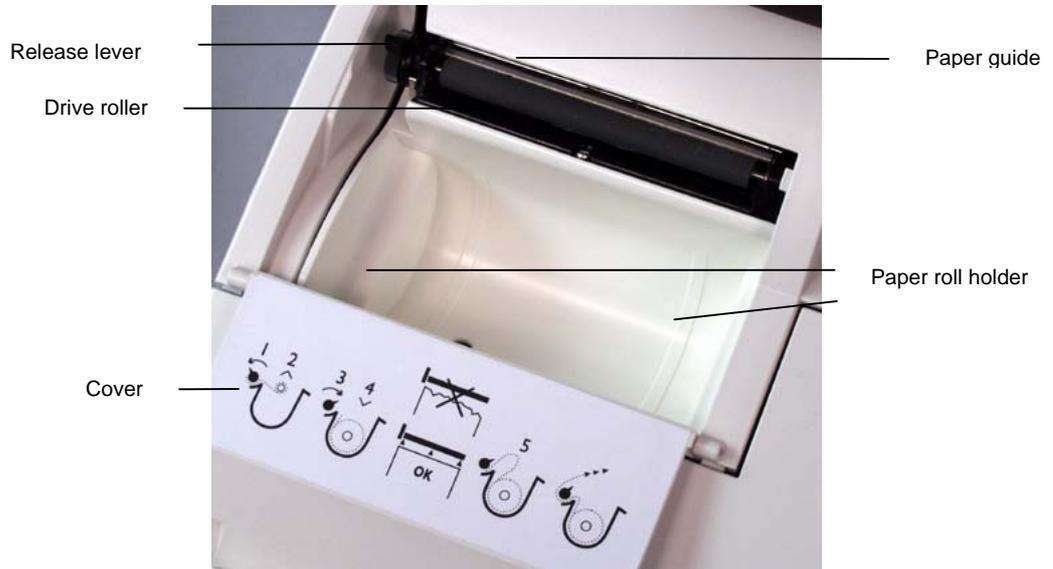
The components are as follows:

Part	Function
FLEXQ sampler tray	<p>FLEXQ sampler tray moves to the position for measurement by means of a step motor (not shown).</p> <p>The samplers used in the sampler tray should be <i>safePICO</i> with the <i>safeTIPCAP</i>.</p>
Indicator diodes	<p>Change the color from green to yellow when the optical switch detects the sampler placed in the slot.</p>
Barcode reader	<p>Laser barcode reader reads the sampler barcode. A short beep indicates that the barcode has been read. You can scan the Sampler ID on the analyzer's scanner and then place it in the sample tray or you can place the sampler in the sampler tray and let the FLEXQ scanner read the sampler barcode.</p>
Sampler tray cover	<p>The sampler tray cover has three slots for the samplers; the slots have optical switches for detecting the sampler. The cover can be removed (as shown) for cleaning.</p>
	
Mixer tray	<p>The mixer rotates and moves the steel ball in the sampler in order to mix the blood sample. The sample is adequately mixed after 7 seconds.</p> <p>The mixer tray moves into position under the sampler immediately before the measurement.</p>
	

Thermal printer

Parts and functions

The components of the thermal printer (with the cover open) are shown below.

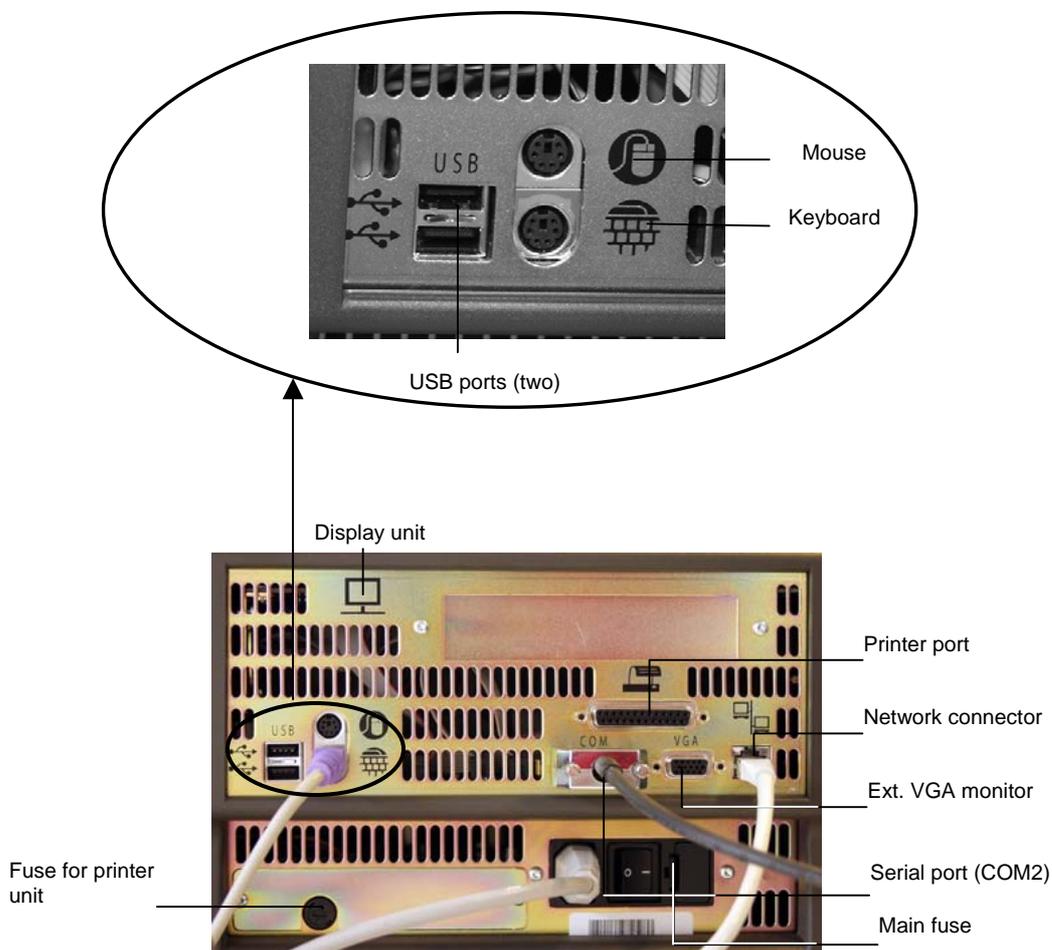


Part	Function
Release lever	Pull the lever fully back to lift the drive roller from the printer head and paper guide in order to adjust paper alignment. Remember to lift the lever (as shown) in order to print
Drive roller	Feeds the thermal paper through the printer.
Paper guide	Located behind the drive roller, it is between this and the drive roller that paper is fed.
Paper roll holder	Holds the paper roll in place.
Cover	Open to replace the paper roll. Contains instructions on how to make a replacement. Close the cover when a new paper roll has been mounted in the printer.

Communication ports

Ports and functions

The following communication ports are available:



The functions of the communication ports are as follows:

Port	Function
Display unit port	For connection to the analyzer's display
Mouse port	PS/2 connector used for the connection of a standard mouse (user supplied).
Keyboard port	PS/2 connector used for connection of a keyboard (user supplied).
Serial port (COM2)	9-pin serial port used for HIS/LIS communication or connection of an external barcode reader.
Network	RJ45 ethernet interface connection to network.
Printer port	Parallel port for connection to a local printer

Continued on next page

Communication ports, *Continued*

Ports and functions (<i>continued</i>)	Port	Function
	External VGA monitor port	15-pin connector for external monitor (optional; is enabled by Radiometer service representative).
	USB (2 ports)	For connecting USB devices, e.g. a removable drive. USB keyboard supported. Other USB devices need an approved XP driver (user-supplied mouse or modem, etc.).
	Fuse for printer unit	The compartment contains 1 protective fuse: 5 × 20 mm, 4 Amp, Slow blow (T4AL) (order code number 450-035).
	Main fuse	The compartment contains 2 protective fuses: 5 × 20 mm, 4 Amp, High break (T4AH). Type Shurter No. 0001.2510 (order code number 450-144). <i>WARNING/CAUTION: Fire hazard. Replace fuse as marked.</i>

Barcode reader

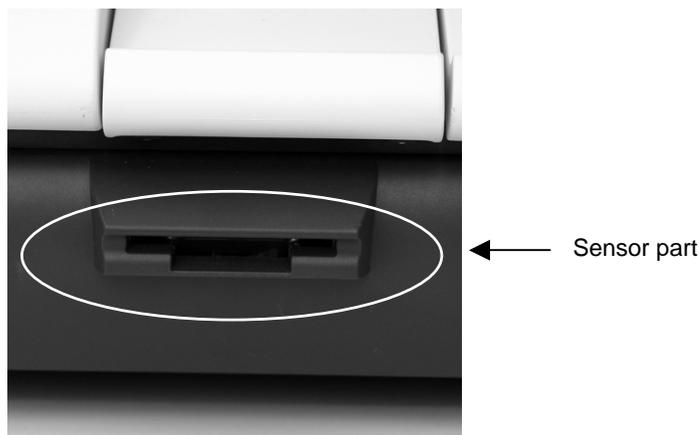
Barcoded items The following items have barcodes that can be read into the analyzer:

Item	Location of barcode
All solution containers	Label on the container
QC ampoules	Insert in the box containing the ampoules
tHb calibration ampoules	Insert in the box containing the ampoules
Electrodes	Label on the box containing the electrode
Electrode membranes	Label on the box containing the membrane unit
Gas cylinders	Label on the cylinder
Pump tubing	Label on the tubing packaging
Fan filter	Label on the box containing the filter
Inlet gasket	Label on the box containing the inlet gasket

In addition the items above, you can enable every text box on the **Patient Profile**, **Patient ID**, **Patient Result**, **QC ID** and **Recording Fluid Replacement** screens where it is possible to enter a barcode – refer to *Miscellaneous Setup* in *chapter 3: Installation and setup*.

Reading in a barcode

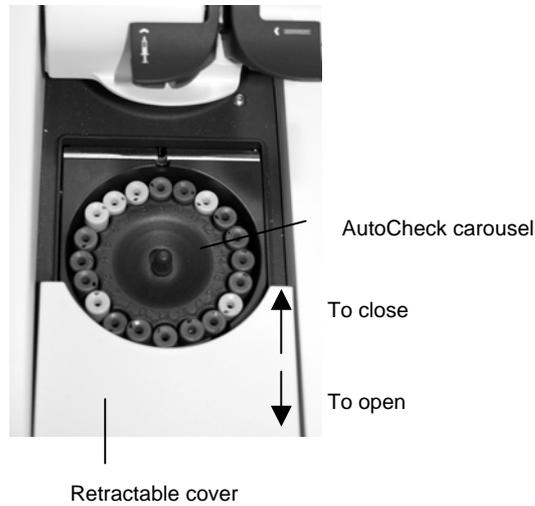
Hold the barcode of the item you wish to read in parallel to the sensor part of the barcode reader. A short beep from the barcode reader indicates that the information has been read in successfully.



AutoCheck module

Parts and functions

The AutoCheck module is shown below.



Part	Function
Retractable cover	<p>Gives access to the carousel.</p> <p>You can either slide the carousel cover open or press <i>Menu - Analyzer Status - AutoCheck - More - Open Module.</i></p> <p>Make sure that no objects prevent the cover from opening freely.</p>
AutoCheck carousel	<p>Contains the AutoCheck ampoules packed according to the optimal packing list – see <i>Refilling the AutoCheck carousel</i> in <i>chapter 7: Replacements.</i></p>

Screen elements

Ready screen Operation and management of the ABL800 FLEX analyzers is performed via a touch screen. Almost all commands to the analyzer come from the touch of a button or area on the screen.

The touch screen is divided into three sections:



For the analyzers without the FLEXQ module, the **Ready** screen looks as follows:



The **Ready** screen appears automatically if the touch screen remains idle for more than 3 minutes. The screen intensity reduces by 50 % when the analyzer is not used.

Top section The **status bar** varies slightly, according to which screen you are in and the status of the analyzer.

Example:



The status describes the current task of the analyzer (e.g. calibration, measurement, etc.) or its status (e.g. ready for use, on hold, etc.).

Continued on next page

Screen elements, *Continued*

Top section (*continued*)

The **time bar** is present only when the analyzer is performing a task; it follows the progress of the current task. For example:



The **Stop** button is visible only when it is allowed to interrupt an activity in progress.

The **parameter bar** lists all measured parameters available and activated on your analyzer.



It allows you to judge the parameter status at a glance before you have to perform a measurement.

Green parameter: Parameter status is okay; no problem is detected on the given measuring channel.



Yellow parameter: Error associated with the given parameter during last calibration or quality control measurement. The parameter is unreliable and will have “?” (if requested in Corrective Actions) in front of the result.



Red parameter: Serious error associated with the given measuring channel. Parameter cannot be used at all and will be displayed as “.....”; or a parameter was repressed in the Parameter Setup program due to errors during last calibration or quality control measurement.



NOTE: A parameter disabled in the Parameter Setup program will be removed from the parameter bar – see *Analysis Setup Programs (Disabled versus Deselected Parameters)* in chapter 3.

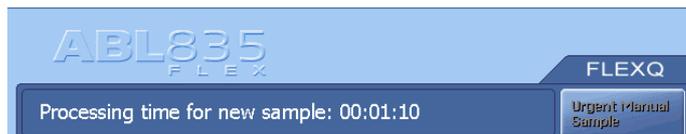
Continued on next page

Screen elements, *Continued*

Center section The center section is the main information and interaction area of which there are many different types.

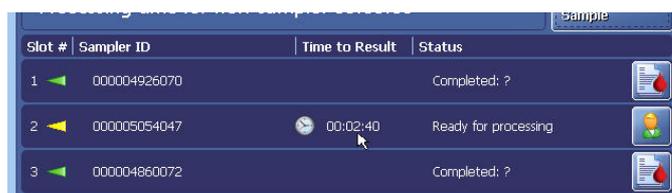
The center section of the **Ready** screen is described part by part, starting from the top (for the analyzers without FLEXQ module the center part contains the analyzer name and – if entered in Miscellaneous Setup (see *chapter 3*) – analyzer message).

This part of the **Ready** screen contains the following elements:



- Analyzer name
- The messages to the operator regarding the FLEXQ activities
- **Urgent Manual Sample** request button. The button allows you to book an inlet for an urgent measurement while the analyzer performs a task. The button is grayed out when the analyzer is ready for any measurement.

This part of the **Ready** screen contains the following elements:



- "Slot #": condition of each sampler tray slot (1, 2 and 3) is indicated with the arrows that reflect the indicator diodes in the sampler tray:

Green	Place the sampler into the slot or remove it from the slot.	Yellow	Do not remove the sampler from the slot.
Blinking green	Wait for the sampler to be identified.	Blinking yellow	Remove the sampler from the slot.

- "Sampler ID": appears when the sampler is placed in the sampler tray slot and is registered. The name of this column can be changed in the Sample Logistics Setup (see *Analysis Setup* in *chapter 3* of this manual).
- "Time to Result": shows time left till a result will be ready; the clock indicates that the sample age has exceeded settings selected in Sample Logistics setup.
- "Status": gives information about a sampler in the slot:

Slot empty	A slot is ready to accept a sampler.
Ready for processing	Sampler has been registered in the slot.
Processing	Patient and sampler data are being processed.
Completed	Measurement is completed and the result can be viewed.

Continued on next page

Screen elements, *Continued*

Center section
(*continued*)

	Patient data can be edited.
	Result can be viewed.

This part of the **Ready** screen is reserved for the analyzer messages and is entered in the Miscellaneous Setup (see *chapter 3* in this manual):

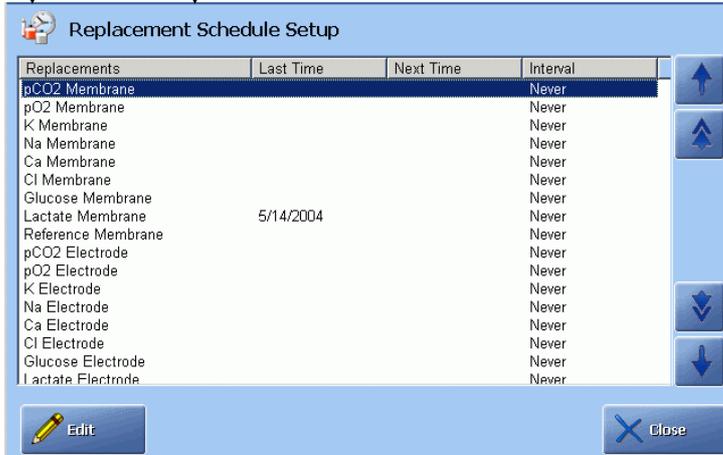


Other screen types and their elements are described on the following pages.

Icon and screen name identify each screen. Example:

Icon Screen name

↓ ↓



Replacements	Last Time	Next Time	Interval
pCO2 Membrane			Never
pO2 Membrane			Never
K Membrane			Never
Na Membrane			Never
Ca Membrane			Never
Cl Membrane			Never
Glucose Membrane			Never
Lactate Membrane	5/14/2004		Never
Reference Membrane			Never
pCO2 Electrode			Never
pO2 Electrode			Never
K Electrode			Never
Na Electrode			Never
Ca Electrode			Never
Cl Electrode			Never
Glucose Electrode			Never
Lactate Electrode			Never

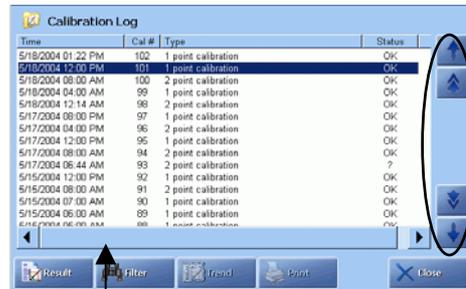
The icon and title of a screen are the same as the button that gives access to that screen.

Continued on next page

Screen elements, *Continued*

Center section (*continued*)

Text boxes show a text in the form of lists, items, tables, etc. Various types of text boxes and navigation in them are given on the next page.



Scroll bar

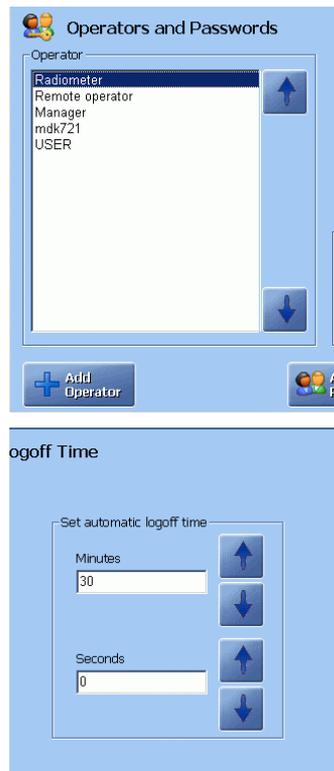
Scroll keys

The first line is highlighted. To highlight another line, touch it on the screen or use up and down arrow scroll keys displayed on the screen beside a relevant text box.

A **scroll bar** scrolls a text box horizontally when the text box extends beyond the area available on the screen.

A **single-arrow scroll button** highlights one item at a time upward or downward.

A **double-arrow scroll button** highlights an item at the top or the bottom of the screen.



The first line is highlighted. To highlight another line, use the up and down arrow buttons or touch this line in the box.

Enter the data using the screen keypad or keyboard.

In this text box you can select one of the predefined options.

Use the up and down arrow buttons to select an item.

NOTE: If the text box already contains an entry, it will be overwritten and cannot be retrieved.

Text boxes are designated in quotation marks, e.g. "Operator". The same applies to the other elements on the center section of the screen: names of the columns (e.g. "Status"), input fields (e.g. "Draw time"), etc.

Continued on next page

Screen elements, *Continued*

Center section (*continued*)

Check buttons allow you to enable/disable or select/deselect an item on the screen. For example:



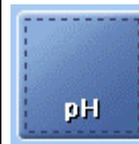
A function is selected (e.g. acoustic signal if the inlet remains open) or activated (e.g. communication with RADIANCE)



A function is deselected or deactivated.

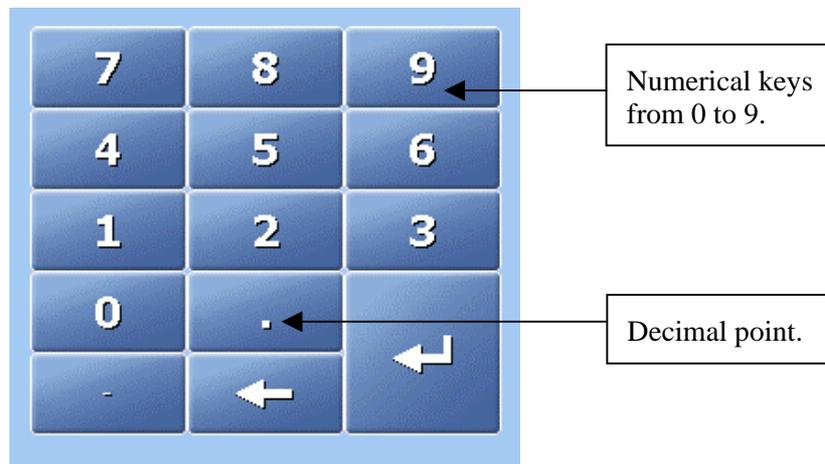


Parameter is selected.



Parameter is deselected.

Screen keypad allows the entry of numerical data on the screen.



The buttons listed below have the following functions:



Press to confirm a numerical entry and to highlight the next line in the text box.



Press to delete a character (from right to left) or to type in the new data (the box is cleared as soon as the first character is typed).



Press to display the full alphanumeric keyboard.

Continued on next page

Screen elements, *Continued*

Center section
(continued)

Screen keyboard is used for entering both alphabetical and numerical data – see the description on the next page.



The keyboard functions as a normal keyboard with alphabetical and numerical characters. The typed text appears in the activated text box.



Enter

Press to confirm the entry and to return to the previous screen.



Backspace

Press to delete characters from right to left.



Press to cancel any changes made in the activated text box and to return to the previous screen



Press to delete an entry in the activated text box.



Shift

Press to type a capital letter or symbol.



Press to lock the keyboard in order to type capital letters and symbols on the numerical keys. When activated, indicator is green.



Up/down/left/right arrows move the cursor in the activated text box in order to edit a text.

Continued on next page

Screen elements, *Continued*

Buttons

Each button has an icon and a name placed on it. When pressed, it opens a screen or a menu.



The buttons are designated in bold italics in this manual, e.g. *Menu*, *Utilities*, etc.

The buttons displayed in full color can be activated. A button in a weaker color, i.e. grayed out, is temporarily inactive.

The buttons at the top and the bottom of the screen can be selected in the Setup program Operators and Passwords together with the access profiles for each operator – for detailed information see the description in *chapter 3: Installation and setup*.

Note the functions of the following buttons:



Returns you to the previous screen in the same program, e.g. in the Patient Results log, it will return you from the **Patient Identification** screen to the **Patient Result** screen.



Returns you to the **Ready** screen.

Information bar and icons

The **information bar** is placed in the lower right corner of the screen.



Continued on next page

Screen elements, *Continued*

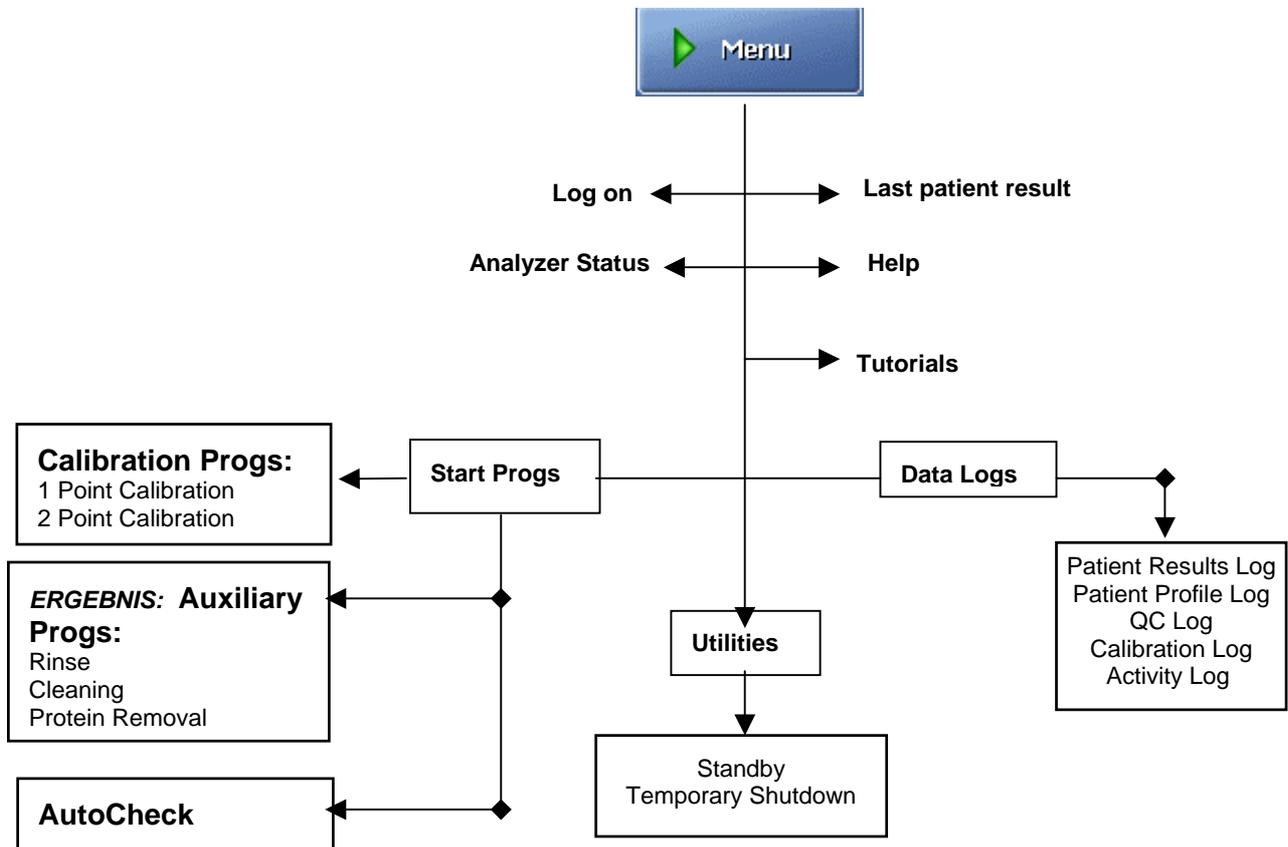
Information bar and icons The following **icons** are available on the information bar:
(*continued*)

Icon	Function
	Shows the current time in the selected format.
	Shows that an analyzer is connected to RADIANCE.
	Shows the time of the next scheduled calibration. The time changes when a calibration has been completed.
	Shows the time of the next scheduled QC measurement. The time changes when a QC measurement has been completed.
	Shows that the remote operator is connected.
	Click to make more icons visible.
	Click to reduce the number of visible icons to a clock.

Menu structure

Menu at analyzer startup When the analyzer is taken into use, only the following limited menu is available:

Press *Menu*.



Allowed actions at analyzer startup The following actions are allowed at analyzer startup:

- To perform a measurement
- To call a calibration
- To edit data in the data logs
- To perform a replacement
- To start an AutoCheck measurement

The menu above and the scope of actions are suitable for those users whose activities include performing measurements and occasional replacements.

Continued on next page

Menu structure, *Continued*

Entering standard password

To access the complete menu, do the following:

- | Step | Action |
|------|---|
| 1. | Press Menu on the Ready screen.
Then click on Logon . |
| 2. | Type in the standard password: 123456. |



Standard password:
123456.

Confirm with **Enter**.

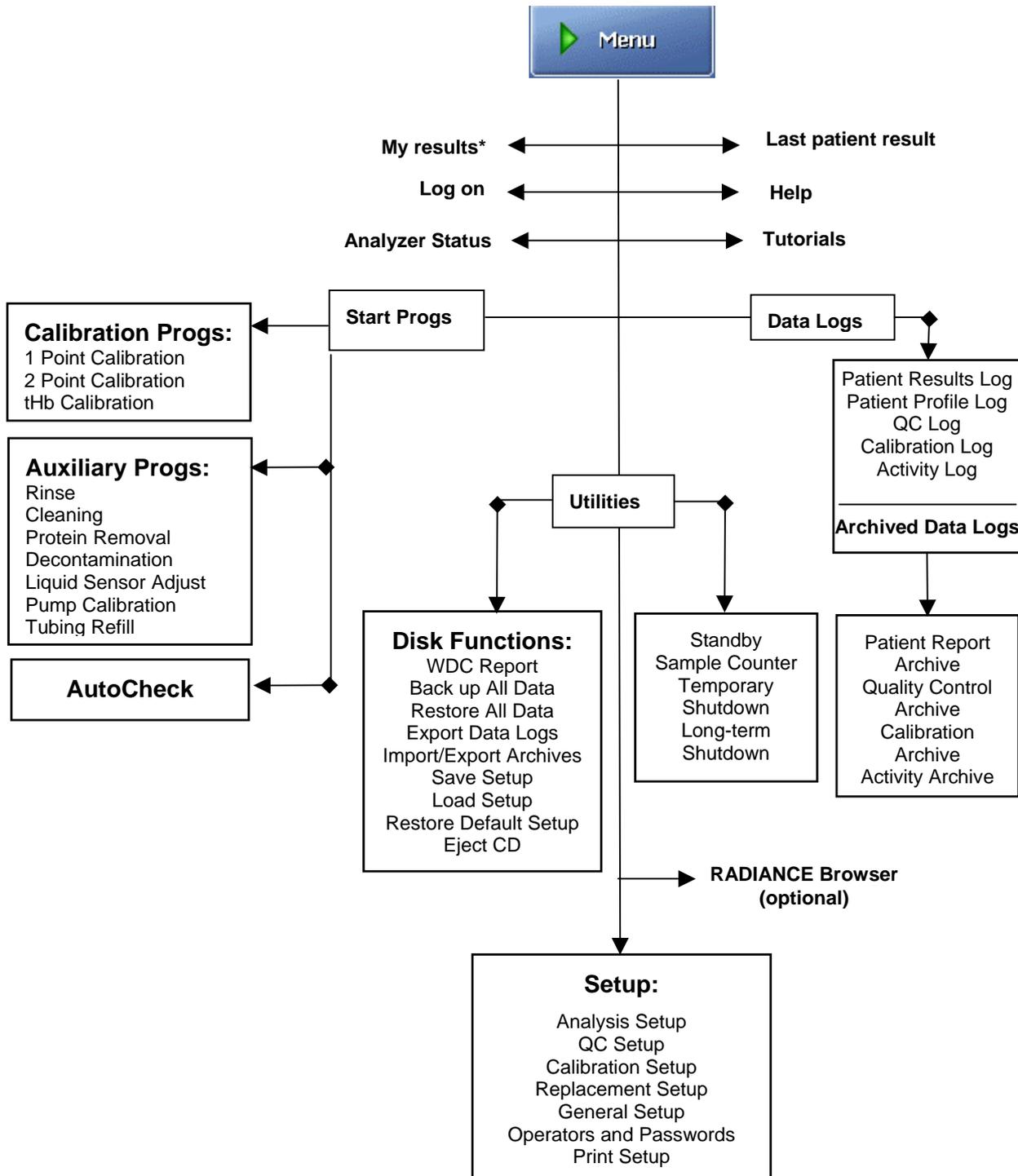
- Press **Menu** to access the complete menu – see the next section.

The access possibilities for each user of the analyzer and their passwords are entered in Setup program Operators and Passwords – see *chapter 3: Installation and setup* in this manual.

Continued on next page

Menu structure, *Continued*

Complete menu Press *Menu*.



* Is selected in the Setup program Operators and Passwords – see *chapter 3*.

Structure of the Setup programs – see *chapter 3: Installation and Setup*.

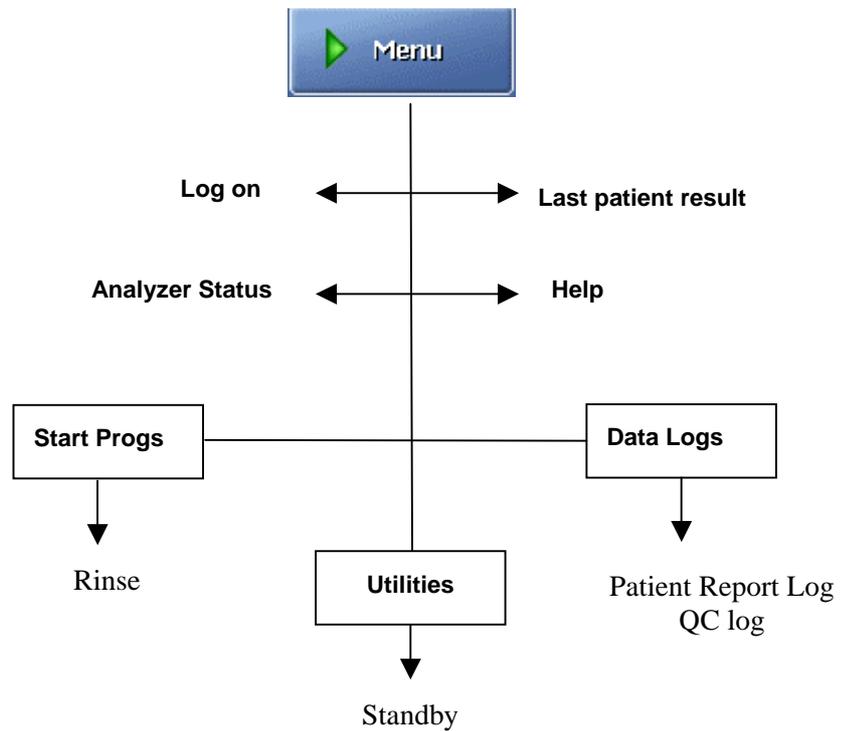
Continued on next page

Menu structure, *Continued*

Access to analyzer menu The access to various parts/functions of the analyzer menu is determined by the rights defined in the Setup program Operators and Passwords.

Example:

You as a user can enter the following: Rinse, Patient Report and QC logs, and Standby programs. Then your menu – after you have logged on – will look like this:



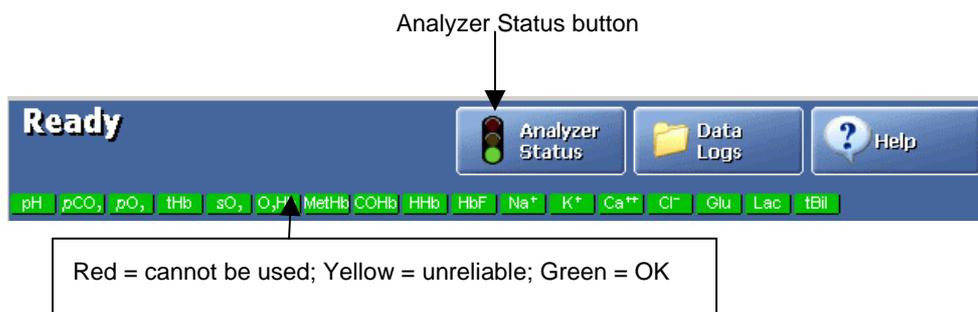
For details see the *chapter 3: Installation and setup* and *chapter 15: Radiometer Settings*.

Analyzer status

Analyzer status at a glance The working condition of the analyzer is continuously monitored during its operation.

To evaluate the analyzer status at a glance before a measurement, use the following facilities:

- parameter bar
- color of the traffic light on the *Analyzer Status* button.



Analyzer Status elements To enter the *Analyzer Status* screen, press *Menu - Analyzer Status*.



Traffic light color of the *Analyzer Status* button is determined by the traffic light colors of the following status elements:

Status element	The colors indicate...
<i>Calibration Status</i>	GREEN – OK.
	YELLOW – error(s) in the last calibration and/or cal schedule reminders.
	RED – error-prone parameters are repressed.

Continued on next page

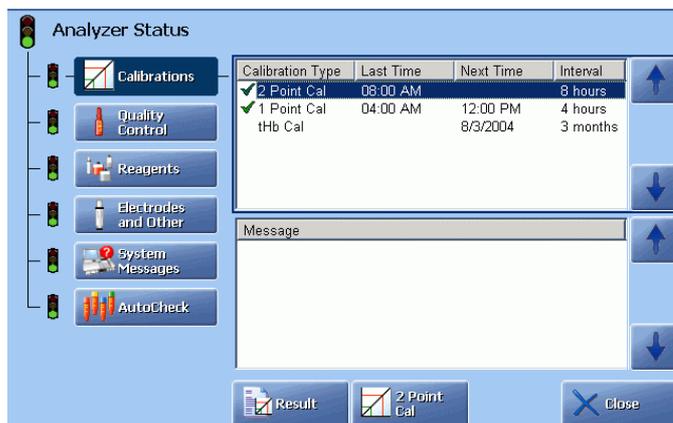
Analyzer status, *Continued*

Analyzer Status elements (*continued*)

Button	The colors indicate...
Quality Control Status	GREEN – OK. YELLOW – error(s) in the last QC measurement and/or QC schedule reminders. RED – error-prone parameters are repressed.
Reagents Status	GREEN – no replacements due at the present time. YELLOW – a replacement is due.
Electrode and others	GREEN – no replacements due at the present time. YELLOW – a replacement is due.
System Messages	GREEN – No (critical) messages. YELLOW – Non-critical messages. RED – Critical messages. The analyzer cannot calibrate or measure.
AutoCheck Status	GREEN – no replacements due at the present time. YELLOW – a replacement is due.

Calibrations status

The Calibrations status gives an overview of the status of the most recently performed calibration of each type and relevant messages.



The following information is available on the screen:

- | | |
|---|--|
| Calibration Type | Lists each calibration type along with its status: |
| OK | Calibration was accepted. |
| ? | Error(s) detected during calibration. |
|  | Pending or overdue calibration. The last calibration was accepted. |

Continued on next page

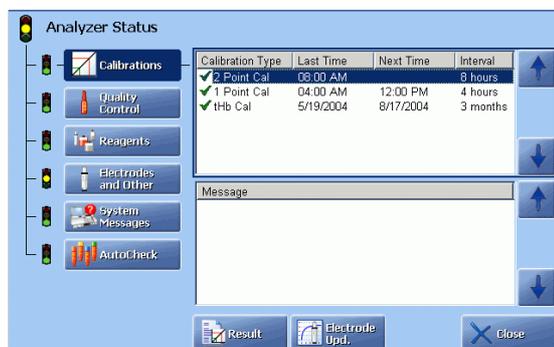
Analyzer status, *Continued*

Calibration status (*continued*)

Calibration Type	Lists each calibration type along with its status:
?+	 Pending or overdue calibration. The last calibration was not accepted.
Last Time	The date and time the last calibration of the specified type was performed.
Next Time	The date and time the next calibration of the specified type is due according to the Calibration Schedule - see <i>Calibration Schedule, Chapter 3</i> .
Interval	The time interval between calibrations as set up in the Calibration Schedule.

The following buttons are available:

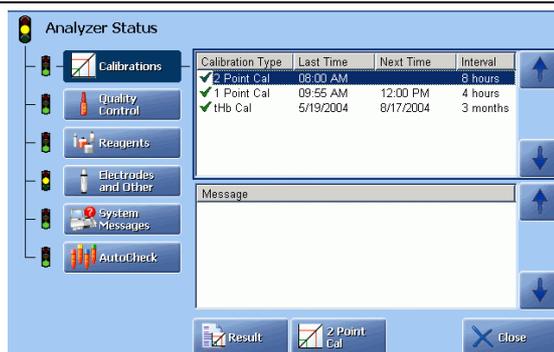
During a calibration:



Result Press to display the result of the highlighted calibration.

Electrode Upd. Press to display the electrode updatings for the ongoing calibration.

After a calibration:



Result Press to display the result of the highlighted calibration.

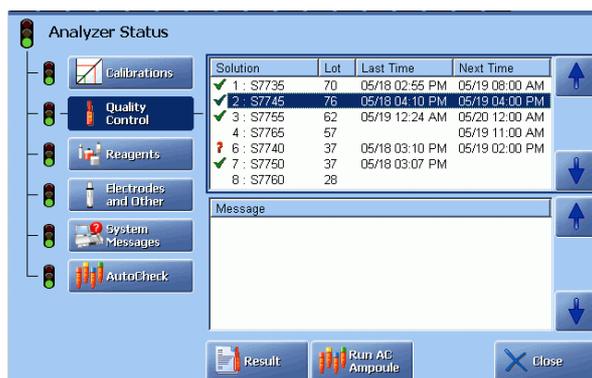
Start Calibration Is activated for the overdue calibrations or the calibrations with "?".

Continued on next page

Analyzer status, *Continued*

Quality Control status The Quality Control status provides the following information:

- status of the last measurement on each control solution type
- messages referring to quality control measurements.



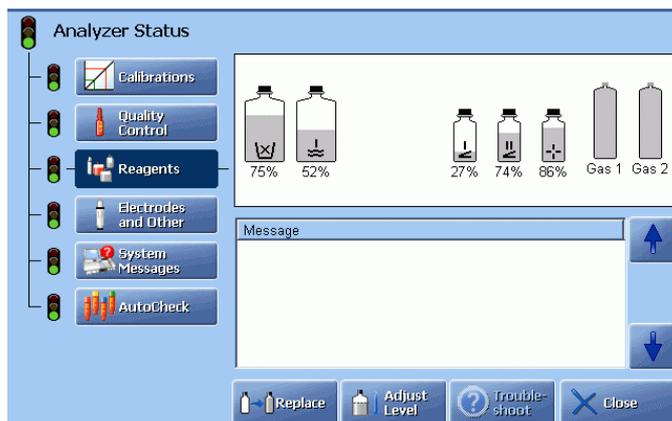
Element	Function
Solution	Lists the quality control slot and its solution type along with a status symbol. OK The last measurement was accepted. ? One or more of the following occurred: <ul style="list-style-type: none"> • error in the last calibration. • analyzer error during last QC measurement. • a parameter measurement is outside the defined ranges or a Westgard Rule has been violated.  The next measurement is overdue, and the previous measurement, if any, was accepted.  The last quality control measurement had errors present, and the next measurement is overdue.
Lot #	The solution lot number for the slot.
Last Time	Lists the time the last measurement was performed.
Next Time	Lists the next scheduled time to perform the measurement on the slot. See <i>Quality Control Schedule, Chapter 3</i> .

Continued on next page

Analyzer status, *Continued*

Reagents status The Reagents status shows the following:

- status of the solutions and gas cylinders
- messages referring to solutions and gas cylinders.



Buttons:

- Replace** Press to enter the screen for replacements of fluids – see *chapter 7: Replacements*.
- Adjust Level** Press to enter the Solution Level Adjustment program to make adjustments – see chapter 3 in this manual.
- Troubleshoot** Press to view the error interpretation and operator actions – see the description in *chapter 11: Troubleshooting*.
- Close** Press to exit to the **Ready** screen.

Electrodes and Other status The Electrodes and Other status shows the following:

- replacement schedule for items replaced in the Hold mode
- messages referring to replacements or user activities.



Continued on next page

Analyzer status, *Continued*

Electrodes and Other status *(continued)*

Buttons:

Replace

Highlight the item and press this button to enter the screen for replacements of electrodes/membranes – see *Replacing membrane or electrode* in chapter 7.

Log Activity

Activate “User Activities” part of the screen to make this button visible. When the button is visible, press it to enter the User Activity program to edit the user activities list – see *chapter 3* in this manual.

Close

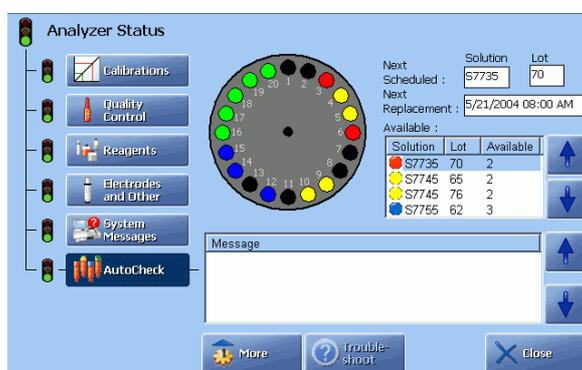
Press to exit to the **Ready** screen.

System messages See chapter 11: *Troubleshooting*.

AutoCheck status

AutoCheck Status is available only if the AutoCheck module has been installed. It shows the following:

- status of the carousel and the measurements scheduled in the QC Schedule program (see section *Quality control setup* in *chapter 3*).
- messages referring to AutoCheck.



Element	Function
Next Scheduled	To show the next AutoCheck solution/lot combination according to the scheduled setup.
Next Replacement	To show the date and time for refilling the carousel according to the scheduled setup.
Available	To show the presently available AutoCheck control solutions: type, lot and quantity of ampoules in the carousel. Use the up/down arrow buttons to highlight the desired solution.

Continued on next page

Analyzer status, *Continued*

AutoCheck status (*continued*)

The carousel shows the number of ampoules available in it. The black spots indicate used ampoules.

Button  unrolls to access the following buttons:

- | | |
|----------------------------------|---|
| <i>Packing List</i> | Displays the Optimal Packing List screen. |
| <i>Reset</i> | <ul style="list-style-type: none"> • Cancels pending manual measurements on control solutions requested from, e.g. RADIANCE. • Interrupts ampoule conditioning in the carousel. • Resets wet section programs. |
| <i>Open Module</i> | Opens the cover of the AutoCheck module. |
| <i>AutoCheck Programs</i> | Displays the AutoCheck Programs screen to start an AutoCheck measurement. |

Online aid facilities

Online facilities The online aid facilities include the following:

- Online Help
- Tutorials
- Online troubleshooting.

Help

This function assists you in using the analyzer.



Press the button in the Main menu (if not moved to the **Ready** screen – see *Operators and Access Profiles* in *chapter 3*) or on the **Ready** screen.

The help text is available for practically every screen your analyzer shows during its operation.



The **Contents** screen displays all help topics. Each topic is hyper-linked to either the next topic level or to the appropriate help text screen.

Use the scroll bar or touch the text to search through the topics and access the relevant help information.

Press the **Previous Topic** button to display the help text of a previous screen.



The **Index** screen is an alphabetic list of subjects in the help program.

Each letter at the top of the screen is a hyperlink to that section in the index.

Touch the letter to display the list of entries under that letter.

Each index entry is displayed in bold, purple text (a hyperlink). Simply touch the text to display the relevant help text.

Continued on next page

Online aid facilities, *Continued*

Tutorials

Tutorials are short video sequences of commonly used procedures. Press the

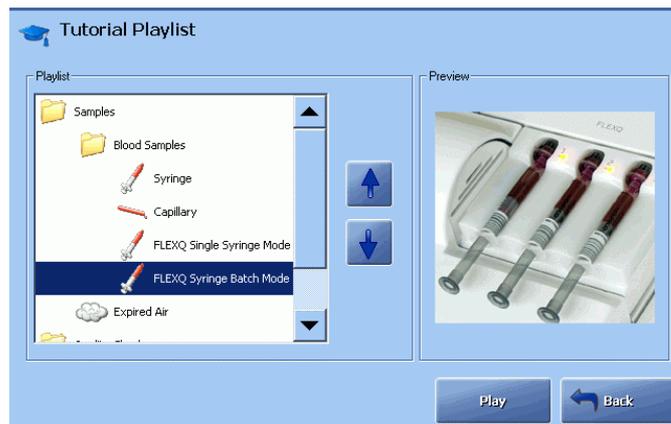


Tutorial button in the main menu or



button next

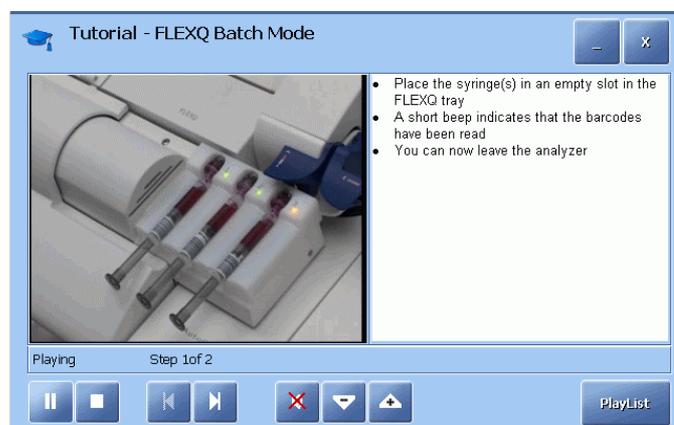
to the **Troubleshooting** button (when performing troubleshooting) to enter the Tutorial Playlist screen.



The Preview shows the highlighted sequence animation. To start a tutorial on full screen, highlight the topic of interest from the menu, using the arrows, and press the **Play** button.

Topic	Contents
Blood Samplers	Videos of a capillary, syringe or expired air sample introduction by highlighting it.
Quality Check	Videos of manual or AutoCheck quality control.
Replacement	Video sequences on various replacements.

The buttons on the **Tutorial** screen during a sequence allow to do the following:



Continued on next page

Online aid facilities, *Continued*

Tutorials (*continued*)

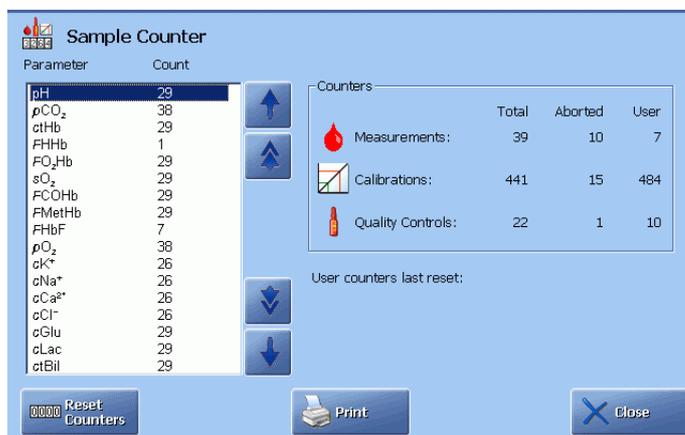
Button	Function
	Pause.
	Stop.
	Show previous picture – show next picture.
	Switch on the sound (voice presentation of a sequence) with volume regulation.
	Switch off the sound.
	Show the list of video sequences.
	The "-" button puts Tutorials in the background in order to perform an action and then to return to Tutorials again. The "x" button exits Tutorials.

When a button is grayed out, it is not functional.

Sample counter

Purpose The sample counter allows you to keep track of the measurements, calibrations and quality control.

Description The screen elements are described below:



Element	Function								
Parameter Count	Lists the parameters and how many times each of them was measured by the analyzer. Normally the count is the same as the total number of measurements provided the parameters were not excluded from the measurement(s).								
Counters	Shows the number of sample measurements, calibrations and QC measurements made since the sample counter was last reset (User column). The following is registered: <table border="1"> <thead> <tr> <th>Activity</th> <th>Number of...</th> </tr> </thead> <tbody> <tr> <td>Total</td> <td>Completed sample/quality control measurements/calibrations only. Interrupted or aborted measurements are excluded.</td> </tr> <tr> <td>Aborted</td> <td>Aborted sample/quality control measurements/calibrations due to sample errors, wet section errors, etc. interrupted measurements excluded.</td> </tr> <tr> <td>User</td> <td>All completed sample/quality control measurements/calibrations performed by all operators since the sample counter was last reset.</td> </tr> </tbody> </table>	Activity	Number of...	Total	Completed sample/quality control measurements/calibrations only. Interrupted or aborted measurements are excluded.	Aborted	Aborted sample/quality control measurements/calibrations due to sample errors, wet section errors, etc. interrupted measurements excluded.	User	All completed sample/quality control measurements/calibrations performed by all operators since the sample counter was last reset.
Activity	Number of...								
Total	Completed sample/quality control measurements/calibrations only. Interrupted or aborted measurements are excluded.								
Aborted	Aborted sample/quality control measurements/calibrations due to sample errors, wet section errors, etc. interrupted measurements excluded.								
User	All completed sample/quality control measurements/calibrations performed by all operators since the sample counter was last reset.								
User counters last reset	Gives the date when the counters in the User column were last reset to zero.								

Continued on next page

Sample counter, *Continued*

Description
(*continued*)

Element	Function																																																				
<i>Reset Counters</i>	 <p>The screenshot shows the 'Sample Counter' window. On the left, a list of parameters and their counts is displayed:</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Count</th> </tr> </thead> <tbody> <tr><td>pH</td><td>29</td></tr> <tr><td>pCO₂</td><td>38</td></tr> <tr><td>stHb</td><td>29</td></tr> <tr><td>FHb</td><td>1</td></tr> <tr><td>FO₂Hb</td><td>29</td></tr> <tr><td>sO₂</td><td>29</td></tr> <tr><td>FCOHb</td><td>29</td></tr> <tr><td>FMetHb</td><td>29</td></tr> <tr><td>FHbF</td><td>7</td></tr> <tr><td>pO₂</td><td>38</td></tr> <tr><td>cK⁺</td><td>26</td></tr> <tr><td>cNa⁺</td><td>26</td></tr> <tr><td>cCa²⁺</td><td>26</td></tr> <tr><td>cCl⁻</td><td>26</td></tr> <tr><td>cGlu</td><td>29</td></tr> <tr><td>cLac</td><td>29</td></tr> <tr><td>stBil</td><td>29</td></tr> </tbody> </table> <p>On the right, the 'Counters' section contains a table:</p> <table border="1"> <thead> <tr> <th></th> <th>Total</th> <th>Aborted</th> <th>User</th> </tr> </thead> <tbody> <tr> <td>Measurements:</td> <td>39</td> <td>10</td> <td>7</td> </tr> <tr> <td>Calibrations:</td> <td>441</td> <td>15</td> <td>484</td> </tr> <tr> <td>Quality Controls:</td> <td>22</td> <td>1</td> <td>10</td> </tr> </tbody> </table> <p>Below the table, it says 'User counters last reset:'. At the bottom of the window are three buttons: 'Reset Counters', 'Print', and 'Close'.</p>	Parameter	Count	pH	29	pCO ₂	38	stHb	29	FHb	1	FO ₂ Hb	29	sO ₂	29	FCOHb	29	FMetHb	29	FHbF	7	pO ₂	38	cK ⁺	26	cNa ⁺	26	cCa ²⁺	26	cCl ⁻	26	cGlu	29	cLac	29	stBil	29		Total	Aborted	User	Measurements:	39	10	7	Calibrations:	441	15	484	Quality Controls:	22	1	10
Parameter	Count																																																				
pH	29																																																				
pCO ₂	38																																																				
stHb	29																																																				
FHb	1																																																				
FO ₂ Hb	29																																																				
sO ₂	29																																																				
FCOHb	29																																																				
FMetHb	29																																																				
FHbF	7																																																				
pO ₂	38																																																				
cK ⁺	26																																																				
cNa ⁺	26																																																				
cCa ²⁺	26																																																				
cCl ⁻	26																																																				
cGlu	29																																																				
cLac	29																																																				
stBil	29																																																				
	Total	Aborted	User																																																		
Measurements:	39	10	7																																																		
Calibrations:	441	15	484																																																		
Quality Controls:	22	1	10																																																		
<i>Print</i>	Press to start the printout of information in Counters and in Parameters.																																																				
<i>Close</i>	Press to return to the Ready screen.																																																				

For the analyzers with no logon protection of the Setup programs, press this button to reset the counters in the User column.

Print Press to start the printout of information in Counters and in Parameters.

Close Press to return to the **Ready** screen.

3. Installation and setup

Overview

Introduction After the analyzer has been installed, you can define the settings on your ABL800 FLEX analyzer according to your own needs and requirements.

Contents	This chapter contains the following topics.	
	Installation.....	3-2
	Setup menu structure.....	3-3
	Operators and Passwords	3-6
	Analysis setup	3-12
	Patient reports	3-24
	Calibration setup	3-30
	Quality control setup.....	3-33
	Replacement setup	3-44
	Parameters and input.....	3-51
	Analyzer settings.....	3-58
	Communications	3-62
	Printers	3-70
	Disk Functions setup.....	3-73
	Corrective actions	3-76
	Miscellaneous setup.....	3-79

Installation

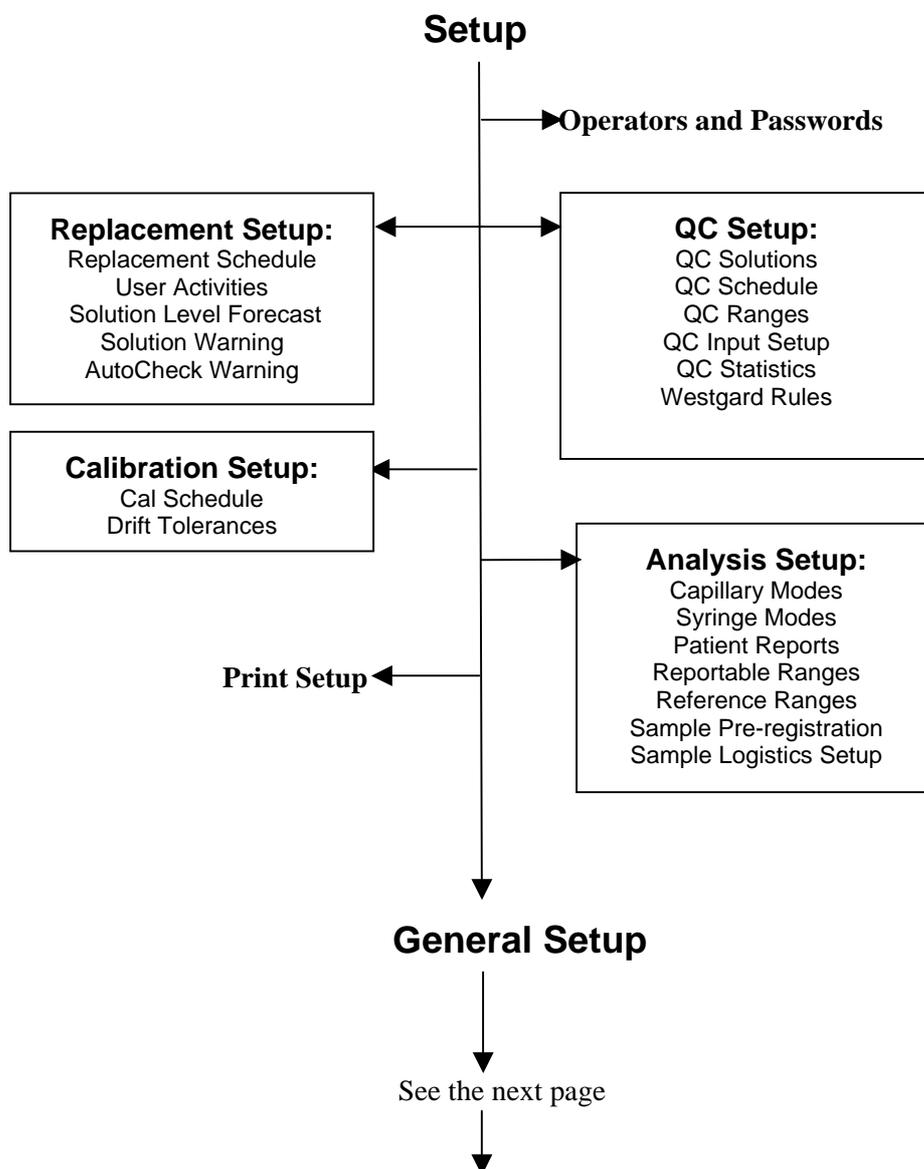
Information The ABL800 FLEX analyzers are installed and fully prepared for use by Radiometer representatives in your country. The reason for it is that – due to the analyzer's modular design – each user can select only those modules that cover his/her specific needs. These modules are installed and checked at the user's place. Installation of consumables and accessories are exactly the same as the procedures described in *chapter 7: Replacements*.

Setup menu structure

Accessing Setup programs To access the Setup programs, press the buttons:



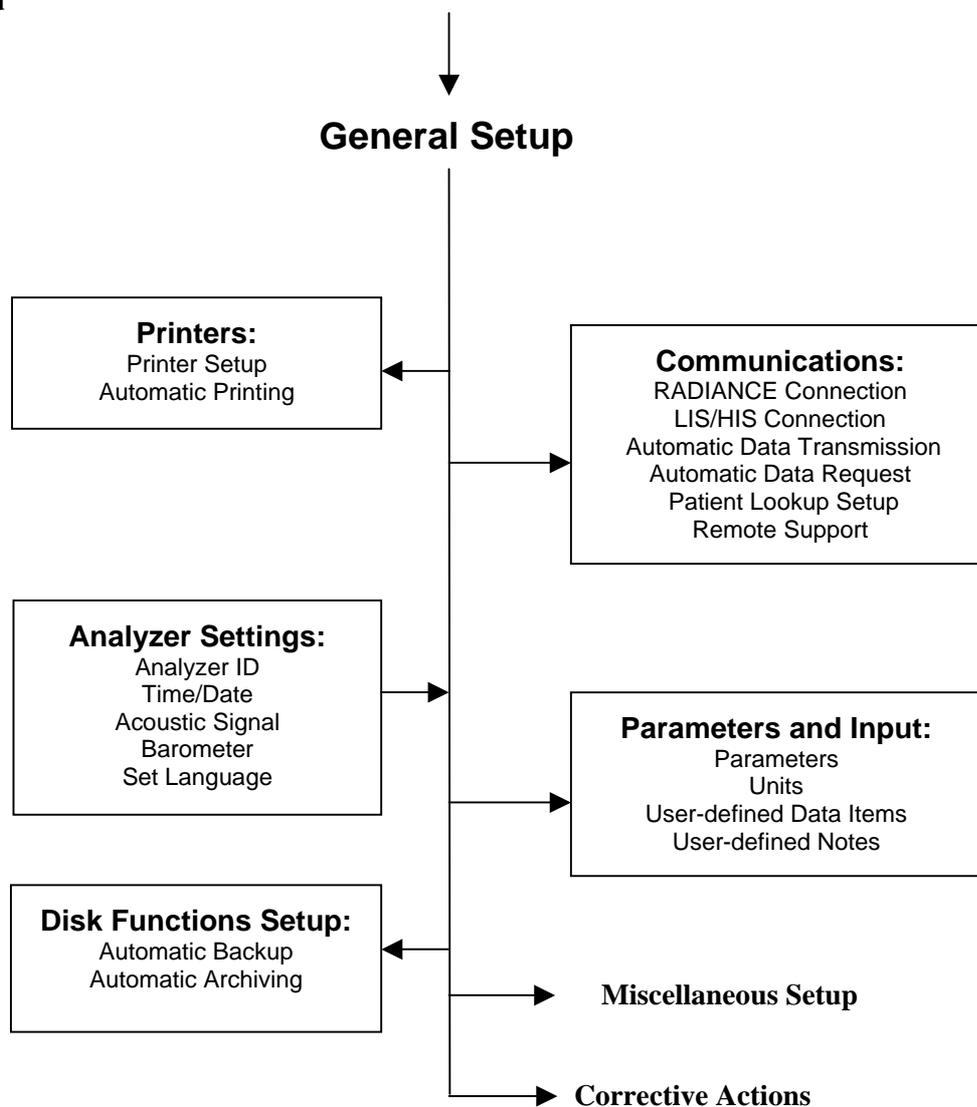
Setup menu structure



Continued on next page

Setup menu structure, *Continued*

Setup menu
structure
(*continued*)



Note that the exit from a setup program returns you to the **Ready** screen. You will find it more convenient to place some buttons, e.g., *Utilities*, on the **Ready** screen to shortcut the entry to a desired setup program - refer to *Operators and Passwords* program in *chapter 3*.

Continued on next page

Setup menu structure, *Continued*

Entering password

To enter the Setup programs, do the following.

- | Step | Action |
|------|---|
| 1. | Press Menu on the Ready screen.
Then click on Logon . |
| 2. | Scan or type in your password (use the keypad or press the keyboard icon to display the alphanumerical keyboard). |

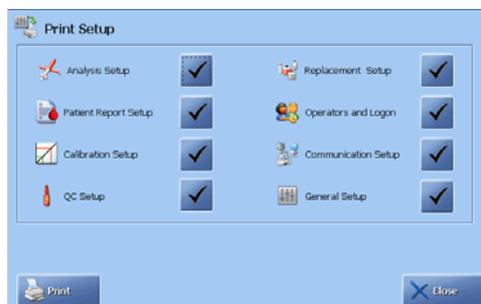


Confirm with **Enter**.

Print Setup

This program allows you to print parts of the setup. To select the parts of the setup for printing, do the following:

- | Step | Action |
|------|--|
| 1. | Press Menu – Utilities – Setup – Print Setup . |
| 2. | All setups are selected as a default. Press the relevant check buttons to deselect the setup that you do not wish to be printed out. |



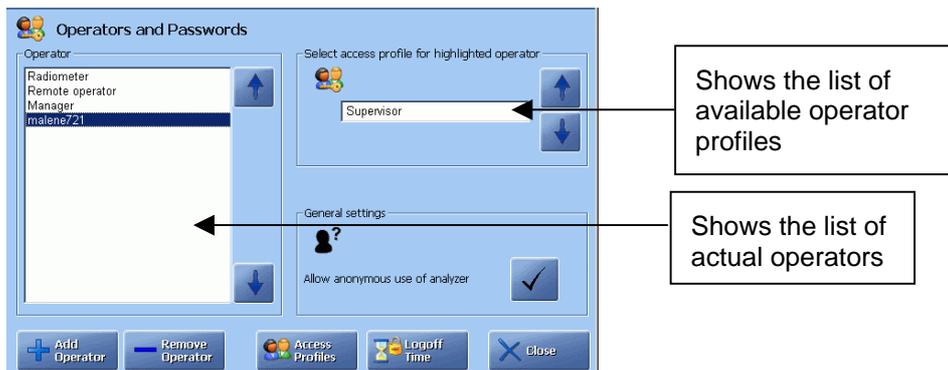
- | | |
|----|---|
| 3. | Press Print to start printout of the selected setups or press Close to return to the Ready screen. |
|----|---|

Operators and Passwords

Purpose This program allows you to do the following:

- set up passwords
- add/remove operators from the operator list
- assign and define access profiles
- assign an anonymous operator, i.e. allow the use of the analyzer without a password.
- define access to menus for each access profile
- select configuration of six buttons on the **Ready** screen
- set automatic logoff time

To enter this program, press *Menu – Utilities – Setup – Operators and Passwords*.



Default list of operators

When the analyzer is taken into use, the following default operators are available:

Operator	Has access to...
Radiometer	All menu items and programs (user and service) on the analyzer. Note that "Radiometer" cannot be removed from the operator list.
Manager	All menu items and programs (not service programs). It is recommended to remove this operator with the standard password: 123456, and enter the actual users with their profiles and passwords.
Remote operator	Only if the electronic key is installed.

Continued on next page

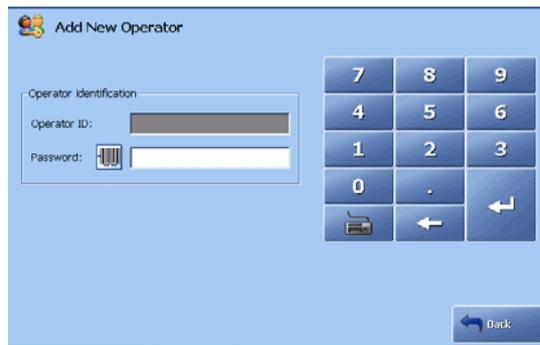
Operators and Passwords, *Continued*

Adding an operator

To add an operator to the list, do the following:

Step	Action
------	--------

1. Press the **Add Operator** button to display the **Add New Operator** screen.



2. Touch and highlight the "Operator ID" box. Type in the name of the operator or operator category, using the screen keyboard.
3. Highlight the "Password" box by touching it and enter the password as a barcode – see *Barcode reader, Chapter 2*, or manually use the keyboard.

The password must be at least four characters long, and not more than 32.

4. Press **Back**.

If the password is accepted, the **Operators and Passwords** screen is displayed.

If the password is not accepted, the **Add New Operator** screen remains. Enter the correct password again and press **Back**.

5. Select the new operator's access profile.

Removing an operator

To remove an operator from the list, use the up/down arrow buttons in the "Operator" box to highlight the operator, and press **Remove Operator**.



Continued on next page

Operators and Passwords, *Continued*

Selecting access profile To select the access profile for an operator, do the following:

Step Action

1. If an anonymous operator is desired, activate the check button in the "General settings" box.



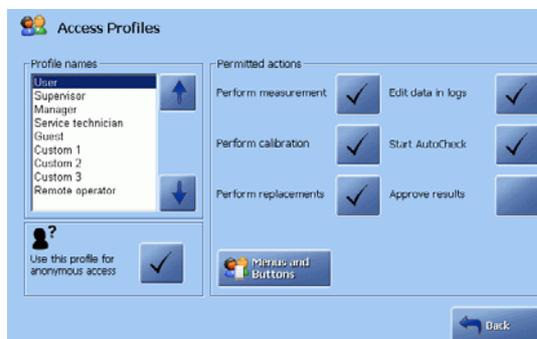
2. Highlight an operator in the "Operator" box and select the access profile for this operator.



Available profiles:
User, Supervisor,
Manager, Guest,
Custom1,
Custom 2,
Custom 3.

Note that "User" profile is set for anonymous access by default. Press the **Access Profiles** button.

3. The selected profile is highlighted in the "Profile names" box.



Activate relevant check buttons to select permitted actions for the given profile.

Continued on next page

Operators and Passwords, *Continued*

Selecting access profile (*continued*)

Step	Action
4.	Select access profiles for other operators in the same manner. Note that permitted actions are not available for remote operator.
5.	If you wish an unauthorized operator to use the analyzer, select profile name, and activate the check button:

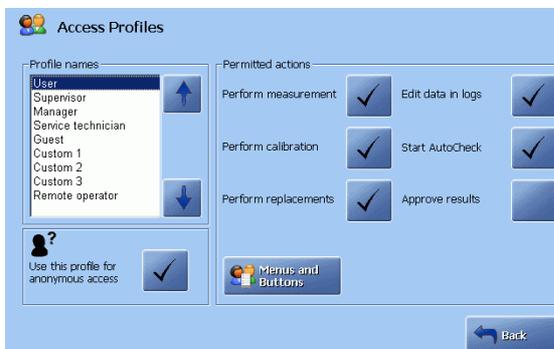


- | | |
|----|--|
| 6. | Select access to menus and button configuration for each access profile, if desired – see the next page. |
|----|--|

Selecting access to menus

To select access to menus for each access profile, do the following:

Step	Action
1.	Highlight the access profile, using up/down arrow buttons and press Menus and Buttons .



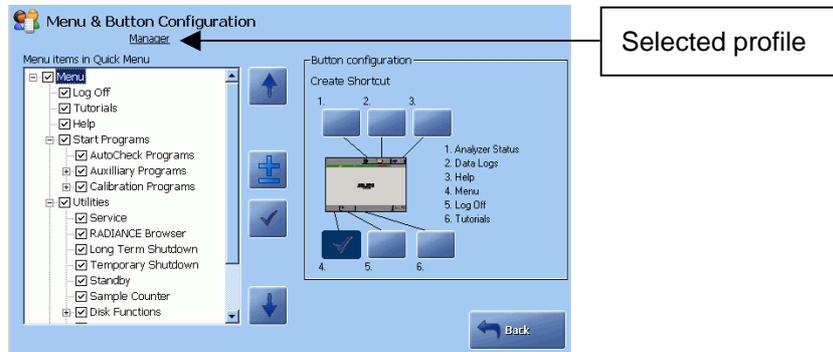
Note that the button is grayed out for the service technician profile.

Continued on next page

Operators and Passwords, *Continued*

Selecting access to menus
(*continued*)

- | Step | Action |
|------|--|
| 2. | The selected profile is named on the screen. |



A grayed-out item indicates that only some sub-items were selected in this group. Clear checked items indicate that all sub-items have been selected.

Use the buttons to do the following:



Highlight menu items



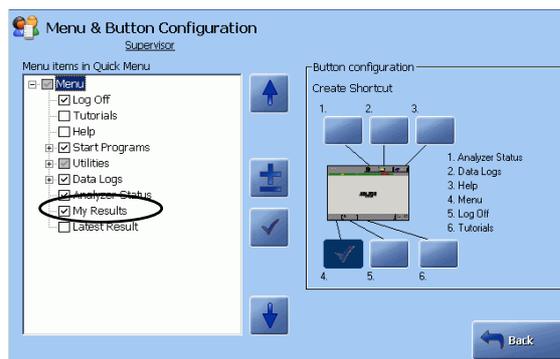
Open/close submenus



Select/deselect a menu item.

Select the allowed menu items for the desired profile.

- | | |
|----|---|
| 3. | Select the possibility for each operator to see her/his patient reports |
|----|---|



by checking the “My Results” item in the Data Logs menu.

- | | |
|----|---|
| 4. | Select buttons to be displayed on the Ready screen for the given access profile – see the next page. |
|----|---|

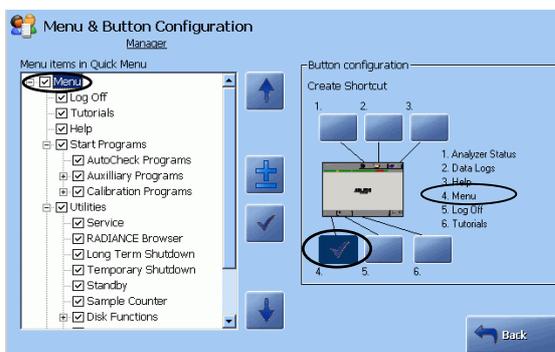
Continued on next page

Operators and Passwords, *Continued*

Selecting button configuration To select button configuration for an access profile, do the following:

Step Action

1. Highlight the menu item, using the up/down arrow buttons.



Then press the button position to give it the selected function.

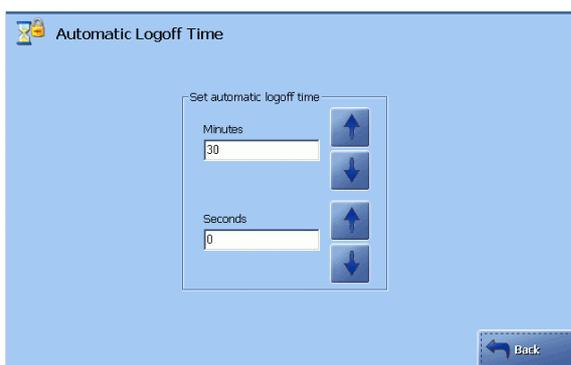
2. Select other five buttons in the same manner.
3. To deselect the button, press it once again.
4. Press **Back** to return to the **Access Profiles** screen.

Setting logoff time

To set the time interval to elapse before an operator is automatically logged off, do the following:

Step Action

1. Press the **Logoff Time** button on the **Operators and Passwords** screen to enter the screen below.



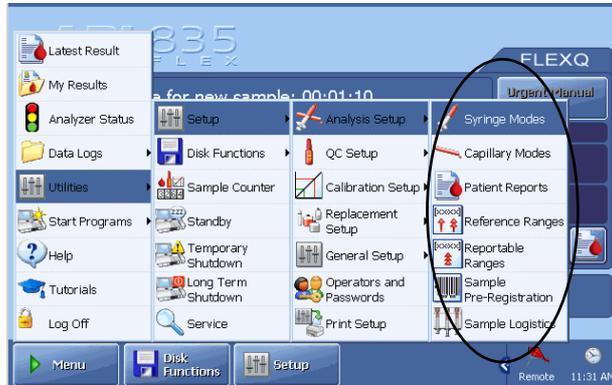
The default logoff time is three minutes.

3. Select the logoff time in minutes (from 0 to 60) and seconds (from 0 to 50 in 10-second intervals).
4. Press **Back** to return to the **Operators and Passwords** screen.

Analysis setup

Programs

Analysis Setup programs are described in this section.



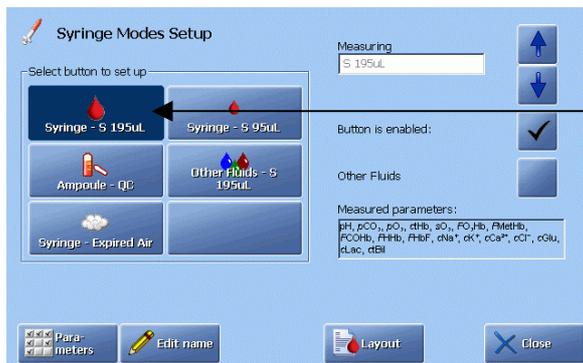
Activate a button to enter the program.

Syringe Modes and Capillary Modes Setup

The **Syringe Modes Setup** and **Capillary Modes Setup** are shown below:



To select a measuring mode
To enable a mode



The button of the mode used last is activated.

Continued on next page

Analysis setup, *Continued*

Selecting a measuring program

To select a measuring program, do the following:

- | Step | Action |
|------|--|
| 1. | Blood and expired air samples: Press the desired mode button, enable it and select the desired measuring program with the arrow buttons.

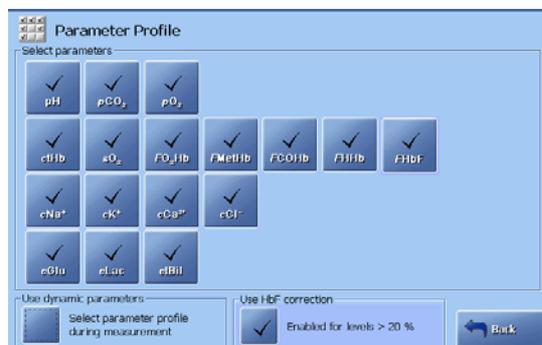
Other fluids: Activate the desired mode button and enable the Other fluids check button. |
| 2. | Press Parameters to select a parameter profile for a measuring program – see <i>Selecting Parameter Profile</i> below. |
| 3. | Edit, if desired, the left part of the button name for the mode by pressing Edit Name . |
| 4. | Enter corrections for the Other fluids mode by pressing Corrections – see <i>Corrections for Other Fluids Mode</i> further in this section. |
| 5. | Select the report layout for a measuring program by pressing Layout – see <i>Selecting a report layout</i> further in this section. |

- NOTES:**
- You can use one of the syringe measuring modes for test tubes.
 - Use Capillary – 35 µL OXI for bilirubin analysis (ctHb = 0) on plasma. Deselect all other parameters for this mode in the Parameter Profile. Alternatively, you can use the Other Fluids mode for the bilirubin measurement on plasma.

Selecting parameter profile

To select parameter profile for each measuring program, do the following:

- | Step | Action |
|------|--|
| 1. | Select a measuring program and press Parameters on the Syringe Modes Setup or Capillary Modes Setup screen. |
| 2. | Select parameters for a given measuring mode by pressing a parameter check button (see <i>Screen Elements</i> in chapter 2). |



Continued on next page

Analysis setup, *Continued*

Selecting parameter profile (*continued*)

- | Step | Action | | | | |
|---|--|--|---|--|--|
| 3. | Select the dynamic parameters option in the Parameter box as follows: <table border="0" style="margin-left: 20px;"> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td style="padding: 0 20px;">Parameters can be selected before a measurement.</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="padding: 0 20px;">Parameters can be selected after a measurement.</td> </tr> </table> |  | Parameters can be selected before a measurement. |  | Parameters can be selected after a measurement. |
|  | Parameters can be selected before a measurement. |  | Parameters can be selected after a measurement. | | |
| 4. | Press the Back button to return to the Syringe Modes Setup or Capillary Modes Setup screen. | | | | |

Disabled versus deselected parameter

A parameter is disabled, i.e. excluded from the **Parameter Profile** screen and the parameter bar, in General Setup – Parameter Setup.

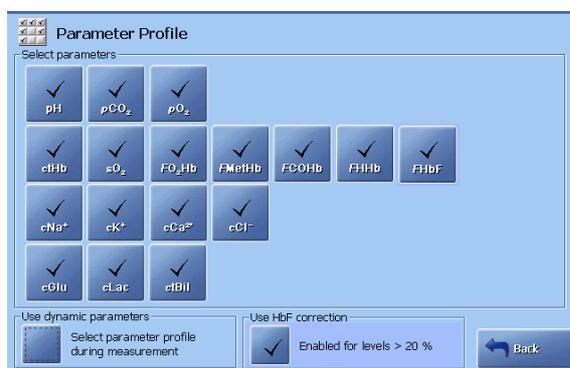
A parameter deselected for the given syringe or capillary measuring program will be measured, but excluded from the displayed and printed patient report.

You can further select or deselect a parameter before or after a measurement – see *chapter 4: Sample measurements*.

Selecting HbF correction

To select HbF correction for a measuring program, do the following:

- | Step | Action |
|------|--|
| 1. | Select HbF correction for all levels or for HbF levels higher than 20 % in Miscellaneous Setup (Setup – General Setup – Miscellaneous Setup) – see the description further in this chapter. |
| 2. | After selecting the setting in Miscellaneous Setup, return to the Analysis Setup, choose the desired syringe or capillary program and press the Parameters button to enter the Parameter Profile screen. |
| 3. | Press the check button in the “Use HbF correction” text box in order to select the function. |

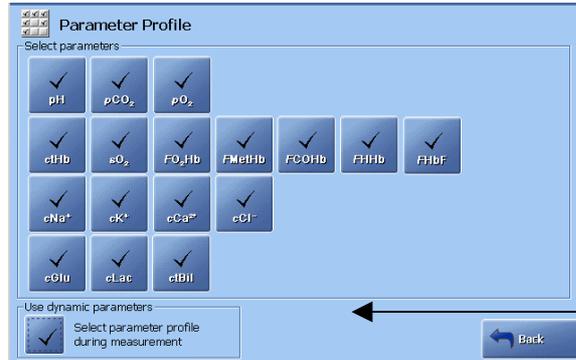


Continued on next page

Analysis setup, *Continued*

Selecting HbF correction (*continued*)

- | Step | Action |
|------|---|
| 4. | Press the dynamic parameters check button in the “Use dynamic parameters” box in order to be able to exclude the HbF correction and other parameters during a sample measurement. |

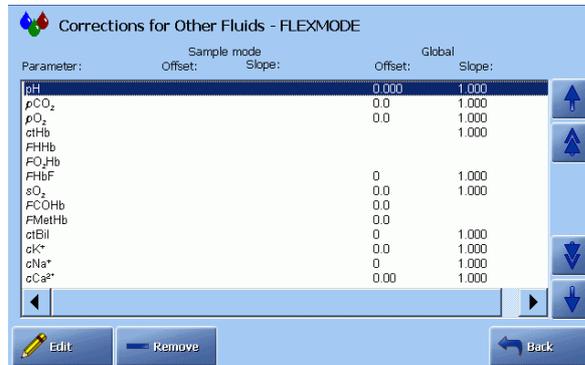


HbF correction was disabled in Miscellaneous Setup

Entering corrections for Other Fluids mode

The Other Fluids mode allows measurement on samples other than heparinized whole human blood and, therefore, requires entering corrections (offset and slope).

- | Step | Action |
|------|--|
| 1. | Select the Other Fluids mode and press the <i>Corrections</i> button on one of the Modes Setup screens (Capillary or Syringe). |
| 2. | Highlight the parameter with the arrow buttons and press <i>Edit</i> . |

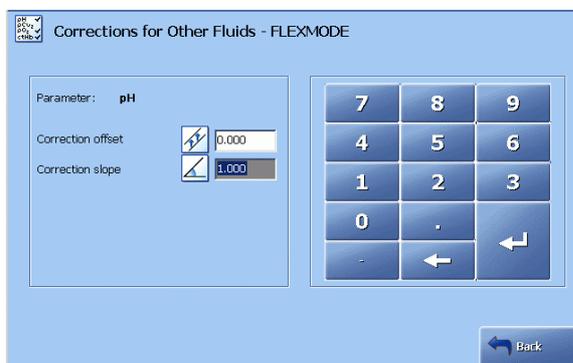


Continued on next page

Analysis setup, *Continued*

Entering corrections for Other Fluids mode (*continued*)

- | Step | Action |
|------|--|
| 3. | Key in the slope and offset values. Confirm each entry with Enter . |



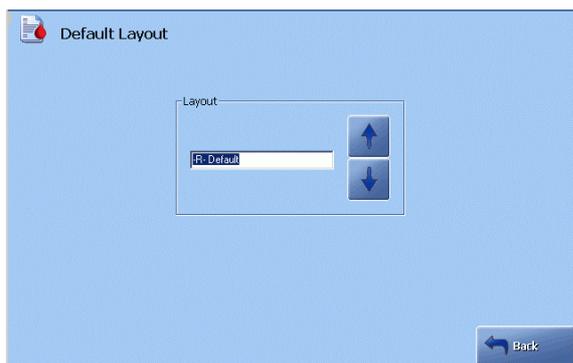
Please note that only values within the range programmed into the software will be accepted.

- | | |
|----|--|
| 4. | Press Back to confirm the entries and return to the previous screen. |
| 5. | To delete a correction, highlight it and then press the –Remove button. |

Selecting a report layout

To select a report layout for a measuring program, do the following:

- | Step | Action |
|------|--|
| 1. | Select a measuring program. |
| 2. | Press the Layout button on one of the Mode Setup screens. |



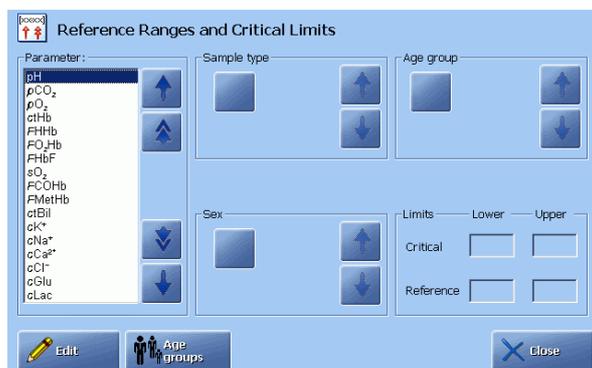
- | | |
|----|---|
| 3. | Select the layout for the measuring program from the list made in the Patient Report Setup – see <i>Patient Report</i> further in this chapter. The selected layout will be the default layout for the given measuring program. |
| 4. | Press Back to confirm the settings. |

Continued on next page

Analysis setup, *Continued*

Reference ranges and critical limits

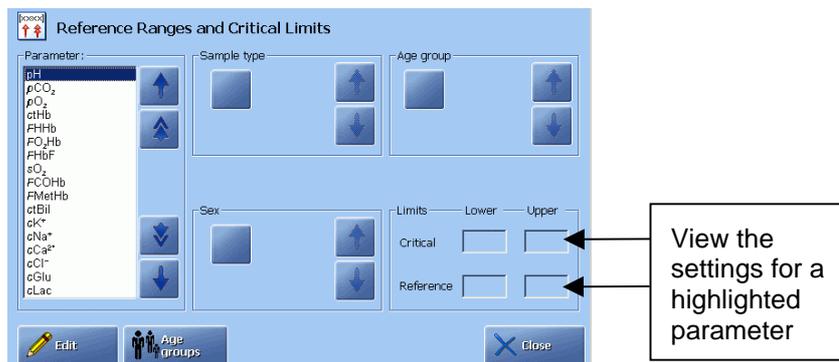
This program allows you to enter your own reference ranges and critical limits for all measured and calculated parameters. For each parameter, you can choose whether or not to differentiate between the categories of sample type, sex and age group.



Press the check button to activate a function; press the check button again to deactivate it.

Viewing the reference ranges and critical limits

To view the reference ranges and critical limits, highlight a parameter in the "Parameter list" box using the arrow buttons.



Selecting sample type

To select a sample type, highlight a parameter in the "Parameter" box, using the arrow buttons.

Press the check button in the "Sample type" box and select a sample type, using the arrow buttons in the box.

To deactivate sample type differentiation, press the check button again.

Selecting sex

To select sex, highlight a parameter.

Press the check button in the "Sex" box and select sex type, using the arrow buttons in the box.

To deactivate sex differentiation, press the check button again.

Continued on next page

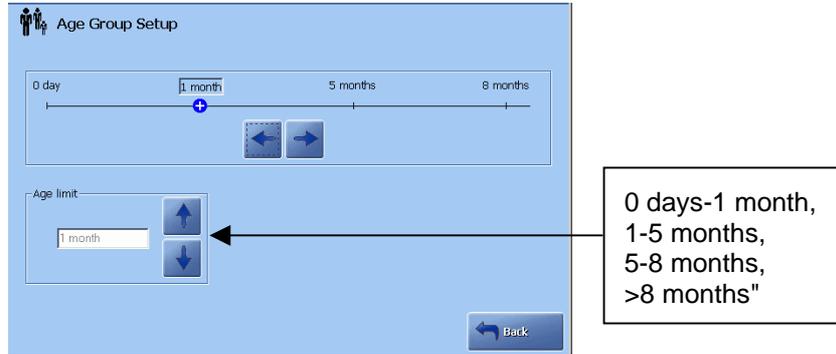
Analysis setup, *Continued*

Setting age group limits

To set the age group limits, do the following:

Step	Action
------	--------

1. Press the **Age groups** button to display the following screen:



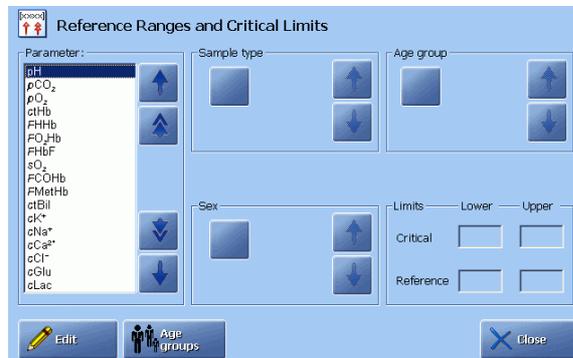
2. Use the following:
 - left/right arrows to choose the age group limit you want to alter (indicated by a blue circle containing a white cross).
 - up/down arrows to scroll through the list of possible age limits. As the list is scrolled the text on the age group bar changes accordingly.
3. Repeat step 2 for each limit to be changed.
4. Press **Back** when completed to return to the **Reference Ranges and Critical Limits** screen.
5. Activate the **Age group** check button.
To deactivate age group differentiation, press the check button again.

Setting reference and critical limits

To set the reference and critical limits for each parameter do the following:

Step	Action
------	--------

1. Highlight a parameter by using the up/down arrow buttons.



2. Choose the sample type, sex, age group and press the **Edit** button.

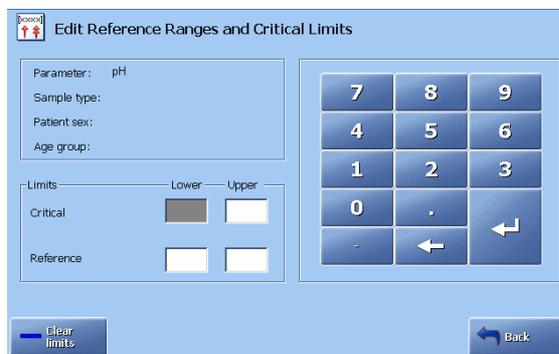
Continued on next page

Analysis setup, *Continued*

Setting reference and critical limits (*continued*)

Step	Action
------	--------

- To remove all current ranges, press the **Clear limits** button.



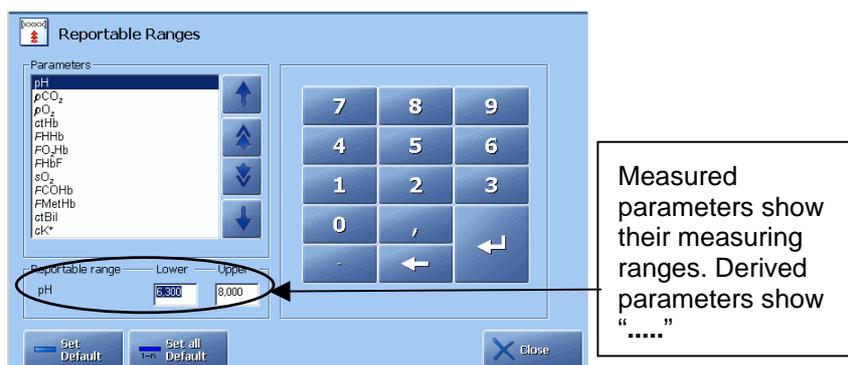
- To change the value in a range limit, touch and highlight the range. Then enter the limit, using the screen keyboard and confirm with **Enter**.
- Repeat for other limits in a similar way.
- Press **Back** when completed.

Reportable ranges

To change or enter a reportable range (must be selected smaller than or equal to the measuring range), do the following:

Step	Action
------	--------

- Scroll to the desired parameter, using the up/down arrows or scroll bar.



- Key in the desired lower limit and confirm with **Enter** on the keypad.
- Key in the upper limit and confirm with **Enter** on the keypad.
- To change the reportable range to the default (primary) setting, highlight the desired parameter and press **Set Default**.

Continued on next page

Analysis setup, *Continued*

Reportable ranges (*continued*)

- | Step | Action |
|------|---|
| 5. | To change all parameters to the default values, press the <i>1-n Set All Default</i> button. |



Press ***Continue*** to change all parameters' reportable ranges to the default ones.

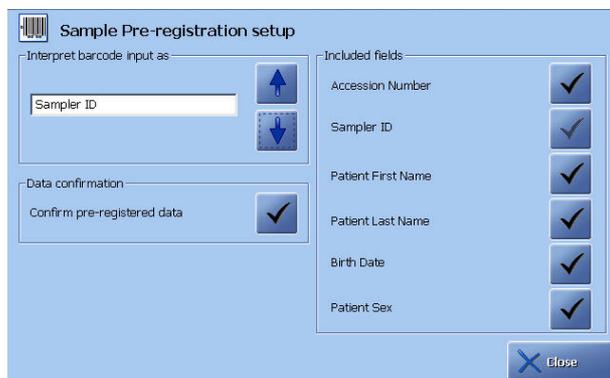
Press ***Cancel*** to keep the user-defined reportable ranges and return to the previous screen.

- | | |
|----|--|
| 6. | Press <i>Close</i> to exit the program and confirm the selected settings. |
|----|--|

See also *Verification of the Reportable Ranges* in chapter 15 in this manual.

Sample Pre-registration setup

This program allows you to select interpretation of the barcode and the patient data that can be confirmed before and during a sample measurement.



To select the settings, do the following:

- | Step | Action |
|------|--|
| 1. | Use the up/down arrow buttons to select the interpretation of the barcode setting in the "Interpret barcode input as" box.
Choose one of the following: <ul style="list-style-type: none"> • Patient ID • Accession Number • Sampler ID. |

Continued on next page

Analysis setup, *Continued*

Sample Pre-registration setup (*continued*)

Step	Action
1 (cont.)	Note that choosing the Accession Number or Sampler ID will gray out its check button (Sampler ID on the screen above). Choosing the Accession Number or Sampler ID ensures that this data will be included in the "Data confirmation" box.
2.	Select the barcode entry.
3.	Activate the relevant check buttons in the "Included information" box: Accession Number, Patient First Name, Patient Last Name, Birth Date, Patient Sex.
4.	Activate the check button in the "Data confirmation" box so that the patient data can be confirmed both before and during the sample measurement.
5.	Press <i>Close</i> to confirm the settings and return to the Ready screen.

Sample Logistics Setup This program allows you to select the following: the batch mode (automatic sample handling), Patient Identification shown on the **Ready** screen and to define maximum allowed sample age for each measured parameter.

Batch mode (automatic sample handling)

The batch mode allows you to place your sampler in an empty slot in the FLEXQ sampler tray and leave the analyzer. The sampler will be registered, sample analysed and the results sent to the required person.

To achieve this the following is required:

- Analyzer has live connection to RADIANCE
- Barcode interpretation is set to Sampler ID in the Sample Pre-registration
- "When entering Sampler ID" in "Request patient demographics" box is selected and "From connection" should be set to RADIANCE in the Automatic Data Request setup
- All sample/patient information is present on RADIANCE

Continued on next page

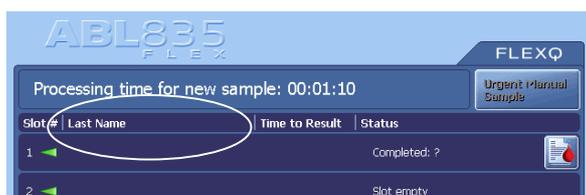
Analysis setup, *Continued*

Batch mode (automatic sample handling) (*continued*)

If the above requirements are fulfilled, activate the check button in the "FLEXQ" box. This box is not available for the analyzers without the FLEXQ module.

Patient identification on the Ready screen

To select the name of the second column on the **Ready** screen, use the up/down arrow buttons in the "FLEXQ" box.



The choices are: Patient Last Name, Accession No. or Sampler ID.

Sample age

Sample age is the time within which the sample should be analysed. It can be defined for each measured parameter individually or for all parameters.

Patient Report Layout (described further in this chapter) offers the following time registration items in the Patient ID:

- "Draw time" (i.e. when the sample was obtained from the patient); is entered by the operator on the **Patient Identification** screen on the analyzer or on RADIANCE.
- "Sample registration" (i.e. when the sample was registered by the analyzer); cannot be entered by the operator.
- "Time before FLEXQ" (i.e. sample transport time to the analyzer; is obtained if the "Draw time" has been entered); cannot be entered by the operator.
- "Time in the FLEXQ" (i.e. waiting time); cannot be entered by the operator.
- Max. sample age (is entered on RADIANCE). This setting, if used, will overrule the settings selected on the analyzer.

The sample age is calculated, using the following:

Manual measurement	"Sample age " = "Sample registration" – "Draw time". Sample age = 0 if "Draw time" is not entered.
FLEXQ measurement	"Sample age" = "Time before FLEXQ" + "Time in FLEXQ" where: "Time before FLEXQ" = "Sample registration" – "Draw time"; "Time in FLEXQ" = "Time the sample aspiration begins" – "Sample registration"

Continued on next page

Analysis setup, *Continued*

Sample age (*continued*)

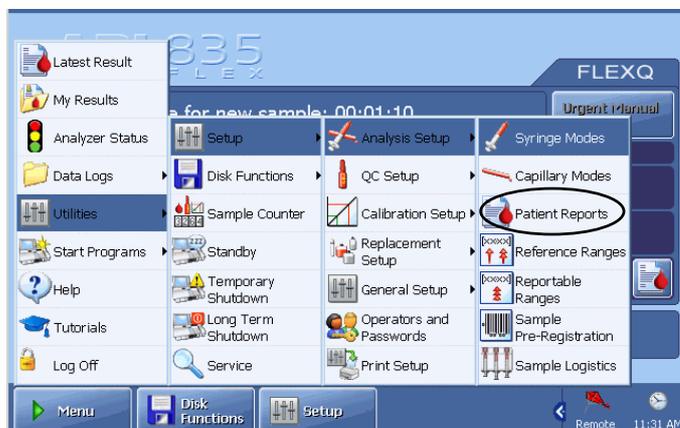
To define maximum allowed sample age, do the following:

Step	Action
------	--------

1. Activate the check button in the "Calculation of sample age" box.
2. To select the same age for all parameters, press ***Set all***.
To select the sample age for each parameter individually, highlight a parameter in the "Sample aging time per parameter" box, using the up/down arrow buttons.
3. Select sample age for the highlighted parameter, using up/down arrow buttons.

Patient reports

Purpose This program allows you to create a number of new layouts for patient reports or to modify the existing ones.



The screen accommodates two main functions: creating a layout and editing a layout.

Creating a layout

To create a new layout, do the following:

Step	Action
------	--------

1. Press **New** or **Copy** on the screen to make a new layout with the name "New" or "Copy" displayed on the right side of the screen in the "Name" box.



Press the keyboard icon beside the "Name" box

Type in a new name for your layout.

Confirm with **Enter** to return to the **Patient Report Setup** screen.

The newly named layout will be added to the list of layouts.

2. Edit your layout as described in *Editing a layout* further in this section.

Continued on next page

Patient reports, *Continued*

Creating a layout (*continued*)

- | Step | Action |
|------|--|
| 3. | If desired, make the highlighted layout a default for your analyzer by pressing <i>Make Default</i> . |



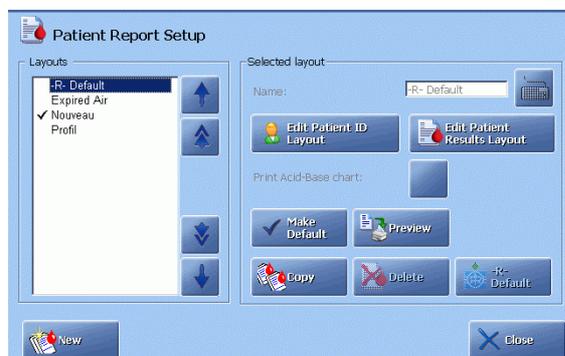
It will be marked with (✓) in the list of layouts.

4. Make a test printout, if desired, of the highlighted layout (patient ID items and selected parameter groups with the parameters/units for each parameter group) by pressing ***Preview***. This test print will be labeled "Preview".
5. Enforce, if desired, the Radiometer default settings on the highlighted layout by pressing ***-R- Default***. This will give you a starting point for designing your own layout.
6. To delete a highlighted layout, press ***Delete***.

Note that the Radiometer default layout cannot be deleted. The button is disabled if only the Radiometer default layout is available.

Editing a layout To edit a layout, do the following:

- | Step | Action |
|------|--|
| 1. | Highlight a layout in the list by touching it on the screen. |
| 2. | Press the <i>Edit Patient ID Layout</i> button to edit the patient ID items – see description on the next page. |



Continued on next page

Patient reports, *Continued*

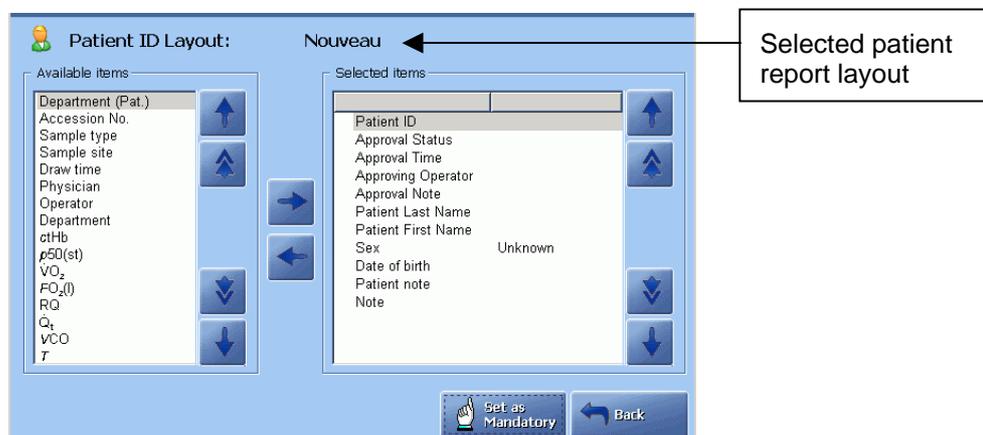
Editing a layout (*continued*)

- | Step | Action |
|------|---|
| 3. | Press the Edit Patient Results Layout button to edit the parameter groups – see description further in this section. |
| 4. | If an automatic printout of the Acid-Base chart for this layout is desired, activate the Print Acid-Base Chart button. |

Editing patient ID layout

You can customize the following patient identification (Patient ID) information:

- select the items for the Patient ID.
- set Patient ID entries as mandatory or not.
- define default values for Patient ID.



To edit a patient ID for a selected patient report layout, do the following:

- | Step | Action |
|------|---|
| 1. | To add a highlighted (by touching it on the screen) item in the "Available items" box, to the list of selected items, press the "→" button. |
| 2. | To remove a highlighted (by touching it on the screen) item from the "Selected items" box, press the "←" button. |
| 3. | To make a highlighted item in the list of selected items mandatory, press the Set as Mandatory button. The item will be indicated by a  on the Patient ID screen and must be entered during a measurement before a patient result can be viewed.

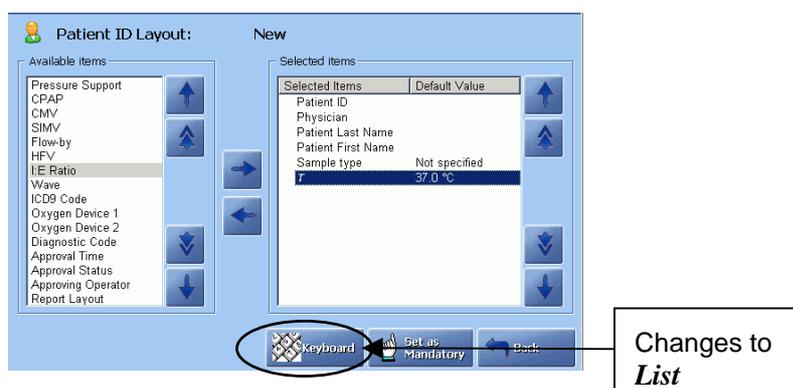
To remove the mandatory mark, highlight the item in the "Selected items" box and press the Set as Mandatory button again. |
| 4. | Press Back to exit the screen. |

Continued on next page

Patient reports, *Continued*

Entering default values To enter default values for patient identification items, do the following:

- | Step | Action |
|------|---|
| 1. | Use the arrow buttons on the right to highlight the desired item in the "Selected Items" box. |



- Set the default:
 - If the item has a value, press **Keyboard**, enter the value and press **Enter** on the keyboard to confirm.
 - If the item has a list of options, press **List**, highlight the option using the arrow buttons and press **Enter** to confirm.
- Set or change other default values in the similar manner.
- Press **Back** to exit and confirm changes.

NOTES:

- It is not possible to set default values for all items.
- The values can be changed on a result-by-result basis on the **Patient Identification** screen.
- An item placed in the **Selected items** list does not appear in the **Available items** list.
- To use the **Patient Lookup** function, Department (Pat.) should be selected for the **Patient Identification** screen.
- To use the **Request** function, Accession number and/or Patient ID should be selected for the **Patient Identification** screen.

Continued on next page

Patient reports, *Continued*

Editing patient result layout

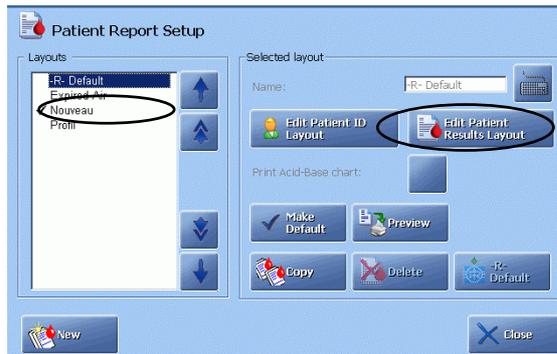
You can do the following:

- select parameter groups and the parameters in each group, and
- make report layout by using layout commands.

To edit a patient result layout, do the following:

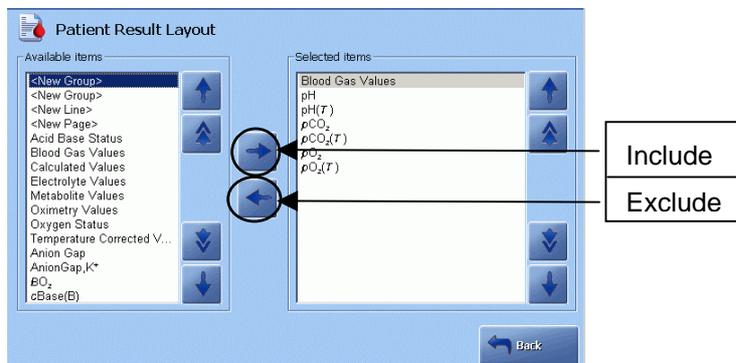
Step	Action
------	--------

1. Select the patient report layout by highlighting it on the screen and



press *Edit Patient Results Layout*.

2. Use the arrow buttons to highlight a parameter group and press “→”



to include the group in the patient result. It will be shown in the "Selected item" box.

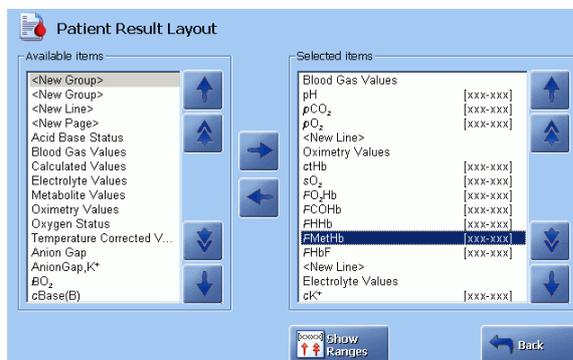
3. Select parameters for this parameter group by highlighting them one by one and pressing “→” (**Include**).
4. Select another parameter group and parameters for this group in the same manner.
5. Use layout commands <New group> (items following this command are placed on the top of the next half of the screen), <New Line> (a line is inserted between items) or <New Page> (items following this command appear on next screen page) as desired and press “→”.

Continued on next page

Patient reports, *Continued*

Editing patient result layout (*continued*)

- | Step | Action |
|------|---|
| 6. | To exclude an item from the selected parameter list, highlight it and |



press “←”

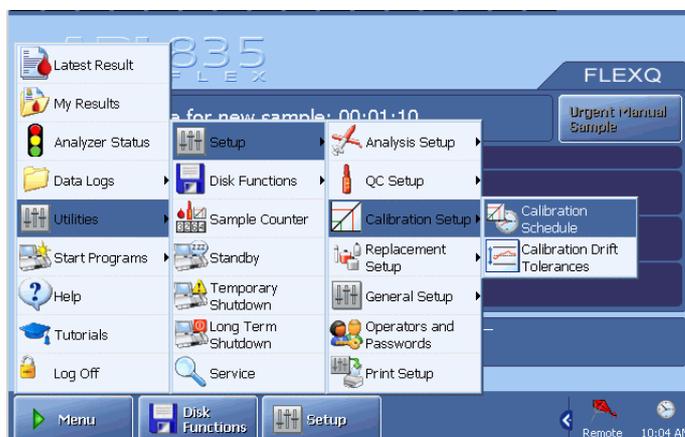
- If you wish to display parameters with their reference ranges and have them checked against reference ranges/critical limits, do the following:
 - Highlight a parameter.
 - Press **Show Ranges** to indicate it by “[xxx-xxx]”.
 - Repeat for other parameters in the same manner.

If the “[xxx-xxx]” is not included for a parameter, checking against reference ranges/critical limits is disabled for this parameter. However, checking against the reportable ranges is always performed.

NOTE: Refer to the Reference Manual, chapter 6: Parameters, for information on parameters and their groups.

Calibration setup

Programs Calibration Setup programs are described in this section.



Activate a button to enter the program.

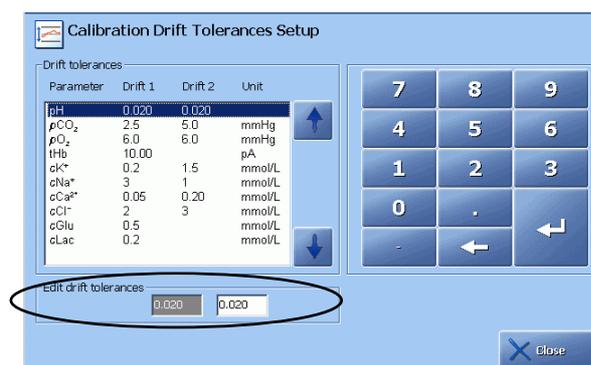
Calibration drift tolerances This program allows you to change the default drift tolerances for the pH, $p\text{CO}_2$, $p\text{O}_2$, electrolyte and metabolite electrodes – see *Radiometer default settings* in *chapter 15* in this manual.

NOTE: Radiometer recommends the use of the default drift tolerances. Too narrow drift tolerances will cause electrode drift errors even for normal electrode fluctuations. If the drift tolerances are made wider, no warning will be given if the electrode should become unstable. Significant measurement errors could result.

To define your own drift tolerances, do the following:

Step	Action
------	--------

1. Highlight the desired parameter by touching it on the screen.



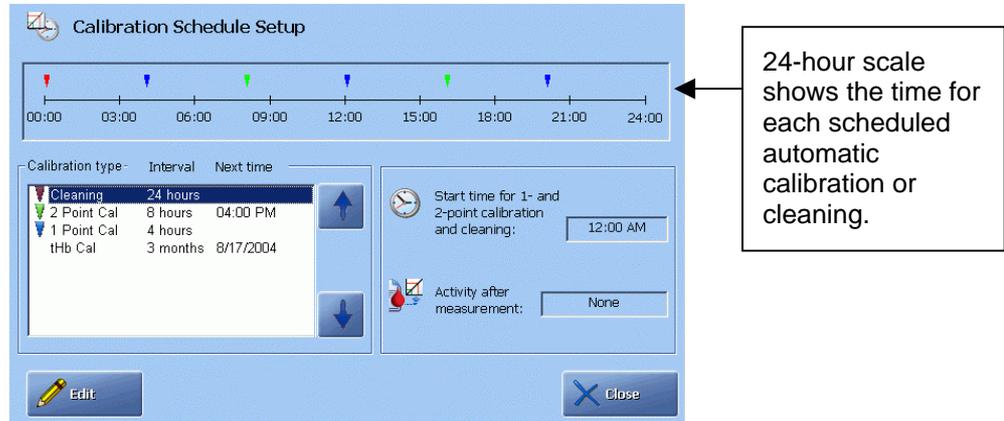
2. Type in your own value and confirm with **Enter**.
3. Change other drift tolerances in the same manner.
4. Press **Close** to confirm the changes.

Continued on next page

Calibration setup, *Continued*

Calibration schedule

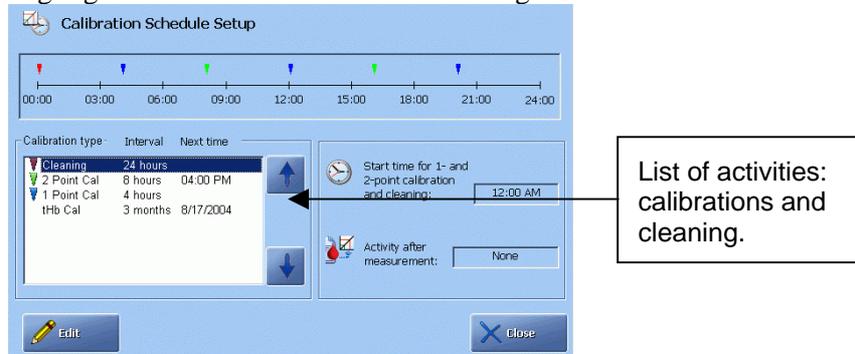
This program allows you to schedule automatic calibrations, manual tHb calibration, automatic cleaning, and select a calibration to be performed after a sample measurement.



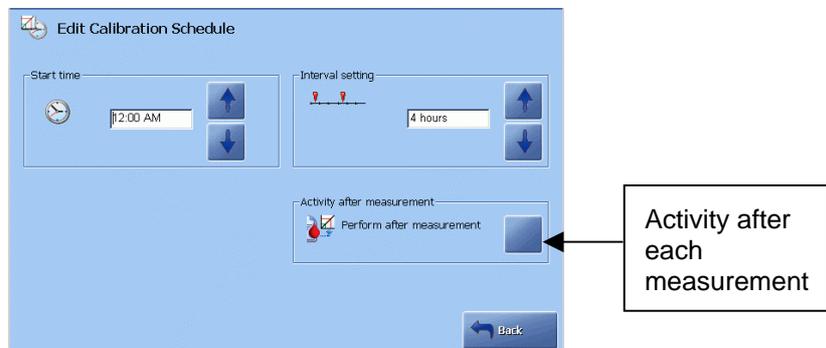
To edit the schedule for automatic calibrations/cleaning and tHb calibration, do the following:

Step	Action
------	--------

1. Highlight the desired calibration or cleaning on the screen.



2. Press the *Edit* button.



Use the arrow buttons to select start time for calibrations and cleaning and the intervals between each activity.

Continued on next page

Calibration setup, *Continued*

Calibration schedule (*continued*)

Step	Action
3.	Select activity after each measurement by activating the check button for the desired calibration.

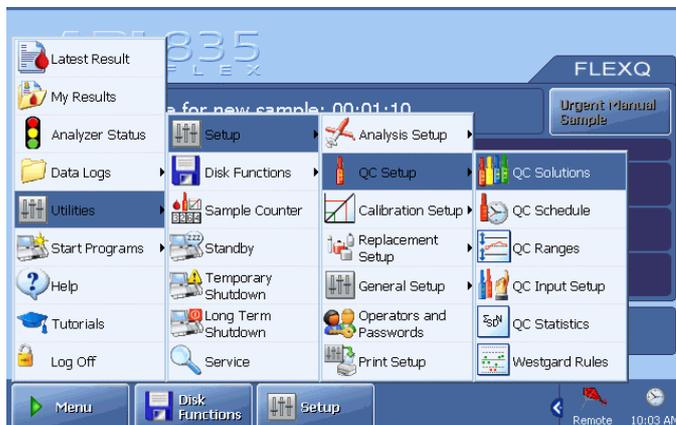
Available calibration schedule options

The following options are available.

Option	Interval
1-point calibration	30 min, 1 hour, 2, 4 or 8 hours.
2-point calibration	1 hour, 2, 4 or 8 hours.
1-point gas calibration (for the USA only)	30 min, 1 hour, 2 hours.
tHb calibration	Never, 7 days, 1 month, 2, 3, 4 or 6 months
Start time	00:00, 00:15, 00:30, 00:45..... 23:45. or 12 midnight, 12:15 am, 12:30 am, 12:45 am.....12 midday, 12:15 pm.....11:45 pm.
Activity after measurement	none, 1-point gas calibration (for the USA only), 1-point calibration, 2-point calibration.
Cleaning intervals	8, 24 hours.

Quality control setup

Programs The quality control setup programs are described in this section.



Activate a button to enter the program.

QC solutions This program allows you to assign or change a quality control solution to a specific slot.

WARNING/CAUTION: Changing a control solution assigned to a slot will delete all current quality control statistics obtained on that slot. If you want a copy of the statistics for the last QC month, create a WDC Report disk – see chapter 8: Disk Functions.



To assign a control solution to a slot, do the following:

- | Step | Action |
|------|---|
| 1. | Highlight a slot, using the arrow buttons. |
| 2. | For control solutions from Radiometer, scan the bar code or press the |

keypad button  to enter the barcode.

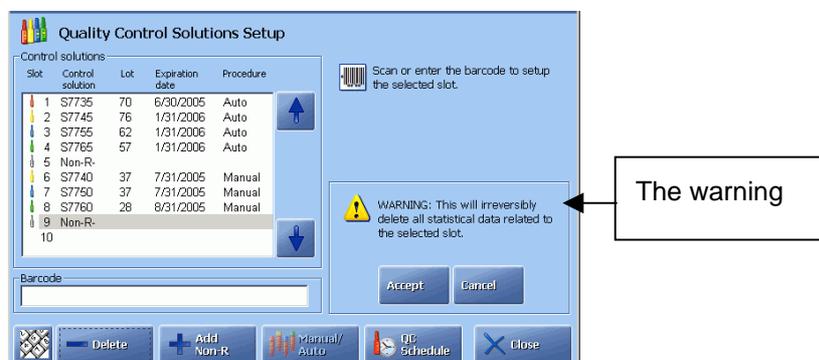
Continued on next page

Quality control setup, *Continued*

QC solutions (*continued*)

Step Action

3. For non-Radiometer control solutions, press ***Add Non-R-***.



Press ***Accept*** to continue with the installation of the control solution.
Press ***Cancel*** to cancel installation of the control solution.

4. To delete a control solution, highlight the desired slot and press ***Delete***. The warning as in step 3 above appears.

Press ***Accept*** to continue with the removal of the control solution.

Press ***Cancel*** to cancel.

5. Press the ***Manual/Auto*** button to select between quality control measurement performed manually or automatically.

The following quality control solutions can be used with the ABL800 FLEX analyzers:

Quality control system	Analyzer
QUALICHECK5+; AutoCheck5+	ABL805
QUALICHECK3+; QUALICHECK5+; AutoCheck3+; AutoCheck5+	ABL830/20/10
QUALICHECK5+; AutoCheck5+	ABL835/25/15

For the solution types for each quality control system, please refer to *chapter 14: Ordering information* in this manual.

You can also use a suitable non-Radiometer quality control system for your analyzer.

Continued on next page

Quality control setup, *Continued*

QC ranges

This program allows you to do the following:

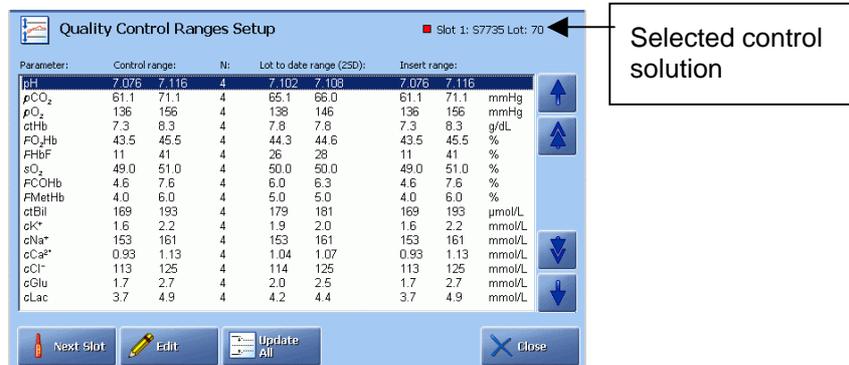
- globally update all control ranges of a slot to a calculated lot-to-date range.
- individually edit parameter control ranges by entering your own ranges or updating to a calculated lot-to-date range.
- define a minimum allowed control range by entering a Fixed SD (standard deviation).

See the Quality Control Systems Reference Manual for detailed information on statistics and its parameters.

To edit data for the control solution, do the following:

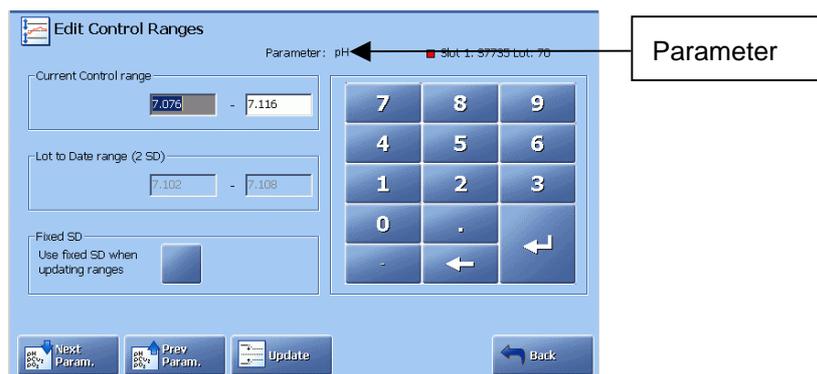
Step	Action
------	--------

- | | |
|----|---|
| 1. | Use <i>Next Slot</i> to display the desired slot. |
|----|---|



Press *Edit*.

- | | |
|----|---|
| 2. | Select the parameter to be edited, using <i>Next Param.</i> or <i>Prev Param.</i> |
|----|---|



- | | |
|----|--|
| 3. | Press <i>Update</i> to change the range to the one shown in the "Lot-to-Date range (2 SD)" box - if available (i.e. the range calculated over the course of the lot, represented mathematically by: mean value ± 2 SD. This is the range within which 95 % of the measurements taken are found). |
|----|--|

Continued on next page

Quality control setup, *Continued*

QC Ranges (*continued*)

- | Step | Action |
|------|---|
| 4. | Highlight the limit by touching it on the screen and enter your own value(s), using the keypad. |
| 5. | To activate or deactivate the Fixed SD (i.e. a minimum allowed control range is defined by setting a Fixed SD), press the check button. |



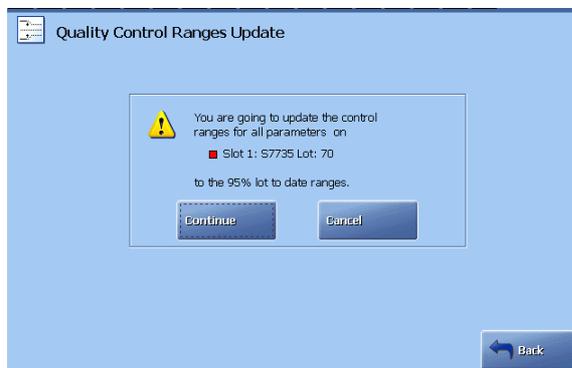
To change the SD value, touch the **SD** field to highlight it and enter the value, using the keypad. Confirm the entry with **Enter**.

- | | |
|----|--|
| 6. | Repeat the procedure for other parameters in the same manner. |
| 7. | To update the control ranges for all parameters of a displayed level to the corresponding lot-to-date (2 SD) range shown, display the desired slot, using Next Slot . |

Parameter:	Control range:	N:	Lot to date range (2SD):	Insert range:	
pH	7.076 7.116	4	7.102 7.108	7.076 7.116	
pCO ₂	61.1 71.1	4	65.1 66.0	61.1 71.1	mmHg
pO ₂	136 156	4	138 146	136 156	mmHg
ctHb	7.3 8.3	4	7.8 7.8	7.3 8.3	g/dL
FO ₂ Hb	43.5 45.5	4	44.3 44.6	43.5 45.5	%
FHbF	11 41	4	26 28	11 41	%
sO ₂	49.0 51.0	4	50.0 50.0	49.0 51.0	%
FCOHb	4.6 7.6	4	6.0 6.3	4.6 7.6	%
FMetHb	4.0 6.0	4	5.0 5.0	4.0 6.0	%
cBil	169 193	4	179 181	169 193	µmol/L
cK ⁺	1.6 2.2	4	1.9 2.0	1.6 2.2	mmol/L
cNa ⁺	153 161	4	153 161	153 161	mmol/L
cCa ²⁺	0.93 1.13	4	1.04 1.07	0.93 1.13	mmol/L
cCl ⁻	113 125	4	114 125	113 125	mmol/L
cGlu	1.7 2.7	4	2.0 2.5	1.7 2.7	mmol/L
cLac	3.7 4.9	4	4.2 4.4	3.7 4.9	mmol/L

Press **Update All**.

- | | |
|----|--|
| 8. | Press Continue to update the control ranges for all parameters under the specified solution slot. |
|----|--|



Press **Cancel** to cancel updating.

Continued on next page

Quality control setup, *Continued*

QC ranges (continued) *NOTE: Once the Fixed SD is activated, you cannot update the control ranges to the limits that are narrower than those determined by the Fixed SD, for both single-parameter and multiple-parameter updates.*

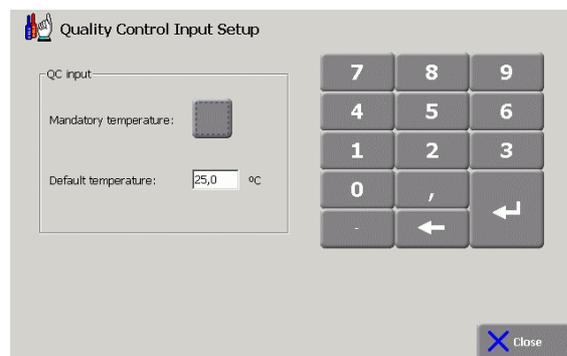
QC input setup This program allows you to select the following for the **Quality Control Identification** screen during a measurement:

- mandatory temperature entry by the operator
- the default temperature always displayed (unless altered by the operator).

To select the settings, do the following:

Step	Action
------	--------

- | | |
|----|---|
| 1. | Activate the <i>Mandatory temperature</i> check button. |
|----|---|



A  will appear next to an empty temperature box on the **Quality Control Identification** screen during each quality control measurement otherwise the result cannot be retrieved.

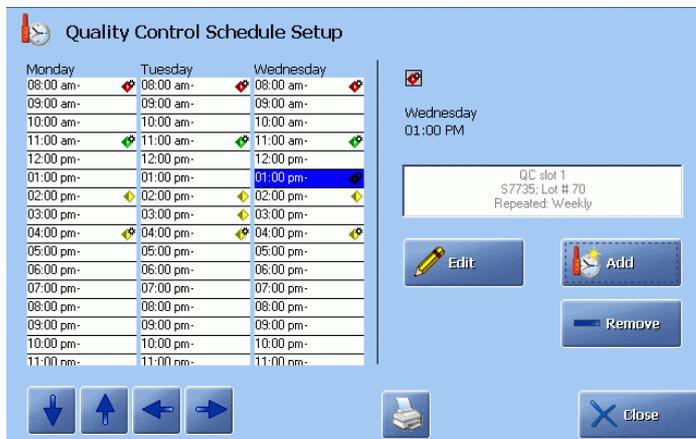
- | | |
|----|---|
| 2. | Highlight the default temperature in the "Default temperature" box and enter a default temperature on the keypad; confirm with ENTER. |
|----|---|

The value in °C or °F is automatically entered on the **Quality Control Identification** screen during measurement. The temperature can be altered for a particular measurement but will return to the default setting for future measurements.

Continued on next page

Quality control setup, *Continued*

QC schedule This program allows you to schedule quality control measurements for your analyzer.



The screen shows the timetable for all days of the week and time during a day.

Step	Action
------	--------

- To select time during a day, use the ↑ and ↓ buttons.
- To display other weekdays, use the ← and → buttons.

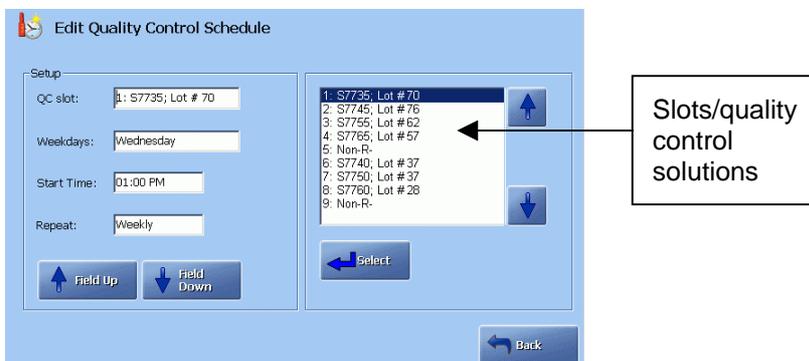
Symbols for manual and automatic quality control are as follows:

-   measurement(s) on the control solution **manually** performed.
-   measurement(s) on the control solution **automatically** performed.

To add a new quality control solution to a schedule, do the following:

Step	Action
------	--------

- Select the desired time.
- Press the **Add** button to display the screen below.



Touch the “QC slot” box to activate it.

Continued on next page

Quality control setup, *Continued*

QC shedule
(continued)

- | Step | Action |
|------|---|
| 3. | Select the slot/quality control solution (entered in the Quality Control Solutions program), using the up/down arrow buttons in the box.

Confirm with Select . |
| 4. | Highlight the "Weekdays" box using the Field down button.

Activate the relevant check buttons to select the days of the week this measurement should be performed. |
| 5. | Highlight the "Start time" box.

Key in the time to perform a measurement and confirm with Enter on the keypad.

<i>NOTE: The symbols for the automatic or manual quality control (given on the previous page) will automatically appear in the schedule.</i> |
| 6. | Highlight the "Repeat" box. Select the interval the measurement should be repeated, using the up/down arrow buttons in the box.

<i>NOTE: The QC schedule reminder "Lock analyzer when 25 % overdue" (selected in Corrective Actions – see further in this chapter) will work on the basis of the setting selected in this box.</i> |
| 7. | Press Back to return to the Quality Control Schedule Setup screen.

If more than one quality control solution was scheduled, the schedule screen will look like this: |



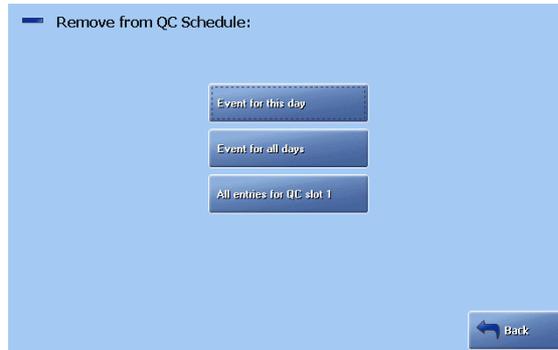
8. To edit the schedule, press **Edit** and follow the procedure above.

Continued on next page

Quality control setup, *Continued*

QC schedule (*continued*)

- | Step | Action |
|------|---|
| 9. | To remove a quality control measurement from the schedule, highlight it and press Remove . |



- Press the desired button to remove the quality control measurement from the schedule: **For this day**, **For all days** or **All entries for QC slot** (number).
- Press **Back** to return to the **QC Schedule** screen.

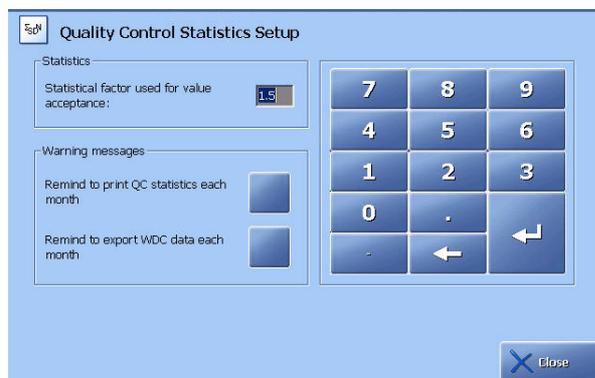
QC Statistics

This program allows you to select the following:

- the statistics factor
- the initiation of warning messages at the end of the statistical month.

To select the settings, do the following:

- | Step | Action |
|------|---|
| 1. | Statistics factor expands the control range to the statistics range (it is a range within which quality control results must fall in order to be included in the quality control statistics). |



Key in the desired statistics factor (from 1.0 to 9.9) on the keypad and confirm with **Enter**. The default value is 1.5.

Continued on next page

Quality control setup, *Continued*

QC Statistics (*continued*)

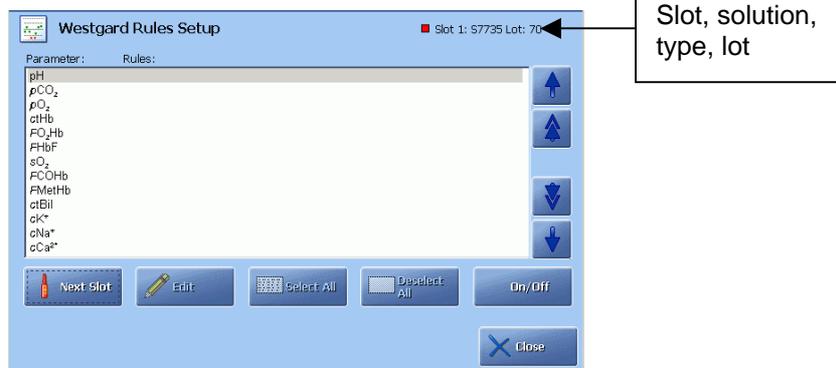
Step	Action
2.	To set up the analyzer to send reminders to print or export the monthly statistics, activate the appropriate check button (or both) for the message(s) to appear in System Messages upon occurrence.
3.	Press <i>Close</i> to exit the program.

Westgard Rules The Westgard Rules are a set of statistical rules that, when applied to the quality control results, can increase the probability of detecting an error in the sampling procedure or in the analyzer itself, or help detecting a shift or trend in your quality control results by comparing current measurement values of a control solution with previous values.

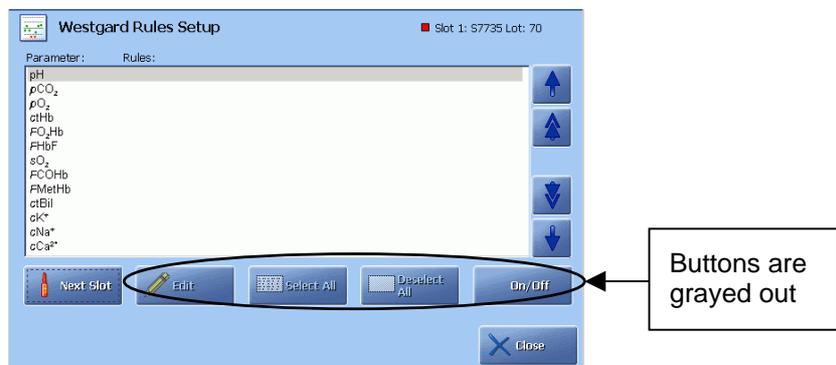
This program allows you to select Westgard Rules for all slots or for specific parameters.

To activate or deactivate the assigned Westgard Rules, do the following.

Step	Action
1.	Press <i>On/Off</i> button to activate the assigned Westgard Rules for the slot.



Press *On/Off* again to deactivate the assigned Westgard Rules.

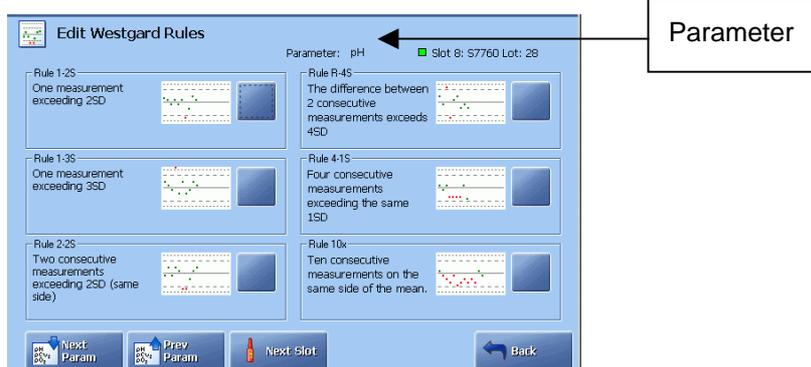


Continued on next page

Quality control setup, *Continued*

Westgard Rules (*continued*)

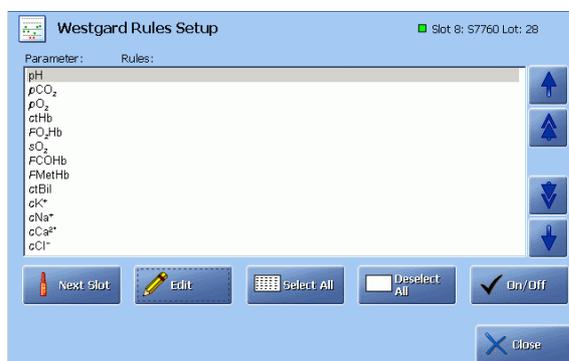
- | Step | Action |
|------|---|
| 2. | Press <i>Next Slot</i> and activate/deactivate the Westgard Rules for the other slots in the same manner. |
| 3. | To activate the Westgard rules for specific parameters in a slot, display the desired slots by using <i>Next Slot</i> . |
| 4. | Press the <i>Edit</i> button. The screen shows all the Westgard Rules and their current settings for the parameter. |



5. Display the desired parameter using the *Next Param* or *Prev Param* buttons.
6. Activate the desired Westgard Rule(s) by pressing the corresponding check button.

Once edited, all future quality control measurements on the parameter for the given slot will be evaluated according to the selected Westgard Rule(s).

7. Select Westgard Rules for other parameters or levels in the same manner.
8. To select/deselect all six Westgard Rules for every parameter of a displayed control solution slot, select the desired slot by pressing the *Next Slot* button.



Continued on next page

Quality control setup, *Continued*

Westgard Rules (*continued*)

Step	Action
------	--------

9.	Press <i>Select All</i> or <i>Deselect All</i> .
----	--

10.	Verify information on the screen.
-----	-----------------------------------



Press *Continue*. Changes are made and shown in the Westgard Rules Setup.

Press *Cancel*. No changes are made.

11.	Select or deselect the Westgard Rules for other slots in the same manner.
-----	---

NOTES:

- All future measurements taken on the slot will be evaluated with respect to the Westgard Rules if the *Select All* function was activated
- Settings will be removed under *Deselect All*. To have the possibility to return to the settings as they were, use the **On/Off** button.
- When a quality control measurement violates an applied Westgard Rule, a *W* is added to the parameter in the result. For a detailed explanation of how to interpret and evaluate results with respect to Westgard Rules, see Chapter 7 of the *Quality Control Reference Manual*.

Reference

Westgard JO, Barry PLL. Cost effective quality control: managing the quality and productivity of analytical processes. Washington: AACC Press, 1992.

Replacement setup

Programs Replacement Setup includes the programs described in this section.



Activate a button to enter the program.

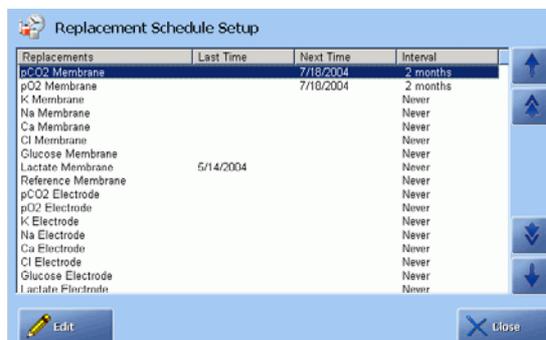
Replacement schedule

This program allows you to schedule routine replacements along with the current scheduled date and interval for replacement. The settings selected here are then used in the Replacements on the **Analyzer Status** screen.

To edit the schedule of replacement actions, do the following:

Step	Action
------	--------

1. Highlight the replacement action to be scheduled and press **Edit**.



Continued on next page

Replacement setup, *Continued*

Replacement schedule (*continued*)

- | Step | Action |
|------|---|
| 2. | Change the interval for the selected replacement action (displayed in the "Action" box) with the up/down arrow buttons (see recommended replacement intervals below). |



NOTE: The replacement schedule reminder "Lock analyzer when 10 % overdue" (selected in Corrective Actions – see further in this chapter) will work on the basis of the setting selected in the "Action" box.

3. Touch to highlight the "Next date" box and change the date using screen keypad. Confirm with ENTER.
4. Press **Back** to return to the Replacement Setup screen.
5. Repeat steps 1-4 for each replacement action to be scheduled.

Recommended replacement intervals

The following replacement intervals are recommended by Radiometer.

NOTE: The replacement intervals below are guidelines only and based on the average use of the analyzer (40 samples per day); under no circumstances do they guarantee the lifetime of the replacement items. For analyzers with high throughput the replacement intervals should be adjusted accordingly in the Replacement schedule.

Action	Interval
Replacing metabolite and reference electrode membranes	1 month
Replacing blood gas and electrolyte electrode membranes	3 months
Replacing pump tubing	6 months
Replacing inlet gasket	6 months
Replacing fan filter	as required
Replacing electrodes	as required

The status of solutions, waste container and gas cylinders are not scheduled and can be viewed in the Replacements on the **Analyzer Status** screen.

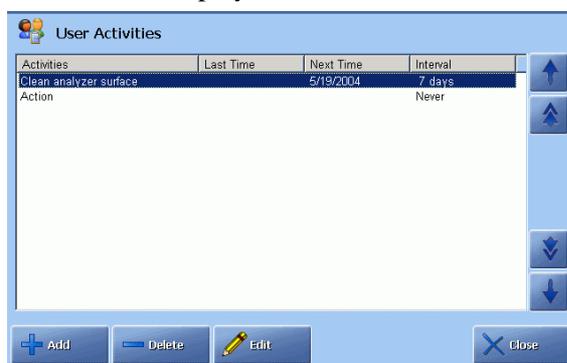
Continued on next page

Replacement setup, *Continued*

User Activities This program allows you to formulate and schedule your own activities (e.g. cleaning analyzer, replacing printer paper, etc.) along with the current scheduled date and interval. The settings selected here are then used in the Replacement Status.

Adding a user activity To add the user activity, do the following:

- | Step | Action |
|------|--|
| 1. | Press Add to display the Edit User Activities Schedule screen. |



2. To add text, press the keyboard icon and type the activity. Confirm with **Enter** on the keyboard.



Choose the Interval with the up and down arrow keys in the "Interval" box:

1-2-3-4-5-6-7-10-14-20-30 days or 2-3-4-6-8-12-18-24 months.

3. Type the "Next date" using screen keypad. Confirm with **Enter**.
4. Press **Back** to return to the **User Activities** screen.
5. Repeat steps **1-4** for each activity to be scheduled.

Continued on next page

Replacement setup, *Continued*

Editing a user activity To edit a user activity, do the following:

Step	Action
------	--------

1. Highlight the desired user activity on the **User Activities** screen. Press **Edit**.
2. Press the keyboard icon to edit the text. Confirm the text with ENTER.

Change, if desired, the interval or next date (confirm the date with **Enter**).

3. Press **Back** to return to the **User Activities** screen.
4. Edit other user activities in the same manner.

Deleting a user activity To delete a user activity from the list, do the following:

Step	Action
------	--------

1. Press **Delete** on the **User Activities** screen.
2. Press **Continue** to delete the activity.

Press **Cancel** to return to the **User Activities** screen.

Continued on next page

Replacement setup, *Continued*

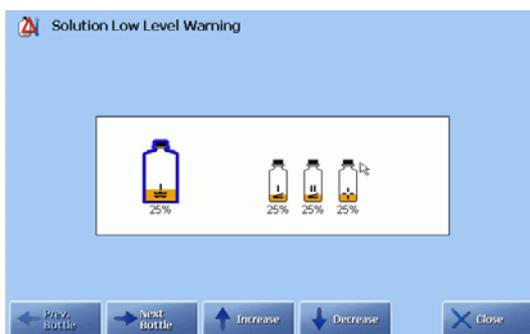
Solution warning

This program allows you to select a solution level value in % below which a warning will be given.

To select the solution level value for the warning to be activated (default value is 25 %), do the following:

Step	Action
------	--------

1. Highlight the desired solution bottle: touch the bottle on the screen or use *Next Bottle* or *Prev. Bottle*.



2. Select the solution warning level (in %), using *Increase* or *Decrease*.
3. Select warning values for solution levels in other bottles in the same manner.
4. Press *Close* to confirm the settings.

Solution Level Forecast

This program allows you to change the solution level forecast so that the analyzer will predict the solution levels in the bottles more precisely.

It will improve both the graphical presentation on the **Replacement Status** screen and the accuracy of the solution low level warning.

To change solution level forecast, do the following:

Step	Action
------	--------

1. Select the solution bottle, using the *Next bottle* or *Prev. bottle* button (the Rinse solution has been selected on the screen).



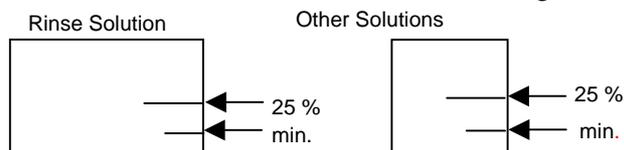
Continued on next page

Replacement setup, *Continued*

Solution Level Forecast (*continued*)

- Step** **Action**
2. Select the true level (in %) with the up and down arrow buttons on the screen.

The bottom of each solution bottle has markings for solution levels.



You can also remove the solution bottle to check the level, and the analyzer will not enter Hold mode. However, the Refill will be performed as soon as the bottle has been mounted back again.

The selected setting will be displayed on the **Analyzer Status** screen. The screen below is an example.



3. Select solution level forecasts for other solutions in the same manner.
4. To reset all solution level forecasts to the default values: $\alpha = -1.00$ and $\beta = 100.0$, press the **–Set Default** button.
5. Press **Close** to confirm the settings.

Continued on next page

Replacement setup, *Continued*

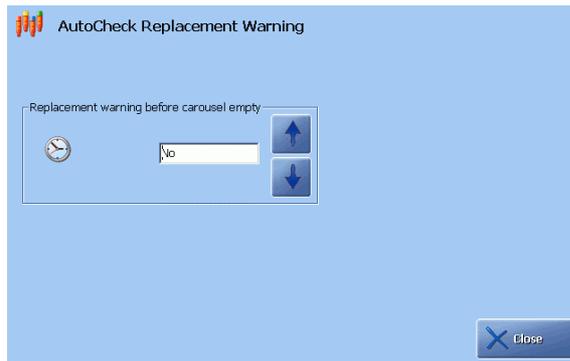
AutoCheck Replacement Warning

This program allows you to select the time for a reminder to appear in the System Messages in order to fill up the carousel.

To select time for the reminder, do the following:

Step	Action
------	--------

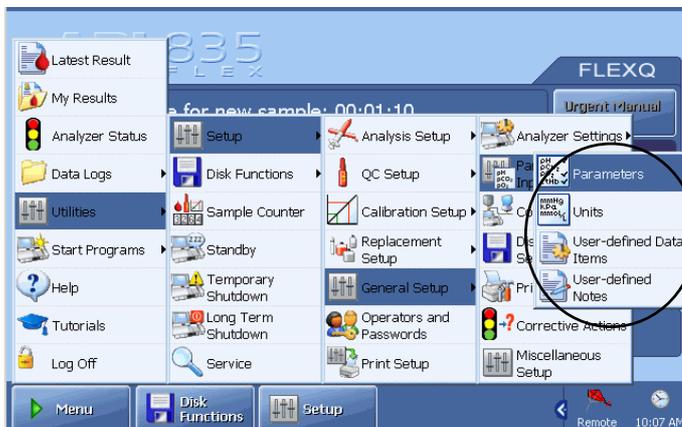
1. Use the up/down arrow buttons to select one of the settings: No, 1 hour, 2 hours, 4, 8, 12, 24, 48 hours.



2. Press *Close* to exit the program.

Parameters and input setup

Programs Parameters and Input Setup includes the programs described in this section.



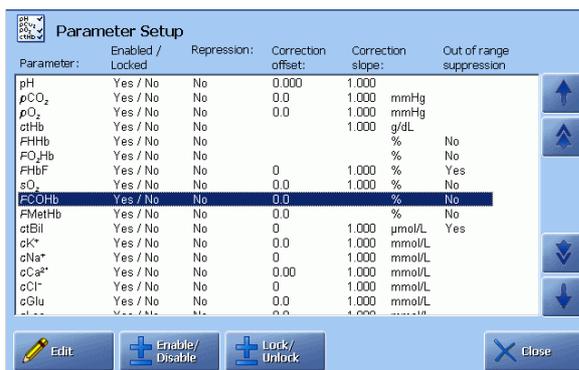
Activate a button to enter the program.

Parameters This program allows you to do the following:

- disable or enable a parameter
- repress parameters if any problems are detected
- to lock a parameter
- make user-defined corrections for each measured parameter
- make out-of-range suppression of oximetry parameters and bilirubin.

To disable/enable a parameter, do the following:

- Step Action**
1. Highlight a parameter on the screen, using the scroll facilities.



2. Press **Enable/Disable** to include or exclude the parameter from a parameter profile and the parameter bar. Note that pH, pCO₂ and pO₂ cannot be excluded.

Continued on next page

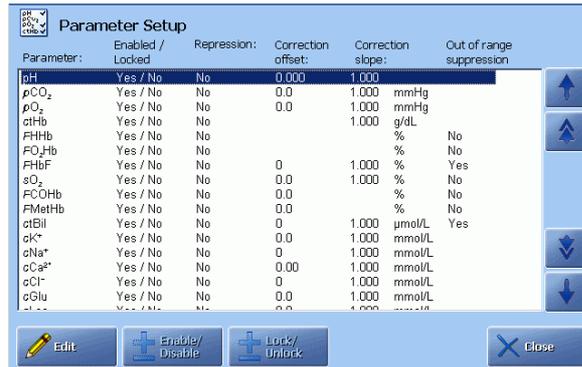
Parameters and input setup, *Continued*

**Parameters
(continued)**

Parameters can be **locked/unlocked** from RADIANCE.
To lock or unlock a parameter from the analyzer, do the following:

Step Action

1. Make sure the analyzer is not connected to RADIANCE. Highlight a parameter on the screen, using the scroll facilities.



2. Press **Lock/Unlock**. (This button is grayed out if the analyzer is connected to RADIANCE.)

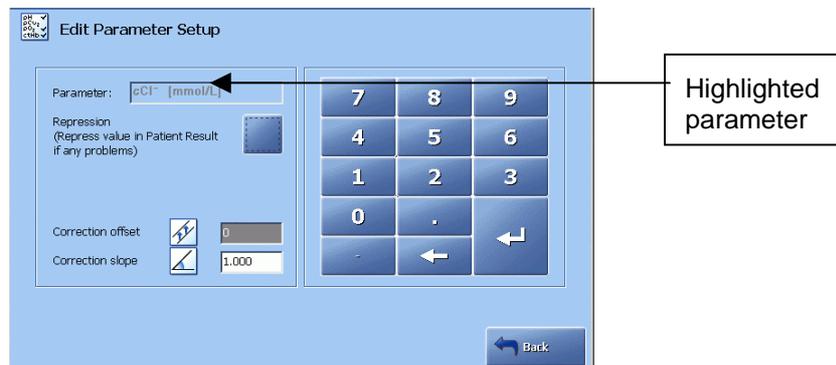
The locked parameter will show red on the parameter bar and will change the overall analyzer status traffic light on the **Analyzer Status** button to red. The parameter value will be absent from the printout. However, the locked parameter will be calibrated.

3. To unlock a parameter, highlight it and press **Lock/Unlock**. The traffic light on the **Analyzer Status** button will change from red to a color corresponding to the analyzer's overall status.

To **edit** the parameter setup, do the following.

Step Action

1. Highlight the desired parameter and press **Edit**.
2. Activate (or deactivate) the following check buttons to select (or deselect) the following functions:



Continued on next page

Parameters and input setup, *Continued*

Parameters (*continued*)

Step	Action
2. (cont.)	<ul style="list-style-type: none"> • Repression (Repress value in patient result if any problems). • Out of range suppression – for oximetry parameters or ctBil only. When activated, this function is applied to the oximetry/ctBil results (including those obtained in the past) as follows: <ul style="list-style-type: none"> – Oximetry parameters and ctBil values inside the measuring range but lower than “0” or higher than "100 %" will be shown as “0” or "100 %", respectively. – ctBil values higher than "1000 µmol/L" but inside the measuring range will be shown as "1000 µmol/L".
3.	Use the keypad to enter the following for the highlighted parameter: <ul style="list-style-type: none"> • Correction offset. Confirm the entry with Enter. • Correction slope. Confirm the entry with Enter.
4.	Press Back to return to the previous screen and repeat steps 1-3 for another parameter, if desired.

WARNING/CAUTION: *User-defined corrections for blood measurements will influence the measurement results from blood and QC analyses and change the specific performance characteristics unless “Apply parameter corrections to QC” was disabled in Miscellaneous Setup.*

Units

This program allows you to select the unit for each parameter or group of parameters.

To select the unit for a group or for a single parameter, do the following:

Step	Action
1.	Highlight the group (i.e. parameters which use the same unit as "pressures" = ($p\text{CO}_2$, $p\text{O}_2$, $p(\text{amb})$, etc) or a parameter, using the arrow buttons.
2.	Select the desired unit, using the arrow buttons.

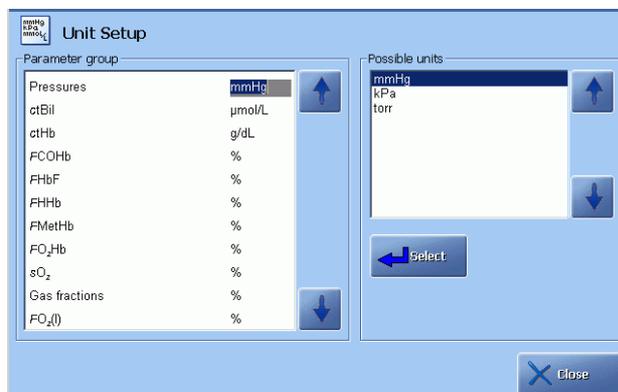
Continued on next page

Parameters and input setup, *Continued*

Units (*continued*)

Step	Action
------	--------

3. Confirm the selected unit with *Select*.



4. Change units for other parameters in a similar manner.
5. Press *Close* to return to the **Ready** screen.

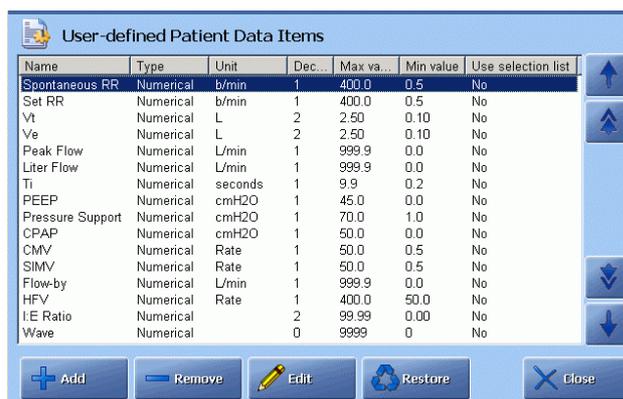
User-defined Patient Data Items

This program allows you to include other patient data in the Patient ID layout than those already available there.

To add a new item to the list, do the following:

Step	Action
------	--------

1. Press *Add*.



2. Follow the procedure for editing an item from step 2 – see the next page.

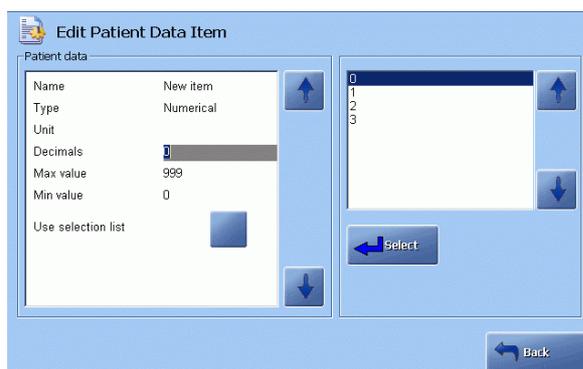
Continued on next page

Parameters and input setup, *Continued*

User-defined Patient Data Items (*continued*)

To edit an item in the list, do the following:

- | Step | Action |
|------|---|
| 1. | Highlight an item in the list and press Edit . |
| 2. | To change the name, press the keyboard icon on the keypad and type in the new name of up to 20 characters. Confirm with Enter on the keyboard. |
| 3. | Select the data type with the up/down arrow buttons and press Select . |



For "Text" entry proceed to step 8.

For "Numerical" entry proceed to step 4.

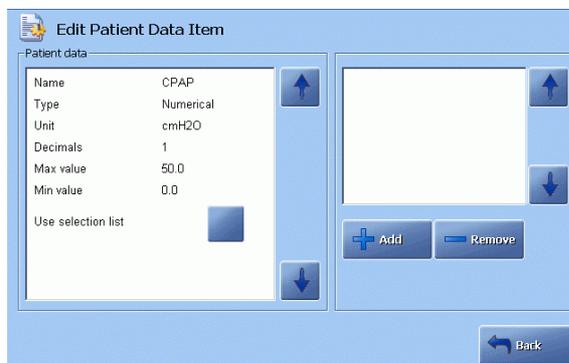
- Highlight "Unit". The keypad is now displayed. Press the keyboard icon on the keypad and type in the new name of up to 20 characters long. Confirm with **Enter**.
- "Decimals" is now highlighted and the box with "None", "1", "2", "3" is displayed. Choose the number of decimals with the up/down arrow keys and press **Select** to confirm.
- Highlight "Max. value". Type in the value and confirm with **Enter** on the keypad.
- "Min. value" is now highlighted. Type in the value and confirm with **Enter** on the keypad.

Continued on next page

Parameters and input setup, *Continued*

User-defined Patient Data Items (*continued*)

- | Step | Action |
|------|--------------------------------|
| 8. | "Use selection list" function: |



Press the check button.

To make a list, press **Add**, type in the item on the displayed keyboard (up to 20 characters) and confirm with **Enter**. Add as many items as you wish in the same manner.

The check button can be activated only if the selection list contains two or more items.

9. Press **Back** to return to the **User-defined Items** screen. The new entry will be included in the list.

To include the new items in a Patient ID Layout, press **Menu - Utilities - Setup - Analysis Setup - Patient Reports - Patient Report ID** and follow the procedure described under *Including an Item into Patient ID in Patient reports* in this chapter.

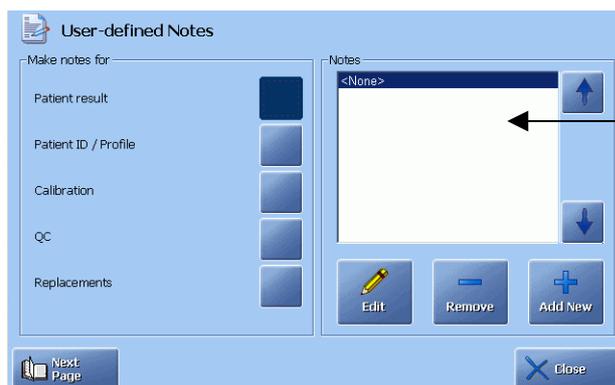
Continued on next page

Parameters and input setup, *Continued*

User-defined Notes This program allows you to formulate and store notes.
To make a Note text, do the following.

Step	Action
------	--------

1. Activate one of the check buttons (e.g. Patient Result, Replacements, etc.). See also the remaining options by pressing *Next Page*.



2. Press *Add New* and type the text for the Note, using the screen keyboard. Confirm with ENTER to save the text and return to the previous screen. Your Note is now included in the list.
3. To edit a Note, highlight it in the Notes box, using the up and down arrow buttons, and press *Edit*.

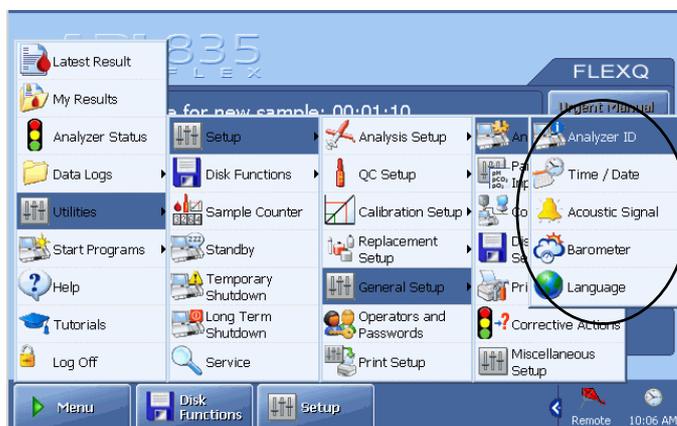
The keyboard will be displayed with the Note text on it. Edit the text and confirm with *Enter*.

4. To delete a Note, highlight it in the Notes box, using the up and down arrow buttons, and press *Remove*.
5. Make notes for other options in the same manner.
6. Press *Back* to exit to the **Ready** screen.

If a list of Notes has been made for a given option, it will be marked with a pencil icon on the relevant screen(s).

Analyzer settings

Programs The Analyzer Settings includes the programs described in this section.



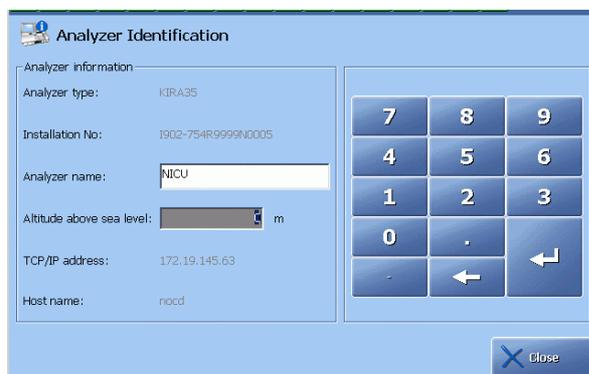
Activate a button to enter the program.

Analyzer ID

This program allows you to change the analyzer's identification and to set the altitude at which your analyzer is placed; the latter is generally used for analyzers at particularly high altitudes.

To enter analyzer ID and the altitude above the sea level, do the following:

- | Step | Action |
|------|--|
| 1. | Touch and highlight the "Analyzer name" box. |



- Type in an identification name and/or number for the analyzer (up to 32 characters), using the screen keypad or keyboard. Confirm with **Enter**.
- Touch the "Altitude above sea level" box to activate.
- Type in the height above sea level in meters, using the keypad. Confirm with **Enter**.

Continued on next page

Analyzer settings, *Continued*

Analyzer ID (continued)

NOTE: Installation number cannot be changed. Quote this number in any technical inquiries you have to Radiometer.

At high altitudes, the difference between $p\text{CO}_2$ values in blood and in the QC solutions is very small due to the high buffer capacity of blood and the QC solutions, and is considered to be negligible. However, the aqueous QC solutions have a different capacity than blood to take up oxygen, and correcting for different $p\text{O}_2$ QC values at high altitudes is imperative as deviations from the respective values at sea level are significant. To correct for the different $p\text{O}_2$ values, the QC control ranges are modified according to the altitude. For detailed information, please refer to the Quality Control Systems Reference Manual, chapter 4.

NOTE: To make altitude corrections operative for the installed QC solutions, re-enter the QC solutions in their slots and re-scan their barcodes.

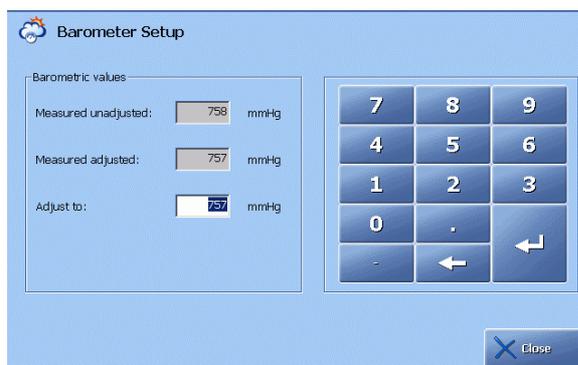
Barometer Setup

This program allows you to adjust the built-in barometer in accordance with the reference barometer in your laboratory.

To adjust the internal barometer, do the following:

Step	Action
------	--------

- Key in the desired pressure value on the keypad.



- Confirm with **Enter**. The value will be shown in the "Measured adjusted" box.

Maximum accepted correction is ± 19 mmHg (i.e. the difference between the "Measured unadjusted" and "Measured adjusted" settings).

Barometer pressure limits are 450-800 mmHg, or 60.0-106.7 kPa, or 450-800 torr.

The units are selected in the Setup program: Units.

Continued on next page

Analyzer settings, *Continued*

Time/Date setup This program allows you to change the current time and date setting.
To reset the time and date, do the following:

Step	Action
------	--------

1. Highlight the "Time" box by touching it on the screen.

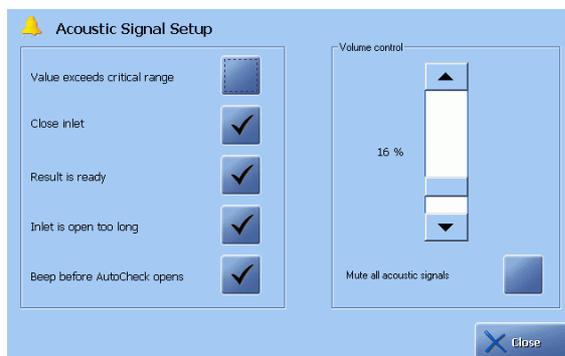


2. Key in the time on the screen keypad. Confirm with **Enter**.
A separator is automatically added between hours, minutes and seconds.
3. Repeat steps **1-2** to reset the Date.
4. To revert to the previous settings, press **Current**.

Acoustic Signal This program allows you to set up a short beep to sound after certain events.
To activate the acoustic signal, do the following:

Step	Action
------	--------

1. Activate the desired check button(s).



2. Select volume for the acoustic signal or activate the "Mute all acoustic signals" check button.

Continued on next page

Analyzer settings, *Continued*

Acoustic Signal The following events are available:
(*continued*)

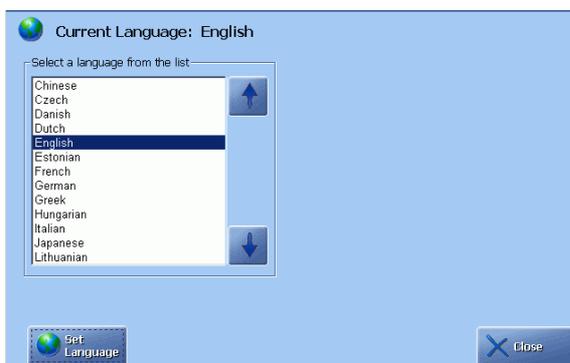
Event	Explanation
Value exceeds critical range	One of the measured values exceeds the specified critical limits for that parameter.
Close inlet	The inlet should be closed.
Result is ready	A sample has been analyzed and the results are ready for viewing.
Inlet open too long	The inlet should be closed.
Beep before AutoCheck opens	A beep sounds to indicate that an AutoCheck measurement is about to take place.

Language This program allows you to select a language of your choice from the list of languages available on your analyzer.

To change to another language do the following:

Step	Action
------	--------

1. Select the desired language with the arrow buttons.



Press **Set Language**.

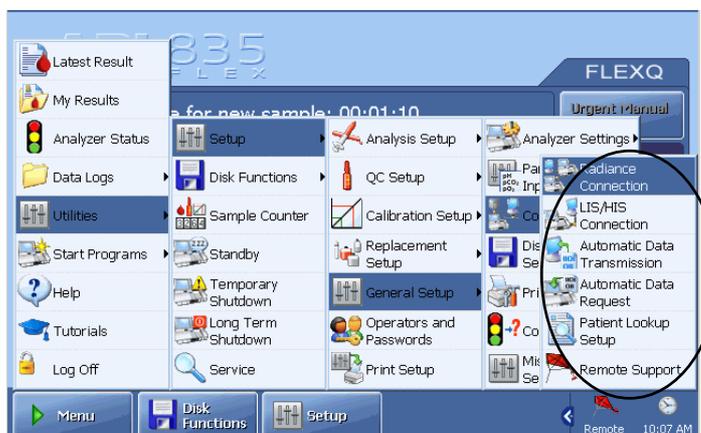
2. Press **Continue** to restart the analyzer.



Press **Cancel** to continue operating the analyzer with the language unchanged.

Communications

Programs The Communications Setup programs are described in this section.



Activate a button to enter the program.

Refer to *Chapter 2, Communication Ports* for the identification and location of a serial RS232 interface connection (COM2) and a network (TCP/IP) RJ45 ethernet connection.

RADIANCE Communication Setup

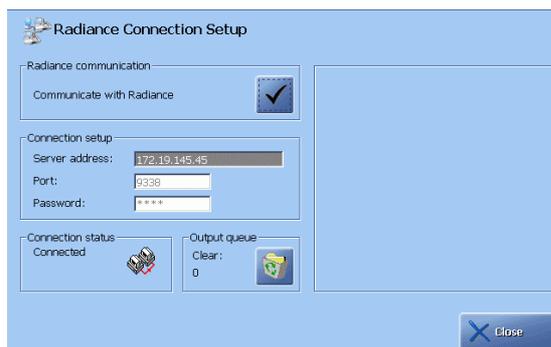
This program allows you to connect the analyzer to RADIANCE.

NOTE: *Connecting the analyzer to RADIANCE should be performed by the RADIANCE administrator in your institution.*

To enable communication with RADIANCE, do the following:

Step	Action
------	--------

1. Touch and highlight the "Server address" box.



Type in the TCP/IP address of your RADIANCE PC, using the screen keypad or keyboard.

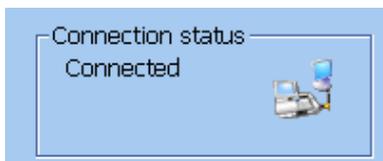
2. Touch and highlight the "Port" box. Type in port number, using the keyboard.
3. Touch and highlight the "Password" box. Type in your RADIANCE password, using the keyboard.

Continued on next page

Communications, *Continued*

RADIANCE Communication Setup (*continued*)

- | Step | Action |
|------|--|
| 4. | Press the check button in the "Radiance Communication" box to activate connection. |



The "Connection status" box with the handshake in it indicates an established connection to RADIANCE.



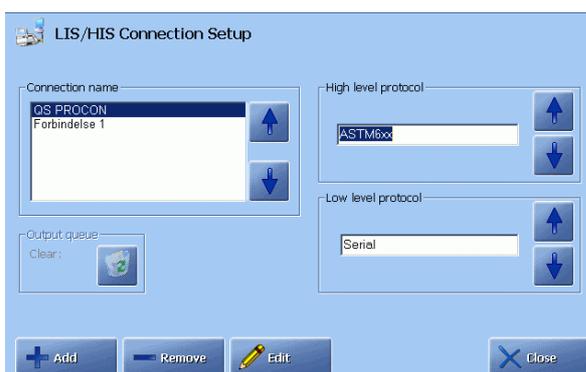
The  icon will indicate the established connection as well.

- | | |
|----|---|
| 5. | The "Output queue" box shows the number of data queued up for transfer. It will be sent to RADIANCE.
Otherwise clear the queue by activating the recycle bin icon. |
| 6. | Press <i>Close</i> to exit the screen. |

LIS/HIS Connection Setup

This program allows you to select communication protocol for a connected device.
To select the communication protocol, do the following:

- | Step | Action |
|------|---------------------------------|
| 1. | Press <i>Add</i> on the screen. |



The "Output queue" box shows the number of data queued up for transfer. It will be sent to LIS/HIS.

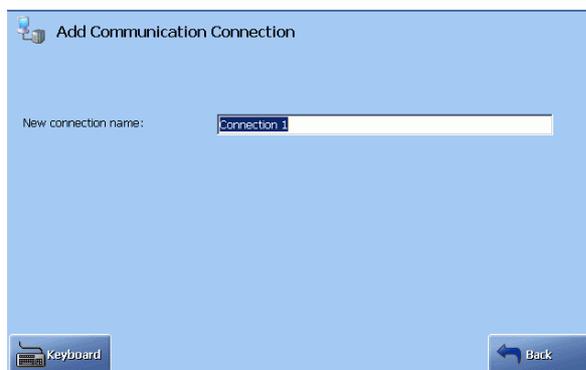
Otherwise clear the queue by activating the recycle bin icon.

Continued on next page

Communications, *Continued*

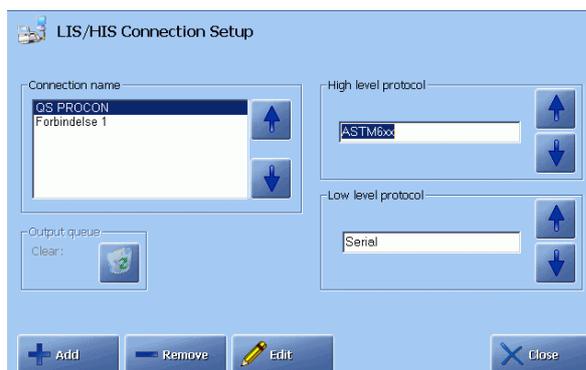
LIS/HIS Connection Setup (*continued*)

- | Step | Action |
|------|--|
| 2. | Press Keyboard , type the name of the connection instead of the default one, and press Enter . |



Press **Back** to return to **LIS/HIS Connection Setup** screen.

3. Select the high-level protocol according to the requirements of the connected device.



Select between: ASTM, ASTM6xx, HL7 version 2.2, HL7 version 2.5 or POCT1-A DML, using the up/down arrows in the box.

4. Select the low-level protocol as follows:
 - Use “Serial” or “Serial (RAW)” for the serial connection.
 - Use “Network (TCP/IP)” for the network connection.
 - Use “Network (TCP/IP)ASTM” for additional serial connection (not all combinations of high-level protocols and low-level protocols are possible).

Continued on next page

Communications, *Continued*

**LIS/HIS
Connection
setup
(continued)**

Step Action

5. a. Connection specifications for serial low-level protocol:
Press **Edit** to display the **Connection Specifications** screen below.

Connection Specifications: Connection 1

Port: COM2

Baud rate: 9600

Data bits: 8

Stop bits: 1

Parity: None

Back

- b. Connection specifications for network low-level protocol:
Press **Edit** to display the **Connection Specifications** screen below (HL 7 version 2.5 is used as an example).

Connection Specifications: Forbindelse 1

Connection setup:

Server Address: []

Port: 2001

Reconnect interval: 60 seconds

Transmission Setup:

Retransmit max: 0 times

Transmit Timeout: 0 seconds

Back

- c. Connection specifications for POCT1-A DML low-level protocol:

Connection Specifications: Forbindelse 1

Connection setup:

Server Address: []

Port: 2001

Reconnect interval: 60 seconds

Back

Continued on next page

Communications, *Continued*

LIS/HIS Connection Setup (*continued*)

Step	Action										
6.	<p>a. <u>Connection specifications for serial low-level protocol:</u> Use the up and down arrows in each box to select the baud rate, stop bits, data bits and parity. Port number should be COM2.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Box</th> <th style="text-align: left;">Option</th> </tr> </thead> <tbody> <tr> <td>Baud rate</td> <td>1200, 2400, 4800, 9600, 14400, 19200, 38400, 115200</td> </tr> <tr> <td>Data bits</td> <td>5, 6, 7, 8</td> </tr> <tr> <td>Stop bits</td> <td>1, 1.5, 2</td> </tr> <tr> <td>Parity</td> <td>Even, odd, none.</td> </tr> </tbody> </table>	Box	Option	Baud rate	1200, 2400, 4800, 9600, 14400, 19200, 38400, 115200	Data bits	5, 6, 7, 8	Stop bits	1, 1.5, 2	Parity	Even, odd, none.
Box	Option										
Baud rate	1200, 2400, 4800, 9600, 14400, 19200, 38400, 115200										
Data bits	5, 6, 7, 8										
Stop bits	1, 1.5, 2										
Parity	Even, odd, none.										
	<p>b. <u>Connection specifications for network low-level protocol:</u> Touch the screen to highlight the following boxes one after another: Server address – Port number – Reconnect Interval (time interval in seconds to attempt re-connection if connection failed) – Retransmit max – Transmit timeout. Use the keypad/keyboard to enter the relevant information.</p>										
	<p>c. <u>Connection specifications for POCT1-A DML low-level protocol:</u> Touch the screen to highlight the following boxes one after another: Server address – Port number – Reconnect Interval. Use the keypad/keyboard to enter the relevant information.</p>										

Continued on next page

Communications, *Continued*

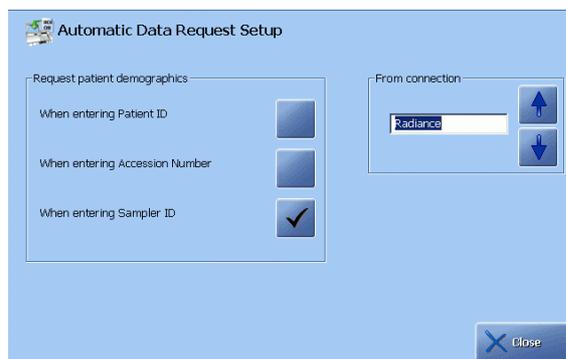
Automatic data request This program allows you to select the conditions for requesting patient demographics automatically from the connected RADIANCE or from LIS/HIS computer system when entering patient ID, Accession Number or Sampler ID.

- FLEXQ: The request will be made during scanning the sampler.
- Manual measurement: The request will be made when the corresponding data is entered on the **Patient Identification** screen during or after analysis.

To select the settings, do the following:

Step	Action
------	--------

1. Select a connected device in the "From connection" box, using the up/down arrows buttons.



2. Activate the relevant check button(s) to request patient demographics from the connected RADIANCE or LIS/HIS when:
 - entering Patient ID
 - entering Accession Number
 - entering Sampler ID.
3. Press *Close* when completed.

NOTE: If the requested patient data (e.g. Patient Last Name) was received after exiting the **Patient Identification** screen, the patient report will be stored without the requested data in the Patient Report log. The requested patient data will be stored as a patient profile in the analyzer's database without, however, being attached to any patient report.

Continued on next page

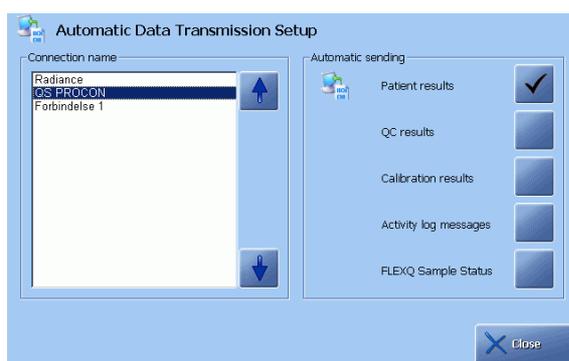
Communications, *Continued*

Automatic Data Transmission Setup This program allows you to set up automatic sending of data to a connected LIS/HIS computer system or to RADIANCE.

To select the settings, do the following:

Step	Action
------	--------

1. Highlight a desired connection device on the screen using the up/down arrows (note that the "FLEXQ Sample Status" is not available if connection to RADIANCE has been selected).



2. Activate the relevant check button(s) to select the data to be sent to the highlighted connection.

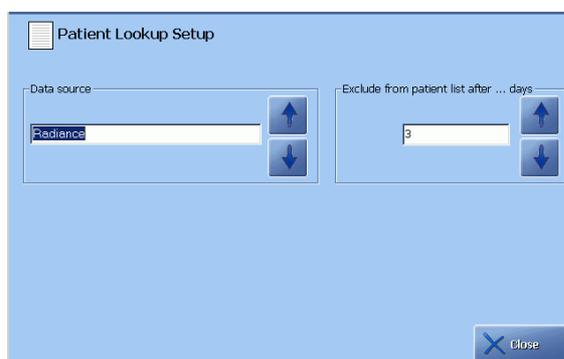
NOTE: If the requested patient data (e.g. Patient Last Name) was received after exiting the **Patient Identification** screen, the patient report will be transmitted without the requested data. To prevent this, select one of the patient data items transferred from LIS/HIS as mandatory.

Patient lookup This program allows you to select the data source in order to obtain the patient information on the **Patient Identification** screen.

To select the settings, do the following:

Step	Action
------	--------

1. Select a data source from the established connections (local database, RADIANCE or LIS/HIS).



Continued on next page

Communications, *Continued*

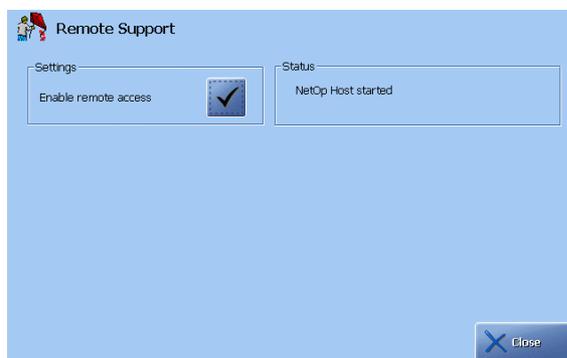
Patient lookup (*continued*)

Step	Action
2.	Select the number of days you want each patient to be kept in the list, using the up and down arrow buttons in the box.

Remote Support This program allows a remote operator, e.g. a service technician, to log in onto your analyzer and monitor its functions.

To select access, do the following:

Step	Action
1.	Press the "Enable remote access" check button to allow a remote operator to log onto your analyzer.



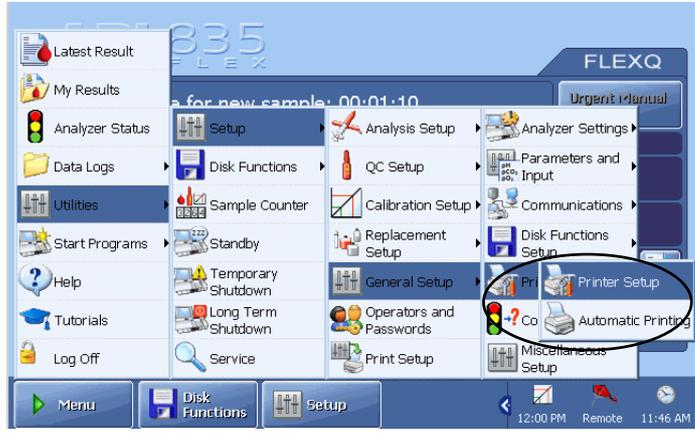
When connected (logged on), the "Remote operator" appears on the analyzer status bar.

2. Deactivate the check button to prevent a remote operator logging onto your analyzer.

NOTE: To select the access profile for the remote operator – see description in Operators and Passwords in this chapter.

Printers

Programs The Printers programs are described in this section. Activate a button to enter the program.

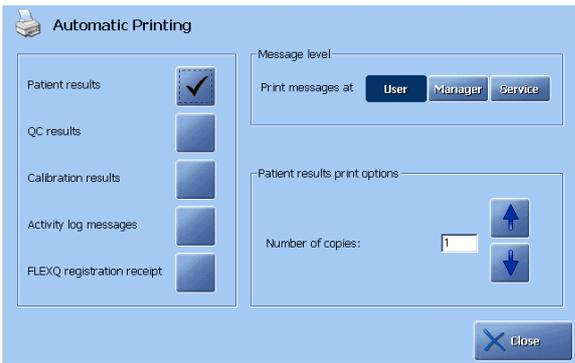


Automatic Printing This program allows you to select automatic printout of patient, QC and calibration results, activity log messages, and registration receipts.

A registration receipt contains patient data and the barcode with the analyzer ID and the sampler number. Scanning the barcode will display the corresponding result.

To select options available on the screen, do the following:

Step	Action
1.	Activate the desired check buttons for the automatic printout of the patient results, QC results, calibration results, activity log messages and registration receipts for FLEXQ.



The last line will not be visible on the analyzers without the FLEXQ module.

2.	Select automatic printout of several copies of patient results (from 1 to 5), using the up/down arrow buttons in the "Patient results print options" box.
----	---

Continued on next page

Printers, *Continued*

Automatic Printing (*continued*)

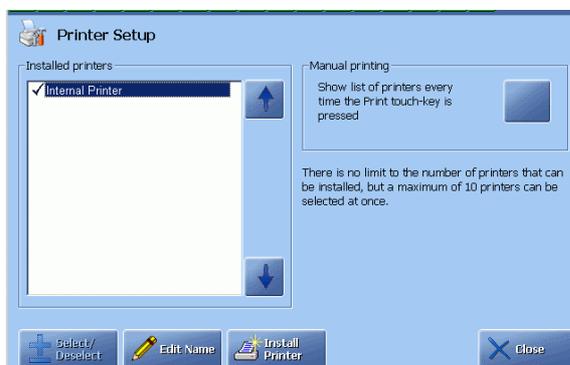
- | Step | Action |
|------|---|
| 3. | Press "User", "Manager" or "Service" in the "Message level" box to select the level for the messages in the Activity log. |

Printer Setup

This program allows you to set up other printers than the analyzer's printer for making printouts.

To select a printer for the analyzer, do the following:

- | Step | Action |
|------|---|
| 1. | Highlight a printer from the list by using the arrow buttons. |



- Press **Select/Deselect** to select the highlighted printer for printing. You can install any number of printers, but only up to 10 printers can be selected.
- To display the list of printers every time the **Print** button is pressed, activate the check button in the "Manual printing" box.
If not activated, all the selected printers will make a printout every time the **Print** button is pressed.
- To change the highlighted printer's name, press **Edit Name** to display the keyboard. Type a name and confirm the entry with **Enter**.

Continued on next page

Printers, *Continued*

Printer Setup (*continued*)

Step	Action
------	--------

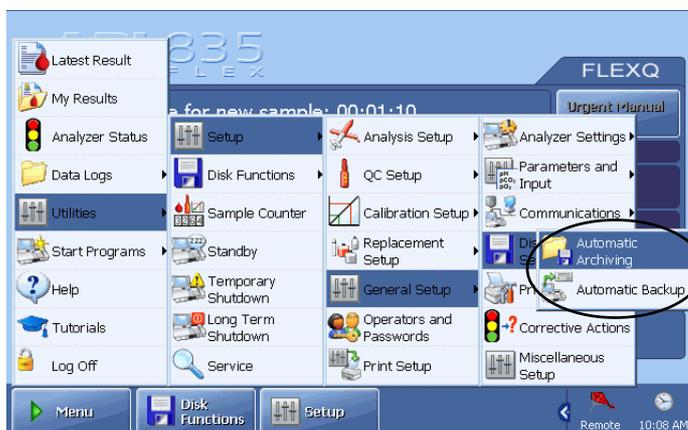
- | | |
|----|---|
| 5. | To install a new printer, press the <i>Install Printer</i> button. |
|----|---|



This function can be used by Radiometer service engineer or a person with network knowledge.

Disk Functions setup

Programs The Disk Functions Setup programs are described in this section.

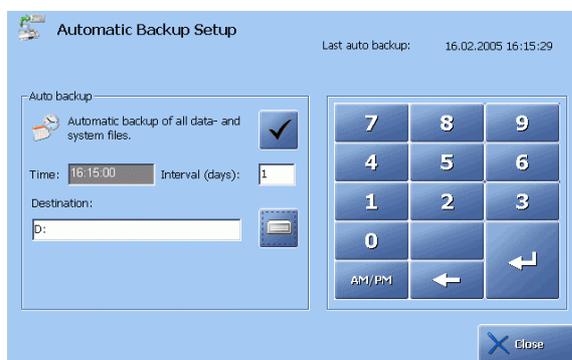


The programs are Automatic Backup and Automatic Archiving.

Automatic Backup Setup This program allows you to select automatic backup of all data and system files. Do the following:

Step	Action
------	--------

1. To select automatic backup of all data and system files, activate the check button.



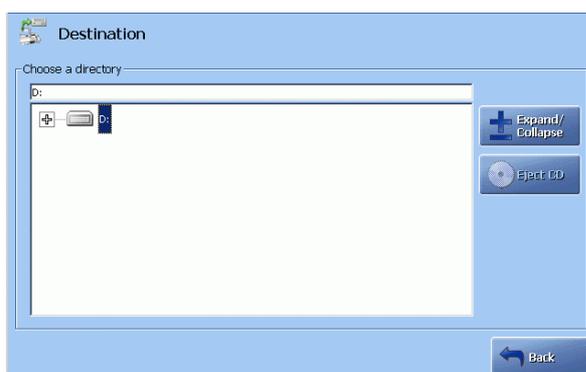
2. Select time for auto backup by highlighting the "Time" box and typing the time using the screen keypad. Confirm the entry with **Enter**.
3. Enter the interval between subsequent backups in the "Interval" box and type the number of days, using the screen keypad. Confirm with **Enter**.

Continued on next page

Disk Functions setup, *Continued*

Automatic Backup Setup (*continued*)

- | Step | Action |
|------|---|
| 4. | Press the drive icon in the “Destination” box to select destination. |
| 5. | Highlight the drive or folder and press the Expand/Collapse button to open a folder in a directory or within a folder. |



Note that automatic backup can be selected for the internal hard disk or the network.

When completed, the correct destination should appear in the upper part of the box.

Automatic Archiving Setup

This program allows you to select automatic archiving of the data logs by activating the relevant check button.

Do the following:

- | Step | Action |
|------|---|
| 1. | To select automatic archiving on the analyzer's hard disk, activate the check button. |



- To select another destination, press the drive icon to select a directory as described in step 5 for *Automatic Backup Setup* above.

Continued on next page

Disk Functions setup, *Continued*

Automatic Archiving Setup (continued) The oldest records (500 patient reports, quality control or calibration results, or 2000 entries in the Activity log) will be automatically removed from a data log and placed into the relevant archive. The archives can be stored on the analyzer's hard disk and viewed in "Archived Data logs" or at a remote location.

For detailed information on archiving the old data, please refer to *chapter 8: Disk functions* in this manual.

Corrective actions

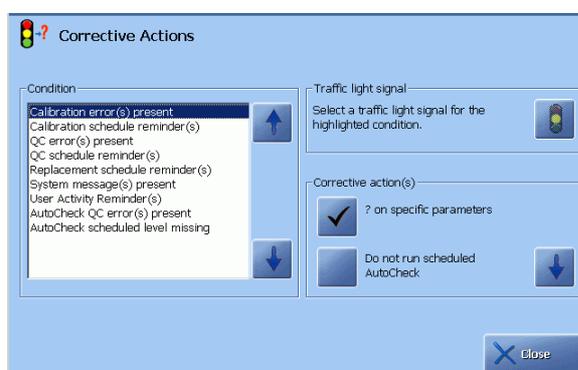
Purpose This program allows you the following:

- to select corrective actions for the events listed in this program,
- to select the traffic light indication, if available, for an event,
- to select analyzer action for the subsequent measurements.

To specify the corrective action and traffic light signal (if available) for each condition listed in the "Condition" box, do the following:

Step Action

1. Highlight the desired condition using the up/down arrows in the box.



2. Select an action for this condition, using the arrow buttons in the "Corrective action(s)" box – see the table below.
3. Select the desired traffic light signal (yellow or green, if available) for the specified event by pressing the traffic light in the "Traffic light signal" box – see the table below.
4. Select corrective actions/traffic light signal for the other conditions in a similar way.

Conditions and correction actions

Conditions and corresponding corrective action choices are as follows:

Condition	Corrective action	Traffic light
Calibration error(s) present	? on specific parameters Perform AutoCheck measurement Do not run scheduled AutoCheck	–
Calibration schedule reminder(s)	Message on next Patient Result	Green or yellow
QC error(s) present	? on specific parameters	–

Continued on next page

Corrective actions, *Continued*

Conditions and corrective actions (*continued*)

Condition	Corrective action	Traffic light
QC schedule reminder(s)	Message on next Patient Result	Green or yellow
	Lock analyzer when 25 % overdue	–
Replacement schedule reminder(s)	Message on next Patient Result	Green or yellow
	Lock analyzer when 10 % overdue	–
System message(s) present	Message on next Patient Result	Green or yellow
User activity reminder(s)		Green or yellow
AutoCheck QC error(s) present	Re-run same level once	–
	Re-run same level twice	–
AutoCheck scheduled level missing	Use ampoule last in schedule	Green or yellow

Explanation of corrective actions

The explanation of the corrective actions is given below.

Corrective action	Explanation
? on specific parameters	The affected parameter(s) will be marked with “?” in subsequent patient results.
Message on next Patient Result	To mark the subsequent patient results on the Message screen
Lock analyzer when 25 % overdue	If a scheduled quality control measurement is more than 25 % overdue compared with the scheduled time for it, the analyzer will be locked.
Lock analyzer when 10 % overdue	If a scheduled replacement procedure is more than 10 % overdue compared with the scheduled time for it, the analyzer will be locked.
Re-run same level once	If an error has been registered during a scheduled AutoCheck measurement, it will be re-run provided the control solution is available in the carousel.
Re-run same level twice	If an error has been registered during a scheduled AutoCheck measurement, it will be repeated twice provided the control solution is available in the carousel.
Use ampoule last in schedule	If a control solution scheduled for AutoCheck is missing in the carousel, the measurement will be on the control solution type scheduled before this one.

Continued on next page

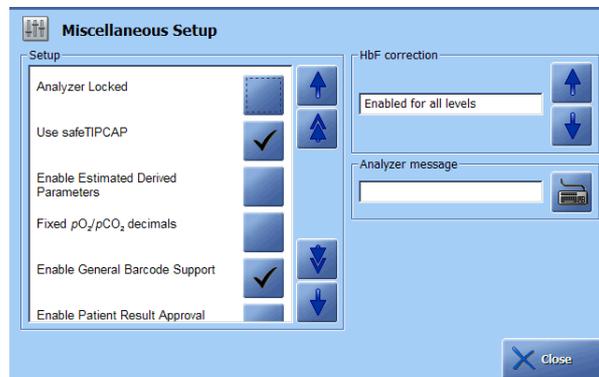
Corrective actions, *Continued*

NOTES:

- *The critical system messages will always result in a red traffic light signal.*
- *If the analyzer locks due to QC or replacement schedule reminders, a critical system message will be generated and the traffic light signal will be red*
- *The specified traffic light signal and the messages will continue to appear until the condition no longer exists.*

Miscellaneous setup

Purpose This program allows you to select the following options (use the arrow buttons to display the rest of the options):



List of options The options are as follows:

Option	Function
Analyzer locked	Suspends all measurements on the analyzer; the other functions such as calibrations and service programs are still enabled. The analyzer can be locked via this program or via a “lock” command from an externally connected system, e.g. LIS or RADIANCE.
Use <i>safeTIPCAP</i>	After the syringe inlet has been opened, two Start buttons will be displayed: one for the samplers without a <i>safeTIPCAP</i> and the other for samplers with a <i>safeTIPCAP</i> . If the check button is disabled, only the Start button for samplers without a <i>safeTIPCAP</i> will be available.
Enable estimated derived parameters	Enables estimation of the derived parameters based on default values even though the measured parameters have been deselected or are not available.
Fixed pO_2/pCO_2 decimals	If enabled, these parameters will be reported with a fixed number of decimals.
Enable general barcode support	Enables every text box on the Patient Profile, Patient Identification, Patient Result, QC ID and Recording Fluid Replacement screens where it is possible to enter a barcode.
Enable patient result approval	Enables the additional buttons on the Patient Result screen used for approval of the result. For detailed information please refer to <i>chapter 4: Sample measurements</i> .
Apply parameter corrections to QC	If enabled, the user-defined corrections (slope and offset) will be applied to the quality control results.

Continued on next page

Miscellaneous setup, *Continued*

List of options (*continued*)

Option	Function
Log all measurement activities	If enabled, "Ready", "Rinse", "Aspirating" and "Measurement" will be registered in the Activity log. Otherwise these activities will not be registered in the Activity log. This option aims to avoid too many entries in the Activity log.
Auto temp. unit conversion	°C will be automatically changed to °F if the entered temperature is over the value of 45.
Show screen saver	The screen saver will show up if the analyzer was idle for 10 minutes.
Show parameter bar	If disabled, the parameter bar will not be shown on the Ready screen.

To activate/deactivate an option, do the following:

Step	Action
1.	Scroll the list of options with the up/down arrow keys.
2.	Highlight the option and press the check-key (✓) beside it. To deactivate the option, press the check-key again.
3.	Press <i>Close</i> to confirm the settings and return to the Ready screen.

Selecting HbF correction option

This option disables HbF correction for all levels, or enables it for all levels or for HbF levels higher than 20 % (HbF correction will be automatically disabled if FCOHb < -0.5 % in order to decrease a false HbF detection on adult blood samples and to ensure non-biased oximetry results).

The guidelines for selecting/deselecting HbF correction are as follows:

For neonatal samples: Use "Enabled for all levels".
It is important to enable HbF correction in order to obtain correct results for ctBil, sO₂, FO₂Hb, FMetHb, FCOHb and FHHb.

For adult samples: Use "Disabled" or "Enabled for levels > 20 %".

NOTE: When an adult sample is measured with HbF correction "Enabled for all levels" or "Enables for levels > 20 %", it will slightly affect measurement of sO₂, FO₂Hb, FMetHb, FCOHb and FHHb, and will cause a marginal number of adult samples reported with HbF present.

If this is not acceptable, the HbF correction for adult samples can be turned off before a measurement – see Selecting HbF Correction in the Analysis Setup in this chapter.

To select the desired option, use the arrow buttons in the box.

Continued on next page

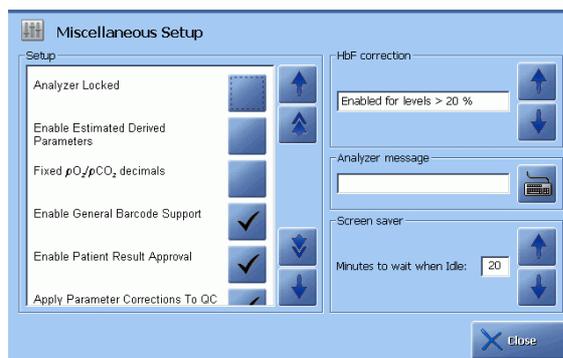
Miscellaneous setup, *Continued*

Analyzer message

A message, sent from RADIANCE to the connected analyzer and displayed on the **Ready** screen, can be changed or deleted in this program as follows:

Step	Action
------	--------

1. Press the keyboard icon to display the keyboard.



Type the message and confirm with **Enter**.

To delete the current message, press **Delete** on the keyboard, or delete a message and type a new one if desired.

NOTE: The analyzer message can be up to 40 characters long.

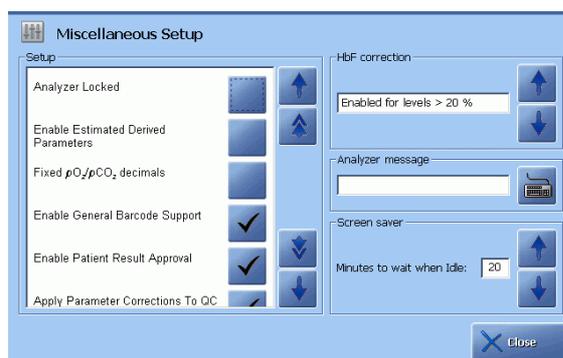
2. Confirm the change with **Enter** on the keyboard to return to the **Miscellaneous Setup** screen.

Screen saver

To set the time for the screen saver to appear, do the following:

Step	Action
------	--------

1. Check that the screen saver check button is activated.



2. Select the time with the arrow buttons.

4. Sample measurements

Overview

Introduction This chapter describes how to perform measurements on patient samples and how to interpret the results.

Contents	This chapter contains the following topics.	
	General information	4-2
	Immediately before analysis	4-7
	Measurements with FLEXQ	4-8
	Introducing a blood sample	4-10
	Introducing an expired air sample	4-13
	Patient identification	4-14
	Patient result	4-18
	Calculation of F_{Shunt} and $ctO_2(a-\bar{v})$	4-22
	Patient result messages	4-23

General information

Measuring modes with FLEXQ

With the FLEXQ module installed, it is possible to make the measuring process automatic (i.e. just place up to three samples in the sampler tray and go), or to place a single sampler in the sampler tray and perform a single measurement.

The following rules apply to the **batch mode**:

- The analyzer is connected to RADIANCE
- All information is entered on RADIANCE via FLEXLINK
- Automatic data request is based on Sampler ID
- Measuring mode will always be the largest syringe mode, and it will be marked "Flex"
- Default layout is always used.

The following rules apply to a **single measurement**:

Parameter profile received from RADIANCE	Parameter profile not received from RADIANCE
<ul style="list-style-type: none"> • Measuring modes will be those syringe modes that can provide the requested parameter profile; these modes will be marked "Flex" • Default layout is always used. 	<ul style="list-style-type: none"> • The measuring modes are those that can be selected on the analyzer (see <i>Available modes and parameters</i> below) • The layout will be the one assigned to the selected measuring mode.

Available modes and parameters

The modes and the measured parameters available on the ABL800 FLEX analyzers are listed below.

Analyzer	Measuring modes	Measured parameters
805	Syringe – S165 µL	pH, $p\text{CO}_2$, $p\text{O}_2$, $c\text{K}^+$, $c\text{Na}^+$, $c\text{Ca}^{2+}$, $c\text{Cl}^-$, $c\text{Glu}$, $c\text{Lac}$
	Capillary – FLEXMODE	See next page
	Syringe – S95 µL Capillary – C95 µL	pH, $p\text{CO}_2$, $p\text{O}_2$, $c\text{K}^+$, $c\text{Na}^+$, $c\text{Ca}^{2+}$, $c\text{Cl}^-$, $c\text{Glu}$, $c\text{Lac}$
	Syringe – S85 µL pH+BG Capillary – C55 µL pH+BG	pH, $p\text{CO}_2$, $p\text{O}_2$
	Capillary – C35 µL MET	$c\text{Glu}$, $c\text{Lac}$
	Ampoule QC	All available
	Expired air	$p\text{CO}_2$, $p\text{O}_2$

Continued on next page

General information, *Continued*

Available modes
and parameters
(*continued*)

Analyzer	Measuring modes	Measured parameters
805 (cont.)	Other fluids (any mode)	Depends on the selected mode
810 BG only	Syringe – S85 µL Capillary – C55 µL	pH, $p\text{CO}_2$, $p\text{O}_2$
	Capillary – FLEXMODE	See next page
	Expired air	$p\text{CO}_2$, $p\text{O}_2$
	Ampoule QC	All available
	Other fluids (any mode)	Depends on the selected mode
810/20/30	Syringe – S85 µL Capillary – C55 µL	pH, $p\text{CO}_2$, $p\text{O}_2$ and 810: ctHb, $s\text{O}_2$ 820: ctHb, $s\text{O}_2$, FO_2Hb , FCOHb , FMetHb 830: ctHb, $s\text{O}_2$, FO_2Hb , FCOHb , FMetHb , ctBil, FHbF
	Capillary – FLEXMODE	See next page
	Capillary – C35 µL OXI	810: ctHb, $s\text{O}_2$ 820: ctHb, $s\text{O}_2$, FO_2Hb , FCOHb , FMetHb 830: ctHb, $s\text{O}_2$, FO_2Hb , FCOHb , FMetHb , ctBil, FHbF
	Expired air	$p\text{CO}_2$, $p\text{O}_2$
	Ampoule QC	All available
	Other fluids (any mode)	Depends on the selected mode

Continued on next page

General information, *Continued*

Available modes
and parameters
(*continued*)

Analyzer	Measuring modes	Measured parameters
815/25/35	Syringe – S195/95 μL Capillary – C95 μL	pH, $p\text{CO}_2$, $p\text{O}_2$, $c\text{K}^+$, $c\text{Na}^+$, $c\text{Ca}^{2+}$, $c\text{Cl}^-$, $c\text{Glu}$, $c\text{Lac}$ and 815: $ct\text{Hb}$, $s\text{O}_2$ 825: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$ 835: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$, $ct\text{Bil}$, $F\text{HbF}$
	Capillary – FLEXMODE	See below
	Syringe – S85 μL pH+BG + OXI Capillary – C55 μL pH+BG+OXI	pH, $p\text{CO}_2$, $p\text{O}_2$ and 815: $ct\text{Hb}$, $s\text{O}_2$ 825: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$ 835: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$, $ct\text{Bil}$, $F\text{HbF}$
	Capillary – C35 μL MET	$c\text{Glu}$, $c\text{Lac}$
	Capillary – C35 μL OXI	815: $ct\text{Hb}$, $s\text{O}_2$ 825: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$ 835: $ct\text{Hb}$, $s\text{O}_2$, $FO_2\text{Hb}$, $FC\text{OHb}$, $F\text{MetHb}$, $ct\text{Bil}$, $F\text{HbF}$
	Expired air	$p\text{CO}_2$, $p\text{O}_2$
	Ampoule QC	All available
	Other fluids (any mode)	Depends on the selected mode

NOTE: In order to perform measurements in the 35 μL mode in accordance with performance specifications it is highly recommended to use 35 μL capillaries with mixing wire and a clot catcher.

Continued on next page

General information, *Continued*



FLEXMODE

This mode allows you to analyze a blood sample of 35 µL and higher – up to the maximum volume accepted by your analyzer. Depending on the available sample volume, the FLEXMODE provides the highest number of parameters: from all available to as many as reliably possible.

The following parameters can be obtained depending on the available sample volume (for the ABL835):

Volume	Parameter profiles	Message No. **
35-40 µL*	pH + OXI	869
40-55 µL*	pH + OXI	870
50-70 µL*	pH + OXI + BG	871, 872
65-100 µL*	pH + OXI + BG + MET	873
> 90 µL*	pH + OXI + BG + MET + LYT	874
195 µL	pH + OXI + BG + MET + LYT + ctBil	No message

* All volumes are approximate volumes at ctHb = 15 g/dL.

** The messages will accompany the obtained result – see *Patient result messages* at the end of this chapter. For interpretation of the messages – see *Troubleshooting messages* in *chapter 11* in this manual.

WARNING/ CAUTION notices

1. *Never use analyzer for lactate measurements if there is any suspicion of presence of glycolic acid in blood as e.g. in case of ethylene glycol poisoning or xylitol infusion. Glycolic acid interferes with the lactate sensor resulting in erroneously high lactate readings*
2. *After performing a measurement on a blood sample of high protein content, perform the Cleaning Program. Protein build-up in the analyzers and on electrode membranes can influence future results*
3. *Visually inspect the measuring chambers for blockages when lifting the inlet flap prior to performing a measurement. If there is a blockage, close the flap and the analyzer will perform a rinse. If repeated visual inspection shows blockages in the measuring chamber, clean the electrodes and the measuring chamber according to step 7 in chapter 11: Troubleshooting, section "Fluid transport troubleshooting procedure" in this manual.*
4. *During measurement, use the sample path view to observe the sample in the measuring chambers. If any bubbles are seen, disregard the result and repeat the measurement.*

When the FLEXQ is in use, the **WARNING/CAUTION** notices 3 and 4 above do not apply. When the FLEXQ is in use, it is mandatory to add S5370 Cleaning Additive to the Cleaning Solution – see the procedure in section *Cleaning Additive* in chapter 7 of this manual.

Continued on next page

General information, *Continued*

Interrupting a measurement

To interrupt a measurement, press  (Stop) button.

Before using the FLEXQ

To use the FLEXQ efficiently, the setup should be made thoroughly.

Program	Recommendations
Analysis Setup – Syringe Modes	<ul style="list-style-type: none"> • Make the report layout for each measuring program you are going to use, including the Patient ID items and parameter profile • Select the default layout for each selected measuring program. <p>This will define the number of measuring programs to select from before each measurement.</p>
Analysis Setup – Sample Pre-registration	Select interpretation of the barcode entry.
Analysis Setup – Sample Logistics	<ul style="list-style-type: none"> • Select batch mode for automatic measuring process or deselect it if single measurements are to be performed • Select sample age for each measured parameter
Connections	<ul style="list-style-type: none"> • Select connection to RADIANCE, LIS/HIS • Select conditions for automatic patient data request • Select data to be transmitted to RADIANCE, LIS/HIS • Select patient data source (Patient Lookup)
Printers – Automatic Printing	<ul style="list-style-type: none"> • Select printing of the registration receipt for FLEXQ measurements

To make the measuring process automatic, the following is required:

- Batch mode selected in the Sample Logistics Setup
- Barcode interpretation (patient ID, Accession number, Sampler ID) selected in Sample Pre-registration and corresponds to that on RADIANCE
- Analyzer connected to RADIANCE
- Patient information entered on RADIANCE via FLEXLINK.

Sampling

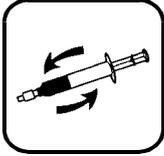
See *chapter 12* in this manual.

Immediately before analysis

Purpose It is necessary to mix a blood sample before introducing it into the system to ensure its homogeneity. If a sample is transferred from a syringe to an analyzer without being properly mixed, either the plasma phase or packed red blood cells may be analyzed which render the oximetry results meaningless.

FLEXQ module Place a *safePICO* in the FLEXQ sampler tray. The sample will be automatically mixed before the measurement.

Mixing a sample For the analyzers without FLEXQ module, mix a blood sample in a sampling device as follows:

Sampling device	Description
	Mix a capillary sample with a magnet. Then move the mixing wire to the end of the capillary opposite to that from which the blood is to be aspirated. Remove both capillary caps.
	<i>safePICO</i> or another syringe: Invert the syringe repeatedly and roll it between the palms of your hands.
	Invert the test tube repeatedly. Then remove the cap.

WARNING/CAUTION: Use capillary tubes with a volume relevant for the selected measuring mode. Too small a volume will give the “Insufficient sample” error. Too large a volume will render the internal analyzer corrections invalid and the results inaccurate.

Guidelines for handling capillary blood samples See *chapter 12* in this manual.

Measurements with FLEXQ

Single measurement from the FLEXQ sampler tray

To make a single measurement, do the following:

- | Step | Action |
|------|--|
| 1. | Place the sampler in a slot on the tray. A short beep indicates that the barcode has been accepted. |
| 2. | The available measuring modes are shown; the selected mode is highlighted. Change a measuring mode if desired.
Press Proceed . |
| 3. | Enter, if required, additional patient data or mandatory data. |

Press **Accept** to accept all the data (patient data, measuring mode, selected parameters, layout, etc.).

- Remember to take the registration receipt printed out on the analyzer's printer.
- Repeat steps 1-4 for another sampler.
- The measurement starts. The patient name and the time left till the result is ready are displayed on the **Ready** screen.

If further editing of the patient data has to be made, press the  button on the **Ready** screen to return to the **Sample Registration** screen.

- When the result is ready, it will be automatically transmitted to its destination (RADIANCE or LIS/HIS).

Batch measurement

To make a batch measurement, do the following:

- | Step | Action |
|------|---|
| 1. | Make sure that a slot indicator is green and ready to accept a sampler. |
| 2. | Place the sampler in an empty FLEXQ sampler tray slot. A short beep indicates that the barcode has been accepted. |
| 3. | Make sure that your sampler is ready for processing. If not, check analyzer connection to FLEXLINK. |
| 4. | Proceed with the next sampler in the same manner as described above. |

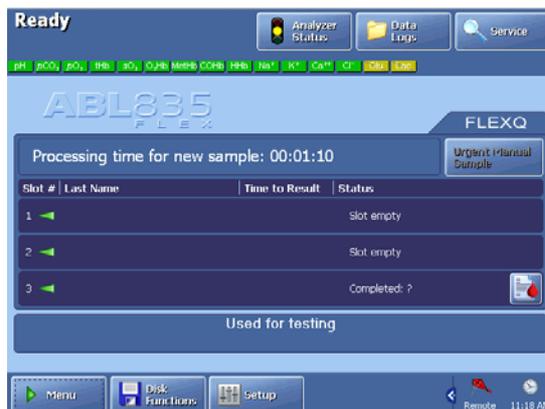
Continued on next page

Measurements with FLEXQ, *Continued*

An urgent measurement To bypass a queued measurement while the analyzer processes the samplers in the sampler tray, do the following:

Step	Action
------	--------

1. Check that *Urgent Manual Sample* is active on the **Ready** screen and press it.



2. If the urgent measurement violates parameter lifetime of one or more queued samples, accept violation and book the inlet for manual measurement by pressing *Yes* or abort booking of the inlet by pressing *No*.
3. When allowed on the screen, open the inlet flap, insert the sampling device in the inlet and press *Start* – see *Introducing a blood sample* in this chapter.

Note that if the *Urgent Manual Sample* button is grayed out, the inlets are free and the sample can be analyzed immediately.

Editing sample registration To change or add information to sample registration, do the following:

Step	Action
------	--------

1. Locate the required sample in the "FLEXQ Status" on the **Ready** screen and press the  button to proceed to the **Sample Registration** screen.
2. Change the patient data on the **Sample Registration** screen.
3. Press *Accept* to confirm the patient data.

Introducing a blood sample

Syringe samples To analyze a blood or other fluid sample without the use of the FLEXQ sampler tray, do the following.

Step	Action
------	--------

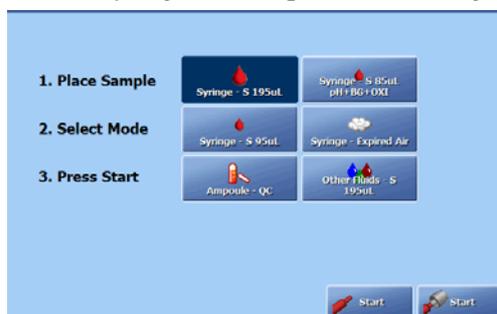
1. Check that the analyzer is in the Ready mode and scan the sample barcode.



Accept or cancel the displayed patient data (selected in Sample Pre-registration setup program – see *chapter 3* in this manual).

If no sample pre-registration was selected, proceed to step 2 below.

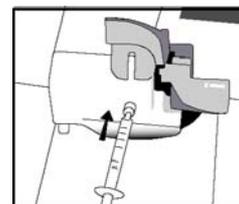
2. Lift the syringe inlet flap. The following screen appears:



If sample pre-registration was selected (see *Analysis Setup* in *chapter 3*), press **Accept** to accept displayed patient data or **Cancel** to cancel the patient data.

3. Place the syringe tip firmly in the inlet as shown.

safePICO: Do not remove the *safeTIPCAP*.



4. Select the desired mode by pressing the appropriate button.

Continued on next page

Introducing a blood sample, *Continued*

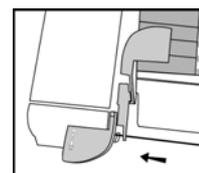
Syringe samples (*continued*)

Step	Action
5.	Press Start with the <i>safe</i> TIPCAP for <i>safe</i> PICO samplers or press Start without <i>safe</i> TIPCAP for other samplers (two Start buttons will be available only if "Use <i>safe</i> TIPCAP" check button is enabled in the Miscellaneous Setup).
6.	Check the selection of parameters depending on their status (green, yellow, red) and your needs (if the Dynamic Parameters check button has been activated for the given measuring mode). Deselect any parameters or the HbF correction for this mode by pressing the parameters or the HbF correction check button.
7.	Press Aspirate to start the measurement.
8.	When prompted by the analyzer, remove the sampling device and close the inlet flap. <i>safe</i> PICO: remove the sampler by holding the <i>safe</i> TIPCAP.
9.	Enter the information on the Patient Identification screen.

Capillary samples

To analyze a blood or other fluid sample from a capillary do the following:

Step	Action
1.	Check that the analyzer is in the Ready mode and scan the sample barcode. Accept or cancel the displayed patient data (selected in Sample Pre-registration setup program – see <i>chapter 3</i> in this manual). If no sample pre-registration was selected, proceed to step 2 below.
2.	Lift the capillary inlet flap.
3.	Remove the capillary end caps, if any, and insert the capillary into the inlet as shown.
4.	Select the desired mode by pressing the appropriate button.
5.	Press the Start button.
6-9.	See steps 6-9 for the syringe mode.



NOTE: If the capillary breaks in the inlet, do not attempt to remove it, but replace the inlet gasket as described in *chapter 7: Replacements*.

Continued on next page

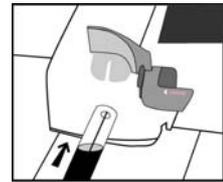
Introducing a blood sample, *Continued*

Test tube samples

To analyze a blood or other fluid sample, do the following.

Step	Action
------	--------

- | | |
|------|---|
| 1. | Check that the analyzer is in the Ready mode and scan the sample barcode.
Accept or cancel the displayed patient data (selected in Sample Pre-registration setup program – see <i>chapter 3</i> in this manual).
If no sample pre-registration was selected, proceed to step 2 below. |
| 2. | Lift the syringe inlet flap. |
| 3. | Hold the test tube at the syringe inlet. |
| 4. | Select the desired mode by pressing the appropriate button. |
| 5. | Press <i>Start</i> .
The probe will move out of the syringe inlet into the test tube. |
| 6-9. | See steps 6-9 for the syringe mode. |

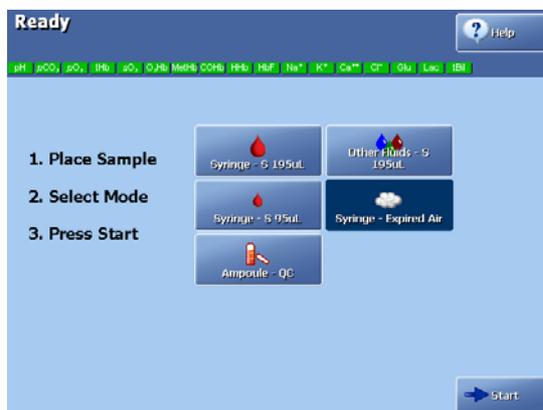


Introducing an expired air sample

Procedure To analyze an expired air sample, do the following:

Step	Action
------	--------

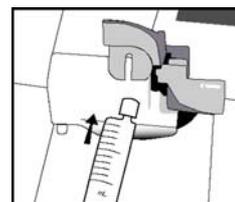
1. Open the syringe inlet flap and select the Expired Air mode.



NOTE: The Expired Air measuring program has to be selected in the Analysis Setup for syringe samples in order to obtain the button on the screen.

2. Place the syringe tip in the inlet.

WARNING/CAUTION: The Expired Air mode is exclusively used for samples of expired air. Injection of blood or other liquid in this mode may cause damage to the analyzer.



3. Press **Start**.
4. Inject the sample slowly, following the volume bar on the screen. Make sure to continue injecting the expired air sample as long as the volume is higher than 0 mL.
5. When prompted by the analyzer status, remove the syringe and close the inlet flap.
6. Enter the patient information on the **Patient Identification** screen.

Patient identification

Entering information with barcode reader

If the FLEXQ module is not used, the **Patient Identification** screen is displayed after the sample has been introduced and the relevant inlet closed.

To enter the patient information with the barcode reader, do the following:

Step	Action
1.	Scan all barcodes, if available (e.g., Accession Number, patient department, last name, etc.). To do this, the "Enable General Barcode Support" function in the Miscellaneous Setup must be activated in Miscellaneous Setup.
2.	Scan "Operator" and "Physician" from your ID-card. If the name is included in the list of analyzer's registered users, the barcode will identify the person and fill in the name automatically. If the name is not included in the list of the analyzer's registered users, the barcode will be read directly from the ID-card.

Entering information manually

To enter patient information manually, do the following:

Step	Action
1.	Highlight the desired text box in the Patient Identification list (the top box is already highlighted when the Patient ID screen appears).

2. Type in the patient information using the screen keypad or keyboard, and confirm each entry with **Enter**.

If a patient ID has been used before or is included in the Patient Profile, the relevant text boxes will be automatically filled in – see *Chapter 9, Patient Profile Log*.

Press the **Patient Lookup** button (if available) to obtain the latest information about your patient – see the *Patient Lookup* function below.

Continued on next page

Patient identificationT, *Continued*

Entering information manually
(*continued*)

Step	Action
3.	<p><u>The analyzer is connected to LIS/HIS and/or RADIANCE:</u></p> <p>Type the patient ID or Accession Number. If automatic data request was selected in Communication Setup (see <i>chapter 3</i>), the relevant text boxes will be automatically filled in. Or –</p> <p>Press the Request button (if available) – after the patient ID or Accession Number was entered – to fill the relevant text boxes.</p>
4.	Fill in all the mandatory (with a  next to it) text boxes in order to view the measurement results.
5.	If desired, select another report layout by highlighting another layout by touching it on the screen.

NOTES:

- *If the requested patient data (e.g. Patient Last Name) was received after the Patient ID screen was exited, the patient report will be stored without the requested data in the Patient Report log. The requested patient data will be stored as a patient profile in the analyzer's database without, however, being attached to any patient report.*
- *If the requested patient data (e.g. Patient Last Name) was received after the Patient ID screen was exited, the patient report will be transmitted without the requested data. To prevent this, select one of the patient ID items transferred from LIS/HIS as mandatory.*

Patient Lookup The Patient Lookup function allows you to transfer the patient information from a department's specific list to the **Patient ID** screen if the following conditions are fulfilled (see the next page):

Item	Conditions
Data source	<p>Should be selected in Patient Lookup Setup (see <i>chapter 3, Communications</i> for details) for the specified data source:</p> <ul style="list-style-type: none"> • LIS/HIS • RADIANCE • Analyzer's database.
Number of days to be excluded from Patient List	Should be selected (see <i>chapter 3, Communications</i> for details).
Department (Pat.)	Should be included and filled in on the Patient Identification screen.

Continued on next page

Patient identificationT, *Continued*

Patient Lookup (continued) To use the Patient Lookup function, do the following:

Step	Action
1.	Highlight and fill in the Department (Pat.) . Press <i>Patient Lookup</i> .
2.	Select your patient from the list by highlighting the line on the screen. Press the <i>Update</i> button to update the Patient List.
3.	Press <i>Select</i> to transfer the specific patient information to the Patient Identification screen and return to the previous screen. Press <i>Back</i> to return to the previous screen without updating the patient information.

Selecting a report layout To select a report layout, do the following:

Step	Action
1.	Highlight "Report Layout" with the up/down arrows on the Patient Identification screen.
2.	If "Report Layout" is included in the Patient ID, select a layout from the list displayed on the right side of the screen, using the up/down arrows. (The list of report layouts has been made in the Patient Report Setup - see <i>chapter 3: Installation and setup</i> in this manual.) If "Report Layout" is not included in the Patient ID, the text box is separated from the rest of the items on the Patient Identification screen. You can select another report layout by highlighting the line on the screen and selecting the desired layout. The patient report will be saved in this layout.

Electrode updatings It is possible to see updatings of the pH, $p\text{CO}_2$, $p\text{O}_2$, K, Na, Ca, Cl, Glucose and Lactate electrodes (the number of electrodes depends on the type of your analyzer) during a measurement.

To display the Electrode Updatings screen, press the *Electrode Upd.* button on the **Patient Identification** screen.

Press *Back* to return to the on the **Patient Identification** screen.

Continued on next page

Patient identificationT, *Continued*

Selecting parameters after a measurement

To change the parameter profile after a given measurement, do the following:

- | Step | Action |
|------|--|
| 1. | Press <i>Parameters</i> on the Patient Identification screen. |
| 2. | To exclude a parameter, deactivate the relevant button. |
| 3. | Press <i>Back</i> to return to the Patient Identification screen and press <i>Result</i> to display the changed result. |
| 4. | Press <i>Print</i> to print out the changed patient report. |

*NOTE: The **Selected Parameters** screen displays all the parameters selected in the **Parameter Profile** for a given measuring mode, depending on the analyzer version.*

Patient result

Retrieving patient result

The FLEXQ module is installed:

The measurement result will not be displayed automatically. You can do one of the following:



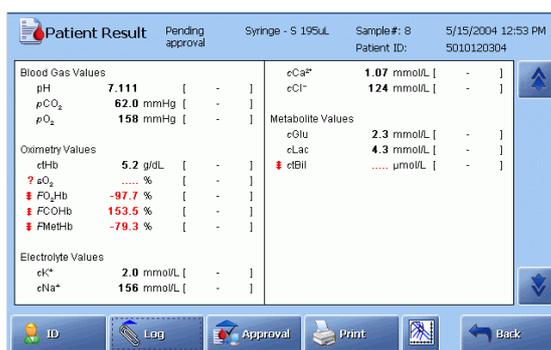
- Press the  button on the **Ready** screen
- Scan the registration receipt
- Press **Menu – Latest Result**
- Press **Menu – My Results**
- Press **Menu – Data Logs – Patient Results Log**, highlight the desired result and press **Result**.

The FLEXQ module is not installed:

The **Patient Result** screen will be displayed automatically when the measurement has been completed. However, if the patient identification information took longer time to enter than the measurement, you can do one of the following:

- Press the **Result** button on the **Ready** screen
- Press **Menu – Latest Result**
- Press **Menu – My Results**

Press **Menu – Data Logs – Patient Results Log**, highlight the desired result and press **Result**.



Press **Print** to print out the patient report.

Parameter status

The absence of any markings next to a parameter indicates that a parameter was measured without any fault.

The following markings may appear next to a parameter:

Marking

Explanation

?

- Error in the last quality control measurement or calibration, or due to sample problems
- Sample age selected for the given parameter(s) in Sample Logistics Setup (see *Analysis Setup* in chapter 3) was exceeded.



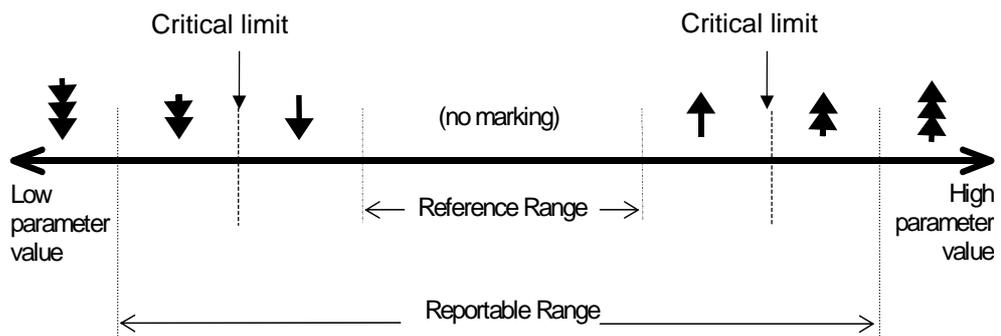
Parameter value is outside the **reference range** (the range within which the parameter value is considered normal, for the specific type of sample being measured), but inside the critical limits.

Continued on next page

Patient result, *Continued*

Parameter status (*continued*)

Marking	Explanation
↑ ↓	Parameter value is outside the upper or lower critical limit (the limits outside of which a parameter value is dangerously high or low, for the specific type of sample being measured), but inside the reportable range.
↑↑ ↓↓	Parameter value is outside the reportable range (user-defined and equal to or narrower than the measuring range). The reportable range can be selected for all measured and derived parameters. These markings will be printed out together with the result.
"....." instead of the value	A parameter cannot be calculated or exceeds the numerical limit of the analyzer.
* next to the value	Values with user-defined correction factors.



Patient result approval

Result approval is possible if "Enable Result Approval" check button has been activated (✓) in the Miscellaneous Setup program.

To use this function, do the following:

Step	Action
1.	Press Approval on the Patient Result screen.
2.	The following buttons become available when you press the button: Approve Press Accept to accept the result and to send it to the connected RADIANCE or LIS/HIS. Press the keyboard icon to write a note. Press Cancel to return to the previous screen.

Continued on next page

Patient result, *Continued*

Patient result approval (*continued*)

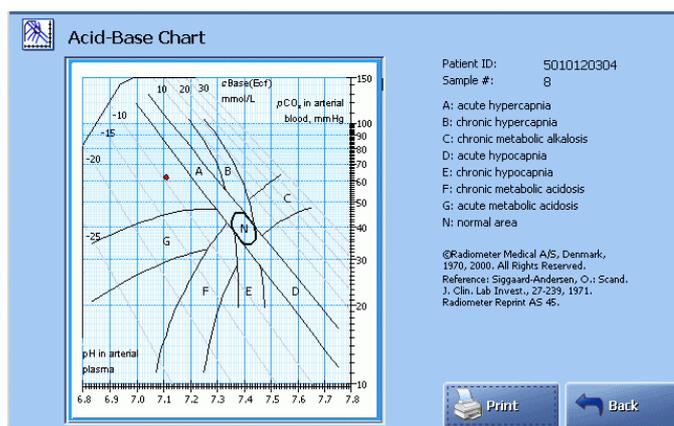
Step	Action
Reject	<p>Press Accept to reject the result and to send it to the connected RADIANCE or LIS/HIS.</p> <p>Press the keyboard icon to write a note.</p> <p>Press Cancel to return to the previous screen.</p>
Rerun	<p>Press Accept to mark that the measurement should be repeated, and to send it to the connected RADIANCE or LIS/HIS.</p> <p>Press the keyboard icon to write a note.</p> <p>Press Cancel to return to the previous screen.</p>
Note	<p>Press the keyboard icon to type a note prior to the approval or to edit a highlighted note.</p> <p>To delete a highlighted note, press the keyboard icon and delete the note.</p>

Once the result has been approved/rejected/rerun, the ID data can only be viewed, not changed (grayed out input boxes). The **Parameters**, **Patient Lookup** and **Request** buttons will not be available either.

In the Patient Report log you can filter patient reports according to the approval status.

The button changes to **Send** (if selected in Communication Setup) after the approval of the patient result has been made.

Acid-Base Chart Press **Acid-Base Chart** to view the acid-base chart for the selected patient result (the button will not be available if pH and $p\text{CO}_2$ were deselected in the Parameter setup. The sample type should be either “Arterial” or “Capillary”).



The chart illustrates the patient result according to the Siggard-Andersen nomogram. The clinical conditions corresponding to each of the 8 zones listed to the right of the screen.

Continued on next page

Patient result, *Continued*

Acid-Base Chart (continued) The point position is determined by the pH and $p\text{CO}_2$ values from the patient result. If the pH and $p\text{CO}_2$ values are outside the defined limits of the acid-base chart, the message "Measurement out of range" will appear on the chart in red and the **Print** button will disappear.

Available buttons:

Print = to print out the displayed acid-base chart and the corresponding patient result, if available - see above.

Back = to return to the patient result screen.

WARNING/CAUTION: *The information provided by the acid-base chart should only be used as a guideline for interpreting the patient's condition. The patient results must always be examined carefully by a clinician before a proper diagnosis is made.*

Recalling patient ID

To recall the **Patient Identification** screen, press the **ID** button.

For detailed information refer to the topic *Patient Identification* in this chapter.

Patient result audit trail

Any changes made on the **Patient Identification** screen will be registered in the Audit Trail function.

The **Messages** button is substituted with the **Log** button to indicate that changes were made.

To see the audit trail, do the following:

Step	Action
1.	Press Log on the Patient Result screen to display the following buttons: Audit Trail and Messages .
2.	Press Audit Trail . The audit trail contains information about the operator who made the change, time of change and new/old values. The changes made at the same time are indicated with "--" in Time and User columns.
3.	Use the up/down arrow buttons to scroll the list of changes. Press Back to return to the Patient Result screen.

Calculation of $FShunt$ and $ctO_2(a - \bar{v})$

Calculation of $FShunt$ and $ctO_2(a - \bar{v})$

To obtain the calculated values of $FShunt$ and $ctO_2(a - \bar{v})$, it is necessary to analyze a mixed-venous and arterial (or capillary) blood sample from the patient.

Do the following:

Step	Action
1.	<p>Make, if required, a new patient report layout (see <i>Patient Reports</i> in chapter 3) with the following parameters included:</p> <ul style="list-style-type: none"> • $FShunt$ and/or $ctO_2(a - \bar{v})$ into the Patient Result • $pO_2(\bar{v})$, $sO_2(\bar{v})$, $FO_2(I)$, RQ and T (patient temperature) into the Patient ID
2.	Analyze the mixed-venous sample and record the $pO_2(\bar{v})$ and $sO_2(\bar{v})$.
3.	Analyze the arterial sample.
4.	<p>On the Patient Identification screen, select the sample type as “Arterial“ or “Capillary“ and key in the following values:</p> <ul style="list-style-type: none"> • $pO_2(\bar{v})$ and $sO_2(\bar{v})$ from the mixed-venous sample (step 2 above) • $FO_2(I)$ if it differs from the default value of 0.21 (for $Fshunt$) • RQ if it differs from the default value of 0.86 (for $Fshunt$) • T if it differs from the default value of 37 °C (for $Fshunt$). • $p50(st)$ from the mixed-venous sample if $sO_2(a) > 97\%$.

NOTE: The $FShunt$ value will be available as an estimated value even without the data obtained from the mixed-venous sample.

Patient result messages

Screen messages The **Patient Result Messages** screen is displayed after the **Messages** button was pressed.

The screen gives the erroneous parameter(s) and the message(s) with number(s) referring to the message described in *Troubleshooting Messages, chapter 11*.

Messages can be seen on the following three levels:

Level	Explanation
User	Messages for the user familiar with the basic daily operation of the analyzer and primarily responsible for performing measurements. The fewest messages are displayed under this level.
Manager	Messages for the user with deeper knowledge of the analyzer functions and responsible for the analyzer's proper operation.
Service	Messages for the service technician with thorough knowledge of the operation and construction of the analyzer. This level displays the greatest number of messages and in most detail.

Buttons and functions

The following buttons are available:

Button	Function
Result	Press to return to the Patient Result screen.
Troubleshoot	Press to display the error description and operator actions – see <i>Troubleshooting Messages, chapter 11</i> for detailed information.
Print	Press to print out the screen message(s).
Back	Press to return to the previous screen.
Note	<p>Press to display the keyboard, type the note and confirm with enter.</p> <p>If Notes for patient result were entered in User-defined Notes program (see <i>chapter 3: Installation and Setup</i>), select a Note from the list with the up/down arrow buttons.</p> <p>To edit a note use Edit Note and type the note on the keyboard. Remember to confirm it with Enter on the keyboard.</p> <p>To delete a note use Delete Note and delete it.</p>

5. Quality control

Overview

Introduction Quality control is used to evaluate the performance of the analyzer to ensure the reliability, accuracy and precision of patient sample results.

This chapter describes how to perform a quality control measurement and the subsequent presentation of results.

Contents This chapter contains the following topics.

General information	5-2
Preparing a control solution	5-4
Manual quality control measurement.....	5-6
AutoCheck measurement	5-7
Quality control identification	5-8
Quality control result.....	5-10
Quality control result messages	5-14

General information

- Purpose** The purpose of quality control is to validate the analyzer's performance by evaluating accuracy and precision. Performing quality control routinely will help to ensure that results from actual patient samples are accurate.
- Solutions** Each quality control system includes 4 types of control solutions in order to provide control of analyzer performance when measuring parameters at low, normal and high levels - refer to the *Quality control setup* in chapter 3.
- It is possible to use non-Radiometer solutions although the accuracy and validity of the results cannot be guaranteed.
- Inserts** Control solutions are packed in ampoule boxes. Each ampoule box contains an insert with the Radiometer-determined control limits valid for that particular lot of control solutions. The solution type, lot number, and expiration date, is bar coded for easy entry.
- Quality control frequency** Quality control solutions are solutions with predetermined values that cover the clinically relevant ranges for the measured parameters, the objective being to simulate a patient sample. Each quality control system from Radiometer includes four levels of quality control solutions in order to cover the whole clinically significant range: low, normal and high. The number of levels should cover the analytical measuring range.
- Special country, state and local regulations must be complied with. Additional quality control should be run after any troubleshooting or preventive maintenance which might alter performance and whenever the technician has questions about the performance of the analyzer.

An example of daily routine with the 4-level quality control system is given below:

Shifts per Day	Quality Control Routine
3	One level tested at the beginning of each shift. The 4th level is tested in the 8-hour shift with the highest volume of patient samples.
2	Two levels at the beginning of each shift.
1	All levels are tested at the beginning of each shift.

Continued on next page

General information, *Continued*

Glossary of Terms

The following terms are used in the quality control:

Term	Explanation
Accepted result	A measurement value which falls within the statistics range.
Control range	The range within which a measurement should fall. Typically the control range is set to be the mean \pm 2 SD (see <i>Quality control setup</i> in chapter 3). This range can be set using the lot-to-date range (2 SD) calculated by the analyzer, or it may be user-defined.
Insert limits	Upper and lower control limits, established by Radiometer, printed in the insert provided with each box of control solutions.
Lot-to-date range	A range calculated by the analyzer from measurements taken on a lot of a particular control solution. It is represented by mean \pm 2 SD.
Measuring range	The range for each parameter the analyzer is capable of measuring. Refer to <i>Measured Parameters</i> in <i>Chapter 13</i> for the analyzer measuring range for each parameter.
Statistics factor	The factor by which the control range is expanded (multiplied by) to determine the statistics range. The recommended statistics factor is 1.5.
Statistics range	The range within which a measurement must fall in order to be included in the quality control statistics. It is determined by multiplying the control range limits by the entered statistics factor. It is typical that the statistics range is set to the mean \pm 3 SD.

For detailed information on terminology and principles for the quality control systems please refer to the *Quality Control Systems Reference Manual*.

WARNING/ CAUTION

In cases where the first blood sample measurement after a measurement on a QUALICHEK3+/5+ or AutoCheck3+/5+ control solution is to be performed with HbF correction (either set up for all levels or for FHbF > 20 %), a rinse must be called prior to the blood measurement to ensure accurate oximetry results.

Preparing a control solution

About control solutions

Brief information is given below:

Item	Description
Quantity	<ul style="list-style-type: none"> Each ampoule of QUALICHECK+ contains 2 mL of solution and is to be used for one measurement only. Each ampoule of AutoCheck contains 0.7 mL solution and is to be used for one measurement only.
Conditioning before measurement	Store the ampoules for 5 hours at 18-32 °C (64.4-89.6 °F). Control solutions are sensitive to light, so always keep the ampoule box closed.
Open ampoule stability	Ampoules must be used immediately after being opened, in order to ensure the reliability of the measurement.

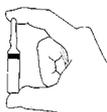
Required materials

The following materials are required to make a manual measurement on a control solution:

Quality Control System	Materials Required
QUALICHECK1+ QUALICHECK3+ QUALICHECK4+ QUALICHECK5+	<ul style="list-style-type: none"> 4 levels of control solutions H700 Ampoule Adapter Ampoule opener Rubber gloves
AutoCheck3+ AutoCheck5+	<ul style="list-style-type: none"> 4 levels of control solutions H700 Ampoule Adapter H705 Ampoule Holder Rubber gloves

Before measurement on QUALICHECK+ control solution

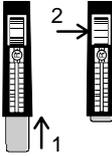
Do the following:

Step	Action
1.	 Holding the ampoule between the two fingers as shown, shake it vigorously for at least 15 seconds.
2.	Tap the top of the ampoule until all of the solution collects at the bottom.

Continued on next page

Preparing a control solution, *Continued*

Before measurement on QUALICHECK+ control solution
(continued)

Step	Action
3.	 <p>Place the ampoule in the ampoule opener and break off the ampoule neck.</p>
4.	 <p>Place the ampoule fully into the H700 Adapter.</p>

Before manual measurement on AutoCheck control solution

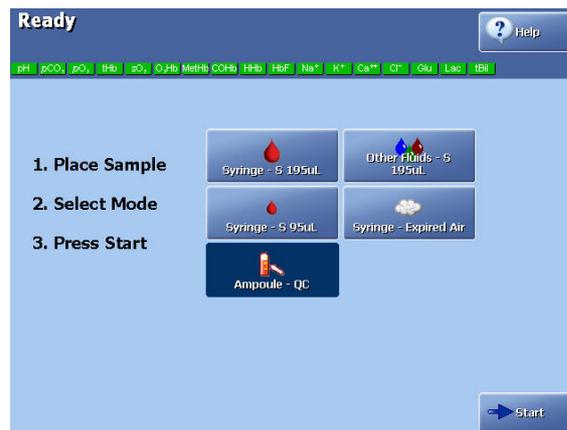
Do the following:

Step	Action
1.	Place the ampoule in the H705 Ampoule Holder.
2.	Holding the ampoule in its holder between two fingers, shake it vigorously for at least 15 seconds.
3.	Place the H700 Ampoule Adapter over the ampoule and press it down to open the ampoule.

Manual quality control measurement

Procedure To make a manual measurement on a QUALICHECK+ or AutoCheck control solution, do the following:

- | Step | Action |
|------|--|
| 1. | Open the syringe inlet flap. |
| 2. | Place the adapter tip up into the syringe inlet. |
| 3. | Press <i>Ampoule-QC</i> to select the measuring program. |



- Press *Start*.
The sample is aspirated and the **Quality Control Identification** screen appears. Refer to the next section, for information on entering data.
- When prompted by the analyzer, remove the adapter and close the syringe inlet flap.
- Dispose of the used ampoules as infectious waste*.

* **Reference:** Clinical laboratory waste management. CLSI document GP5-A2.

AutoCheck measurement



Scheduled AutoCheck measurement

A scheduled AutoCheck measurement will start on time provided that no calibrations are pending. A pending calibration will be performed before the scheduled AutoCheck measurement.

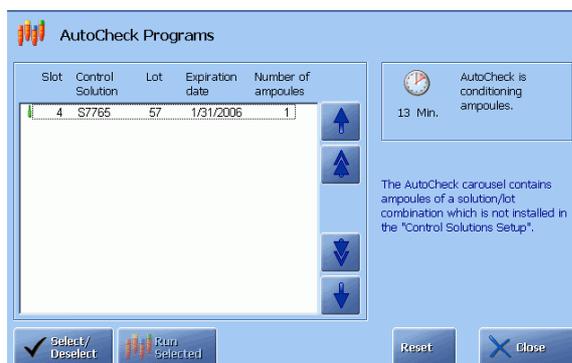
On the screen that appears when an AutoCheck measurement is about to run (scheduled either from QC Schedule or from RADIANCE), select one of the three possibilities:

- **No action taken:** the AutoCheck measurement starts after 20 seconds (see counter on the screen)
- **Proceed** pressed: the AutoCheck measurement starts immediately.
- **Postpone** pressed: the AutoCheck measurement will be delayed by 5 minutes.

Unscheduled AutoCheck measurement

To start an unscheduled AutoCheck measurement, do the following:

- | Step | Action |
|------|---|
| 1. | Press the Menu - Start Programs - AutoCheck Programs buttons. |
| 2. | Highlight the desired level and press Select/Deselect to mark/unmark level(s). |



3. Press **Run Selected** to start a measurement on the selected control solution(s).
4. Press the **Reset** button to do the following:
 - Cancel pending manual measurements on quality control solutions that were ordered from e.g. RADIANCE.
 - Stop conditioning of the ampoules, if underway, in the carousel.
 - Reset wet section programs.

NOTE:

It is only possible to choose ampoules that are packed in the carousel.

The control solutions must be defined in the QC Solutions - see section Quality control setup in chapter 3 of this manual.

Quality control identification

Entering Information with barcode reader

To enter the information with the barcode reader, do the following:

- | Step | Action |
|------|---|
| 1. | Activate "Enable General Barcode Support" check button in the Miscellaneous Setup, if not already done. |
| 2. | Scan "Operator" from your ID-card. |



If the name is included in the list of the analyzer's registered users, the barcode will identify the person and fill in the name automatically.

If name is not included in the list of the analyzer's registered users, the barcode will be read directly from the ID-card.

Entering information manually

To enter information manually, do the following:

- | Step | Action |
|------|---|
| 1. | <p>Highlight the item to be edited using the arrow buttons.</p> <p>Solution Entered automatically if only one quality control system is used. Otherwise highlight desired option from screen and confirm with Enter.</p> <p>If the same type of QUALICHECK+/AutoCheck+ solution is used, then only the solution type will be identified. Choose the specific slot from the screen.</p> <p>Lot Entered automatically if only one lot for each solution is used.</p> <p>Or highlight desired item on screen and confirm with Enter.</p> |
| 2. | <p>Enter the ambient temperature (default: 25 °C/77 °F) on the keypad and confirm with Enter.</p> <p>Mandatory entry is indicated by a .</p> |

Continued on next page

Quality control identification, *Continued*

Entering information manually (*continued*)

Step	Action
3.	Enter "Department" on the keypad and confirm with <i>Enter</i> .
4.	Enter "Operator" on the keypad or keyboard and confirm with ENTER (filled in automatically when operator is logged on).

Electrode Updatings

To display the electrode updatings during measurement, press the *Electrode Upd.* button.

Quality control result

Quality Control Result screen In most cases the **Quality Control Result** screen will be displayed automatically when the measurement has been completed. However, if the quality control identification took longer time to enter than the measurement, you can:

Press **Result** from on the **Quality Control Identification** screen;
 from the **Menu > Analyzer status > Quality Control**;
 from the Quality Control log.

Quality Control Result			
Slot: 1	57735	Lot #: 70	QC# 1
		5/18/2004 01:22 PM	
Blood Gas Values		Electrolyte Values	
pH	7.103 [7.076 - 7.116]	cK ⁺	1.9 mmol/L [1.6 - 2.2]
pCO ₂	65.4 mmHg [61.1 - 71.1]	cNa ⁺	154 mmol/L [153 - 161]
pO ₂	143 mmHg [136 - 156]	cCa ²⁺	1.06 mmol/L [0.93 - 1.13]
Oximetry Values		Metabolite Values	
ctHb	7.8 g/dL [7.3 - 8.3]	cGlu	2.2 mmol/L [1.7 - 2.7]
sO ₂	50.0 % [49.0 - 51.0]	cLac	4.2 mmol/L [3.7 - 4.9]
FO ₂ Hb	44.5 % [43.5 - 45.5]	ctBil	180 μmol/L [169 - 193]
FCOHb	6.1 % [4.6 - 7.6]		
FMetHb	5.0 % [4.0 - 6.0]		
FMetF	27 % [11 - 41]		

The measured values are compared to the defined control range, measuring range and statistics range, then given a status mark accordingly.

NOTE: The user-defined corrections (slope and offset) do not influence the quality control results, unless the "Apply parameter corrections to QC" function has been activated in the Miscellaneous Setup.

Parameter status The absence of any markings next to a parameter indicates that a parameter was measured without any fault.

The following markings may appear next to a parameter:

Marking	Explanation
?	Error in the previous calibration, or analyzer malfunction.
W	A violated Westgard Rule.
↑ ↓	Parameter value outside the control range, but inside the statistics range. Only the values within the statistics range are considered accepted and are included in the quality control statistics.
↑ ↓	Parameter value outside the statistics range and is not included into statistics
↑ ↓	Parameter value outside the measuring range. Measurement is not included into statistics.

Continued on next page

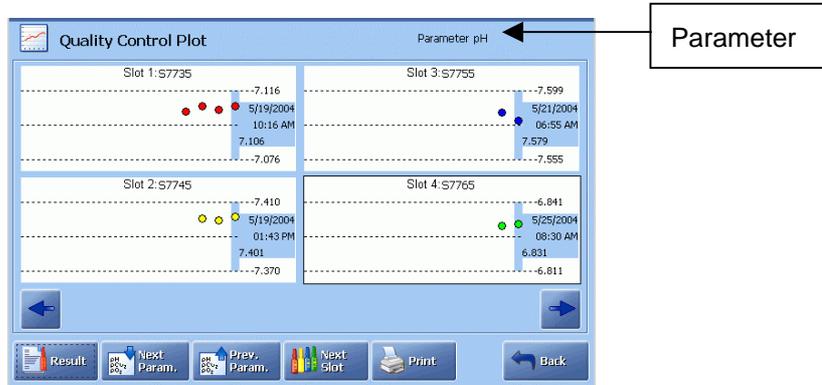
Quality control result, *Continued*

Parameter status (<i>continued</i>)	Marking	Explanation
	“*”	Parameter values with user-defined corrections - see <i>Parameters and Input, Chapter 3</i> for details.
	“....”	Parameter value could not be calculated, most likely due to a system error or malfunction. These values for the most part will be accompanied with a “?”. To obtain a possible explanation, press the Message button.
Unknown solutions		Quality control on a solution identified as unknown are not compared to any previous measurements or statistics, and therefore do not receive a status marking. The parameter results for unknown levels cannot be plotted and are not included into any statistical data unless later changed to a defined slot.
Temperature corrections		<ul style="list-style-type: none"> • For control solutions from Radiometer temperature corrections are made automatically by using the typed in temperature. • For non-Radiometer control solutions, temperature corrections must be made manually. Refer to manufacturer’s literature for procedure.
Reference		For a detailed explanation of the evaluation of results, refer to <i>Chapter 6</i> of the <i>Quality Control Systems Reference Manual</i> .
Recalling quality control identification		<p>To change data that can be edited (non-grey lettered) on the screen, press QC ID. For detailed information refer to previous section <i>Quality Control Identification</i> in this chapter.</p> <p>NOTES:</p> <ul style="list-style-type: none"> • <i>Changing the temperature will initiate recalculation of the last result. It will be substituted by the recalculated result, and the statistics will also be recalculated. In case the temperature is mandatory, the result cannot be viewed until it is entered.</i> • <i>Exiting the QC ID screen without entering a temperature, the previous temperature will be recalled.</i>

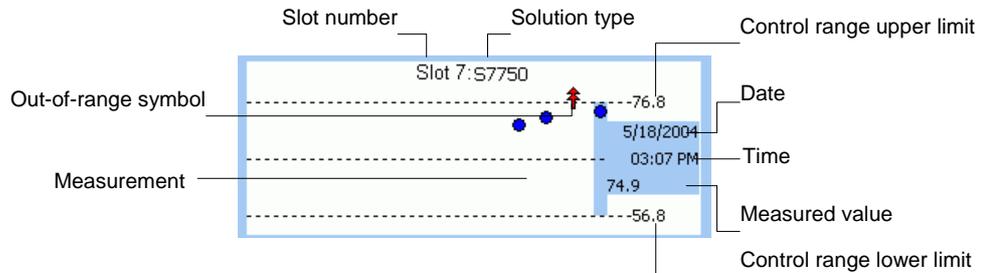
Continued on next page

Quality control result, *Continued*

Quality control plot The **Quality Control Plot** screen appears once the **Plot** button is pressed.



The following diagram shows the details of a typical plot.



Plot element	Function
Shaded block	Date, time and measured value for the highlighted measurement. Use the arrow buttons to scroll the plot and view other measurements.
Control range limits	Show the upper and the lower limits of the control range for the highlighted measurement.
Dots	Show the number of measurements for the selected parameter. To view a measurement result, highlight a dot on the screen and press Result .
Out-of-range symbols	<p>↑ ↓ Measurement outside the control range and inside the statistical range.</p> <p>↑↑ ↓↓ Measurement outside both the control and statistical ranges</p>

Use the following buttons to do the following:

- Next Param.** Display the quality control plots for the requested parameter.
- Prev Param.** Display the quality control plots for the requested parameter.
- Next Slot** Display plots of the next control solution slot.

Continued on next page

Quality control result, *Continued*

Quality control plot (<i>continued</i>)	<i>Result</i>	View quality control result for the highlighted measurement of the highlighted plot.
	<i>Print</i>	Print out the plot.
	<i>Back</i>	Return to the previous screen.

Quality control result messages

Quality control result messages To see the quality control result and check the messages, do the following:

Step	Action
1.	Press <i>Menu - Analyzer Status - Quality Control</i> .
2.	Highlight the desired quality control measurement and press <i>Result</i> .
2.	Press <i>Messages</i> to see the messages in connection with the given quality control result. The erring parameter(s) and the message(s) with number(s) referring to the message are described in <i>Troubleshooting Messages</i> , chapter 15.
3.	Troubleshoot, if required, by highlighting the message (the first message is already highlighted) and pressing <i>Troubleshoot</i> . Follow instructions on the screen to remedy the error. Use Tutorials for assistance. When it is done, press <i>Troubleshooting completed</i> .
4.	Press <i>Back</i> to return to the list of messages screen. Press <i>Print</i> to print out the list of messages. Press <i>Note</i> to display the keyboard, type the note and confirm with enter. If Notes for quality control result were entered in User-defined Notes program (see chapter 3: <i>Installation and Setup</i>), select a Note from the list with the up/down arrow buttons. To edit a note use <i>Edit Note</i> . To delete a note use <i>Delete Note</i> .
5.	Press <i>Back</i> to close the Note popup window. Press <i>Back</i> to return to the Quality Control Result screen.

AutoCheck status See *Refilling the AutoCheck Carousel* in chapter 7: *Replacements*.

6. Calibration

Overview

Introduction This chapter describes the available calibration programs and the calibration results.

A short glossary of terms used in the chapter is also given.

Contents This chapter contains the following topics.

General information	6-2
Unscheduled calibrations	6-4
Interrupted, pending or expired calibrations	6-5
tHb Calibration.....	6-6
Calibration result.....	6-8
Caibration result messages.....	6-10

General information

Purpose The calibration process determines and checks the accuracy with which the analyzer measures its parameters. The process is therefore important in ensuring the reliability of results.

Calibrations are performed using solutions and gases of known concentration, for each of the measured parameters.

Calibration programs The following calibrations performed on the analyzer are briefly described below. (For detailed explanation please refer to the *Reference Manual, chapters 1,2,3.*)

Calibration	Description
1-point	Measures each parameter on one solution and/or gas of known composition, giving one value per parameter. Relates the measured values to the theoretical values for a solution and/or gas of the same composition. Gives the Drift 1 and status values of the electrode.
2-point	Measures each parameter on two different solutions and/or gases both of known composition, giving two values per parameter. Relates the measured values to the theoretical values for solutions and/or gases of the same composition. Gives the Drift 1, Drift 2 values and the status, sensitivity of the electrode.
1-point gas (the USA only)	Measures $p\text{CO}_2$ and $p\text{O}_2$ on one gas mixture of known composition, giving one value per parameter. Relates the measured values to the theoretical values for the gas mixture of the same composition. Gives the Drift 1 of the electrodes.
tHb	Calibrates the spectrophotometer. See <i>tHb Calibration</i> in this chapter.

Calibrations performed automatically at specific intervals selected in the Calibration Schedule setup (see *Calibration Setup* in *Chapter 3*) are called **scheduled** calibrations.

All calibration results are automatically recorded into the Calibration Log from which they can be viewed and printed. Refer to *Chapter 9: Data Management* for details.

Calibration process and a detailed explanation of the terms are described in the *Reference Manual*.

Continued on next page

General information, *Continued*

NOTE: *Additional 1-point calibrations are performed on the analyzers with the metabolite electrodes:*

- *after 11 measurements made one after another, and*
- *30 minutes after the last measurement was made.*

The additional 1-point calibration does not change the intervals selected for the scheduled calibrations.

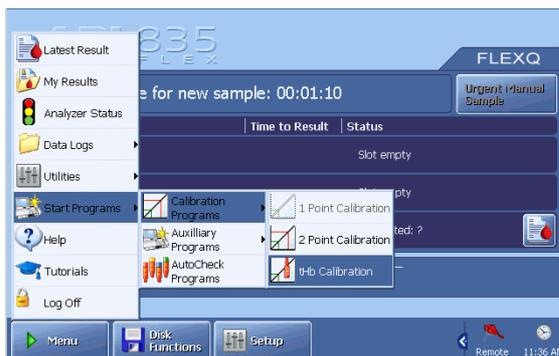
In cases when a scheduled 2-point calibration is imminent, the additional 1-point calibration will be substituted with the 2-point calibration.

Unscheduled calibrations

Calling an unscheduled calibration

Calibrations called by the operator at any time are called **unscheduled** calibrations. To call an unscheduled calibration, do the following:

- | Step | Action |
|------|---|
| 1. | Check that the analyzer is in the Ready mode. |
| 2. | Press <i>Menu</i> → <i>Start Programs</i> → <i>Calibration Programs</i> . |



Call a calibration.

If a button is grayed out, a calibration cannot be called (as 1-point calibration on the screen).

- | | |
|----|--|
| 3. | To see the electrode updatings during a calibration, go to the Analyzer Status screen and press the <i>Electrode Upd.</i> button. |
|----|--|

Calibrations during 24 hours after Restart

The 24-hour calibration period is only necessary after the replacement of electrodes and/or electrode membranes.

The calibration intervals for the first 24 hours after Restart are as follows:

Time After Restart	Calibration Intervals	
First 4 hours	1-point calibration	Every 30 minutes
	2-point calibration	Every hour
Remaining 20 hours	1-point calibration	Every hour
	2-point calibration	Every 4 hours

NOTE: If the calibration schedule is set up to perform calibrations at intervals less frequent than those programmed for the 24-hour calibration period, the calibration schedule is overridden.

Interrupted, pending or expired calibrations

Interrupted calibrations

A calibration is interrupted when the operator presses the *Stop* button during the calibration process. The analyzer performs a rinse before returning to the Ready mode.

If the interrupted calibration was a scheduled calibration, it will be automatically performed after the analyzer has been in the Ready mode for 3 minutes without any activity, i.e. measurements. The scheduled calibration becomes pending if interrupted.

Pending calibrations

A calibration is pending when a **scheduled** calibration cannot be performed at its scheduled time because the analyzer is occupied with another function, e.g., measurement.

A pending calibration is indicated by a clock symbol next to it on the **Analyzer Status - Calibrations** screen as a warning.

A pending calibration will be performed 3 minutes after the analyzer has returned to the Ready mode without any activity. If more than one type of calibrations are pending, the highest priority calibration is performed. The calibrations are given in descending order of priority, the 2-point calibration having the highest priority.

If a calibration is pending, a scheduled AutoCheck measurement will be postponed until after the calibration is performed.

Expired calibrations

A full calibration means that all parameters are calibrated. Normally, a full calibration is a 2-point calibration, but in the case of glucose and lactate electrodes it is a 1-point calibration.

A calibration is expired and considered to be invalid when:

- An electrode or electrode membrane is replaced.
- The time interval since last accepted full calibration exceeds the time interval between two full calibrations **plus** a 1-point calibration.

Under these conditions a “Cal expired (parameter)” message appears in the Activity and System Messages logs, and the replaced item is also recorded in the Activity log.

An expired calibration can be remedied by performing a successful full calibration after a replacement.

tHb calibration

Purpose The calibration is used to calibrate the analyzer's spectrometer and is performed once every 3 months on S7770 tHb Calibrating Solution. The calibration can be included in the Calibration Schedule.

Preparation

- It is recommended to perform the **Protein Removal Program** before a tHb calibration in order to remove protein deposits - see *Protein Removal Program, Chapter 7*.
- Check that the analyzer is in the Ready mode.
- Prepare an ampoule of S7770 Calibrating Solution, an H700 Ampoule Adapter and an ampoule opener.

Performing a tHb calibration To perform a tHb calibration, do the following.

Step	Action
1.	Perform Cal 1 or Cal 2, if not done after the Protein Removal.
2.	Press the Menu - Start Programs - Calibration Programs - tHb Calibration . Enter the barcode from the tHb Calibration Solution insert, using the barcode reader or the keyboard. To cancel the program, press Close .
3.	When the barcode is accepted, the following screen appears. Requirements 1-3 should be fulfilled before you press Start .
4.	Tap the top of the tHb Calibration Solution ampoule to collect the liquid at the bottom and break off the ampoule neck, using the ampoule opener.
5.	Put the ampoule in the H700 Adapter.
6.	Open the syringe inlet flap and place the adapter tip into the inlet.
7.	Press Start to aspirate the calibrating solution.
8.	When prompted by the analyzer, remove the adapter and close the syringe inlet flap. Do not discard the S7770 ampoule, as it will be used for the tHb Calibration verification. After the measurement a rinse is performed and then the analyzer returns to the Ready mode.
9.	If the calibration results are accepted, perform the tHb Calibration Check immediately - see below. Otherwise remedy the error and perform a new tHb calibration.

Continued on next page

tHb calibration, *Continued*

tHb calibration check To verify the validity of the tHb calibration, do the following.

Step	Action
1.	Open the syringe inlet flap and place the adapter with the S7770 solution in the inlet.
2.	Select the mode: Syringe - S195 µL or Syringe - S85 µL depending on the ABL800 FLEX version.
3.	Press the Start button. Remove the ampoule when prompted and close the inlet.
4a.	If the calibration check value* is within the insert limits, the tHb calibration is accepted.
4b.	If the calibration check value* is outside the insert limits, repeat the tHb calibration and then the calibration check immediately after it. If the second tHb calibration and the calibration check fail again, contact a service technician.

* Can be ctHb, or ctHb and ctBil.

NOTE: *If the tHb calibration check has not been performed immediately after the tHb calibration, repeat the calibration and the calibration check immediately after it.*

Calibration result

Viewing a calibration result

The result can be viewed as soon as the calibration is completed. Results from the most recent calibrations can be viewed via the **Analyzer Status - Calibration** screen or via the Calibration Log.

To recall the result, highlight the desired calibration and press the **Result** button to display the **Calibration Result** screen.

Calibration Result					
Type: 2 point calibration		Cal # 108		5/19/2004 08:00 AM	
pH	7.395	Drift	0.000	Status	7.553
	6.871	Drift	0.002	Sens.	98.8 %
pCO ₂	40.0 mmHg	Drift	-0.2	Status	88.8 mmHg
	80.0 mmHg	Drift	0.1	Sens.	88.5 %
pO ₂	140.7 mmHg	Drift	-1.4	Sens.	14.2 pA/mmHg
	0.1 mmHg	Drift	-0.1	Zero	1.1 mmHg
cK ⁺	4.1 mmol/L	Drift	-0.0	Status	0.9 mmol/L
	39.8 mmol/L	Drift	-0.1	Sens.	94.4 %
cNa ⁺	146 mmol/L	Drift	-0	Status	21 mmol/L
	20 mmol/L	Drift	-0	Sens.	93.2 %

Press button:



To display the remainder of the calibration result.

Messages

To display interpretation of any detected errors.

Print

To print out the result.

(Send)

To send the result to a connected LIS/HIS system.

1- or 2-point calibration results

The calibration data is grouped together by parameter:

Bold characters Indicate data updated during this calibration.

Grey characters Indicate data taken from the previous calibration and not included in this calibration.

"?" Indicates an error or the value outside the recommended range, such as:

Drift value = outside the drift tolerances - see *Calibration Setup* in *Chapter 3*.

Status = outside the default limits.

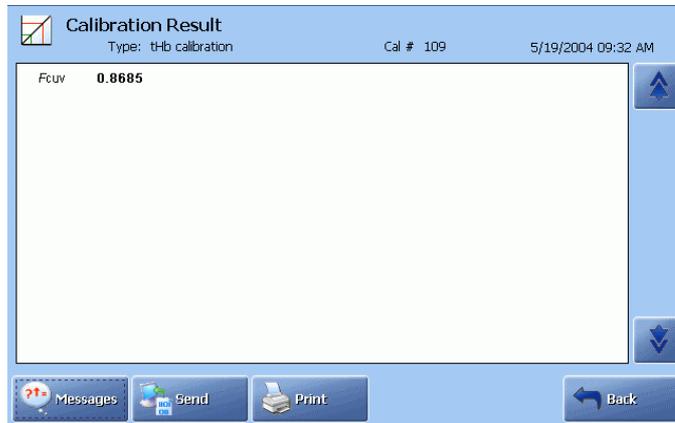
Sensitivity = outside the default limits.

"....." Indicates the value could not be calculated, most likely due to a system error or malfunction. These values for the most part will be accompanied with a "?". Press the **Messages** button for the explanation of error.

Continued on next page

Calibration result, *Continued*

tHb calibration result An example of a successfully performed tHb calibration is shown below:



F_{CUV} is a factor which expresses the ratio of the effective light path of the analyzer cuvette to that of a reference cuvette determined by Radiometer.

The value should be between 0.80-1.20 and have no errors, i.e. no "?" in it.

Calibration result messages

Access to the screen Press the *Messages* button on the **Calibration Result** screen to display the **Calibration Result Messages** screen.

The following buttons are available:

<i>Result</i>	To return to the Calibration Result screen.
<i>Troubleshoot</i>	To display the interpretation and operator actions – see <i>Troubleshooting Messages</i> , chapter 11.
<i>Note</i>	A Note can be selected from a list of Notes (made in the User-defined Notes program), typed by pressing the keyboard icon, edited by pressing the <i>Edit Note</i> button, or deleted by pressing the <i>Delete Note</i> button.
<i>Print</i>	To print out the messages.
<i>Back</i>	To return to the previous screen.

Message levels The message levels can be considered as a type of filter in which the messages displayed are based on the following:

Level	Explanation
User	Messages for the user familiar with the basic daily operation of the analyzer and primarily responsible for performing measurements. The fewest messages are displayed under this level.
Manager	Messages for the user with deeper understanding the analyzer functions and responsible for the analyzer's proper operation.
Service	Messages for the service technician with thorough knowledge of the operation and construction of the analyzer. This level displays the greatest number and most detailed messages.

7. Replacements

Overview

Introduction This chapter describes the replacement procedures that ensure proper functioning of your analyzer.

Remember to perform Decontamination before replacing the parts that were in direct contact with blood.

Contents This chapter contains the following topics.

General information	7-2
Replacing membranes or electrodes.....	7-6
Replacing pump tubes.....	7-8
Replacing inlet gasket and inlet probe	7-11
Replacing waste container, fan filter, printer paper	7-13
Replacing solutions and gases.....	7-15
Refilling the AutoCheck carousel	7-17
Automatic auxiliary programs.....	7-18
Decontamination and Protein removal programs.....	7-19
Cleaning additive	7-21
Cleaning the analyzer.....	7-22

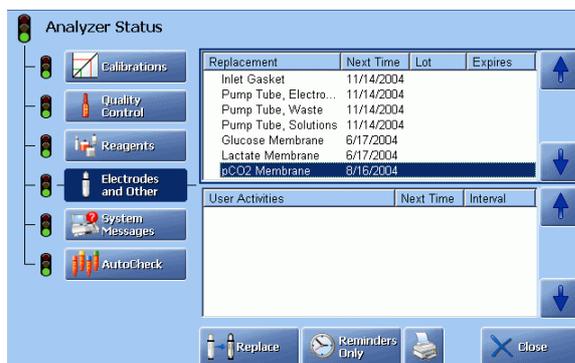
General information

Viewing replacement requirements

To view the replacements that are due, do the following:

Step	Action
------	--------

1. Check the following on the **Analyzer Status** screen:



- Replacement schedule for the electrode membranes and the electrodes
 - Messages referring to the membranes/electrodes or user activities
 - Traffic light color (GREEN = No replacements are due at the present time; YELLOW = A replacement is due)
2. Highlight the item to enter the screen for replacements of electrodes/membranes – see the next page.
 3. Press **Log Activity** to enter the User Activity program to view user activities list – see *chapter 3* in this manual.
 4. Press **Close** to exit to the **Ready** screen.

Entering the Hold mode

The Hold mode ensures that all wet section activities are suspended and that the proper restart sequence will follow the exit from the Hold mode.

To enter the Hold mode, do one of the following:

- Go to **Menu > Analyzer Status > Electrodes and Other**. Press **Replace**.
- Remove the cover to the measuring modules.
- Open the window to the electrode module and wait for draining to complete.
- Remove both inlet flaps.
- Remove a solution container.

Continued on next page

General information, *Continued*

Recording replacements in Hold mode

To record replacements in the Hold mode, do the following:

- | Step | Action |
|------|--|
| 1. | Enter the Hold mode as described earlier. |
| 2. | Remove the component to be replaced according to the recommended procedure. |
| 3. | Preferably scan the barcode of the new item before mounting it in the analyzer. Otherwise highlight the item in the list and press Replaced in order to have it appear in “Recorded replacements” box on the right of the screen. |
| 4. | Repeat step 2 for another replacement in the similar manner. |



To remove an item from the list of recorded replacements, highlight it (with the up/down arrow buttons) and press **Undo**.

- If desired, enter the operator initials and a note for the Activity Log by pressing the keyboard icon in the “Operator:” box (or the keyboard) in the “Note:” box.
 - Select a Note from the list with the up/down arrow buttons.
 - Edit, if desired, a highlighted Note by pressing **Edit** and displaying the keyboard. Remember to confirm a change with **Enter**.
 - Delete, if desired, a highlighted Note by pressing **Delete Note**.
- When all replacement actions are completed, mount all components and the covers, and close the inlets.
- Press **Restart** to begin the proper restart sequence.

Continued on next page

General information, *Continued*

Entering Fluid Replacements mode

The Fluid Replacements mode ensures that the proper restart sequence is will follow the exit from this mode.

To enter the Fluid Replacements mode, do the following:

Step	Action
------	--------

1. Go to *Menu > Analyzer Status > Reagents*.



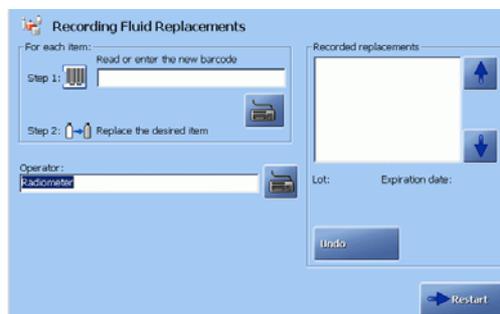
2. Check the following:
 - Solution levels and gas cylinders (press *Adjust Level* to see the screen)
 - Messages referring to the solutions or gas cylinders
 - Traffic light color (GREEN = No replacements are due at the present time; YELLOW = A replacement is due)
3. Press *Close* to exit to the **Ready** screen.

Recording replacements in the Fluid Replacements mode

To record replacements in the Fluid Replacement mode, do the following:

Step	Action
------	--------

1. Press the *Replace* button on the Analyzer Status screen.



(Removing a solution container is equivalent to pressing *Replace*).

2. Remove the component to be replaced according to recommended procedure.

Continued on next page

General information, *Continued*

Recording replacements in the Fluid Replacements mode (*continued*)

Step	Action
3.	Scan the barcode on a new component, or press the keyboard icon in the "For each item" box, type in the barcode and confirm with ENTER. The replaced items appear in the "Recorded replacements" box as soon as the code has been scanned or typed.
4.	Install a new component according to recommended procedure.
5.	Repeat steps 1-4 for another replacement in a similar manner.
6.	To remove an item from the recorded replacements list, highlight it with the up/down arrow buttons in the box and press Undo .
7.	If desired, enter the operator initials and a note for the Activity log as described in <i>Recording Replacements in Hold mode</i> above.

Restart after replacements

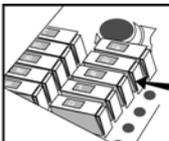
After the **Restart** button has been pressed, the analyzer performs a restart sequence, depending on the replaced item.

After electrode and electrode membrane replacements, calibrations are performed more frequently during the first 24 hours – see *Unscheduled Calibrations* in *chapter 6* of this manual.

Replacing membranes or electrodes

Removing an electrode from measuring chamber

To remove an electrode from the measuring chamber, do the following:

Step	Action
1.	Enter the Hold mode and record the replacement action.
2.	 Press the electrode connector latch, and lift the electrode connector open and lift the electrode out of the measuring chamber.

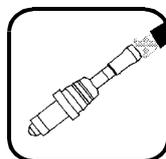
Remembraning an electrode

To remembrane an electrode, do the following:

Step	Action
1.	 Remove the electrode jacket by pressing the tabs on the sides and pulling.

Reference electrode:

Remove the electrode jacket by pulling it off. If the O-ring remains on the electrode, remove it. If the electrode is stuck in its jacket due to salt crystals around the top of the jacket, soak it in water until the crystals dissolve.



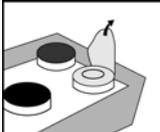
pO₂ electrode:

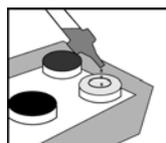
Brush the electrode tip with the supplied brush.

2. Rinse the electrode with tap water and shake to remove excess drops of water. *Do not dry the electrode.*

K, Cl, Ca, Na and reference electrodes:

Remove any salt deposits, using tap water.

3.  Remove the protective foil of a sealed electrode jacket in the Membrane box.



Glucose or Lactate electrode:

Open a capsule of the electrolyte solution supplied and empty it into the electrode jacket.

Continued on next page

Replacing membranes or electrodes, *Continued*

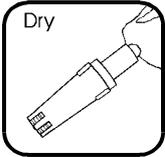
Remembraning an electrode (*continued*)

- | Step | Action |
|------|--|
| 4. | Press the electrode firmly into the jacket until a click is heard.

<u>Reference electrode:</u>
Check that the old O-ring has been removed and press the electrode through the protective film covering the electrode jacket.

WARNING/CAUTION: <i>Irritating to eyes, respiratory system and skin. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</i> |
| 5. | Remove the membraned electrode from the Membrane box.

<u>Reference electrode:</u>
Rinse the electrode with tap water and dry with a lint-free tissue.

<u>pCO₂ and pO₂ electrodes:</u>
Remove any air bubbles trapped between the electrode tip and the membrane by pressing the tabs on the electrode jacket and moving the electrode up and down slightly in the electrolyte until the bubble disappears. |
| 6. |  Dry the electrode contact. |
| 7. | Place the electrode into the measuring chamber and close the electrode connector, pushing on its top until it clicks shut. |
| 8. | If no more replacement actions are to be made, mount all covers and parts, and press Restart . |

Replacing an electrode

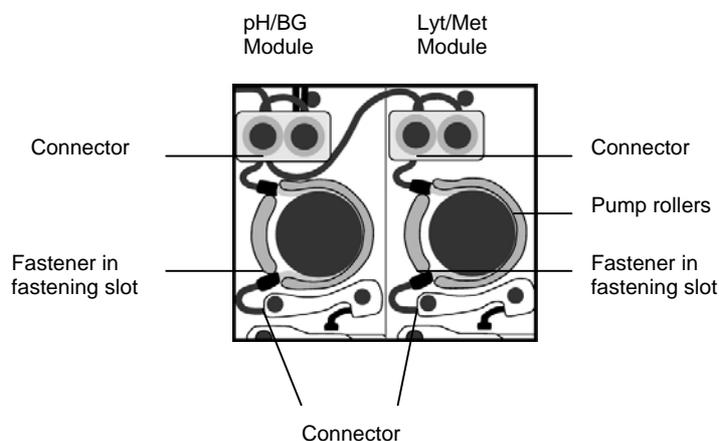
To replace an electrode, do the following:

- | Step | Action |
|------|--|
| 1. | Remove the old electrode from the measuring chamber. |
| 2. | <u>The new pH, pCO₂ and pO₂ electrodes only:</u>
Rinse the electrode under tap water. |
| 3. | Shake it to remove excess drops of water. Do not dry the electrode. |
| 4. | Membrane the electrode at once. |
| 5. | Dry the electrode contact and place the new electrode in the measuring chamber. |
| 6. | If no more replacement actions are to be made, mount all covers and parts, and press Restart . |

Replacing pump tubes

Replacing the electrode pump tubes

The following diagram identifies the parts of the electrode module pumps to aid you in performing the replacement procedure.



To replace an electrode module pump tube, do the following:

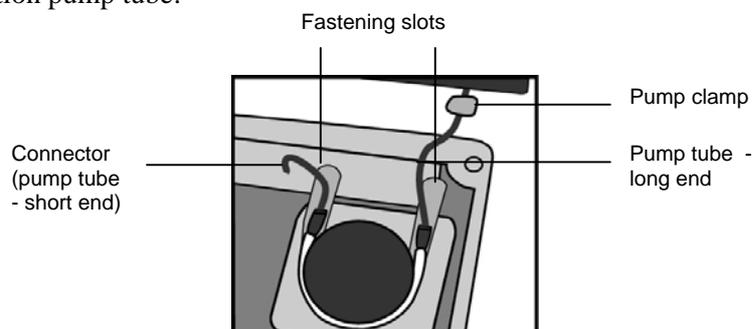
Step	Action
1.	Enter the Hold mode and record the replacement action.
2.	Disconnect the ends of the tube from connectors.
3.	Gripping one end of the tube, free the fastener from the fastening slot by pulling upward.
4.	Pull upward to free the remainder of the tube from around the pump rotor and the other fastening slot.
5.	Place a new pump tube around the pump rotor.
6.	Secure the upper fastener of end of the tube in the fastening slot.
7.	Gripping the other fastener, wrap the tube around the pump rotor, laying the tube along the top of the rollers. Secure the fastener in the other fastening slot.
8.	Press the Rotate Pumps button to turn the pump and seat the tube. This can also be done manually by turning the rotor a few rotations in the both directions. <i>NOTE: If seated correctly, the tube should begin to be drawn downwards onto the rollers. The tubing is correctly drawn onto the rollers by the pump rotation during restart.</i>
9.	Attach the ends of the tube to the connectors, pushing the tube onto the connector as far as possible.
10.	If no more actions are to be performed, remount all covers and restart the analyzer by pressing Restart .

Continued on next page

Replacing pump tubes, *Continued*

Replacing the solution pump tube

The solution pump tube:



To replace the solution pump tube, do the following:

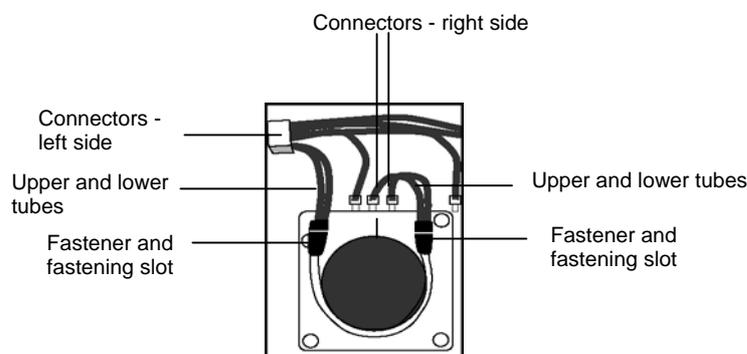
Step	Action
1.	Enter the Hold mode and record the replacement action.
2.	Remove the pump clamp and disconnect the ends of the old tube from the connectors.
3.	Gripping the end of the tube, free the right fastener from the fastening slot by first pulling outward and then lifting upward.
4.	Pull upward to free the remainder of the old tube from around the pump rotor and out of the other fastening slot.
5.	Secure the fastener of the left – short – end of the new tube in the fastening slot. The short end of the tube is to be on the left, the long end on the right. (Figure below illustrates installing the left side first).
6.	Gripping the longer fastener, wrap the new tube around the pump rotor, laying the tube along the top of the rollers. Secure the fastener in the other fastening slot.
7.	Press the Rotate Pumps button to turn the pump and seat the tube. This can also be done manually by turning the rotor a few rotations in both directions. <i>NOTE: If seated correctly, the tube should begin to be drawn downwards onto the rollers by the pump rotation during restart.</i>
8.	Attach the ends of the tube to the connectors, pushing the tube onto the connector as far as possible.
9.	Slide a new pump clamp (supplied with the pump tubes) over the right-side connector so that it is seated over the enlarged portion of the tube end, then clamp it shut.
10.	If no more actions are to be performed, remount all covers and restart the analyzer by pressing Restart .

Continued on next page

Replacing pump tubes, *Continued*

Replacing the waste pump tubes

When replacing the waste pump tubes, use the **yellow** tubes with black ends. These have a greater capacity than the other pump tubes, and leakage of fluid from the inlet due to a smaller capacity tube will be avoided.



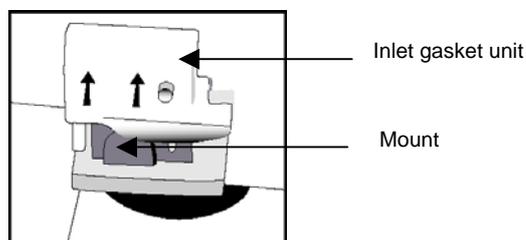
To replace the waste pump tubes, do the following:

Step	Action
1.	Enter the Hold mode and record the replacement action.
2.	Gripping the left end of the upper tube, free the fastener from the fastening slot by first pulling outward, then lifting upward. Pull upward to free the remainder of the tube from around the pump rotor, sliding the right fastener out of the fastening slot.
3.	Remove the lower tube in the same manner.
4.	Take the short end of one of the new yellow tubes and place the fastener into the lower right-side fastening slot. Gripping the other fastener, wrap the tube around the pump rotor, laying the tube along the top of the rollers. Secure the fastener in the lower left-side fastening slot.
5.	Press the Rotate Pumps button to turn the pumps and seat the tube. This can also be done manually by turning the rotor a few rotations in the counterclockwise direction. If seated correctly, the tube should begin to be drawn downwards onto the rollers by the pump rotation during restart.
6.	Connect the right end of the new tube to one of the right-side connectors and the left end of the tube to one of the left-side connectors. Ensure that tube ends are pressed completely onto the connectors.
7.	Repeat steps 4-6 with the other yellow tube except securing the tube fasteners in the upper fastening slots.
8.	If no more replacement actions are to be performed, remount all covers and restart the analyzer by pressing Restart .

Replacing inlet gasket unit and inlet probe

Replacing the inlet gasket unit

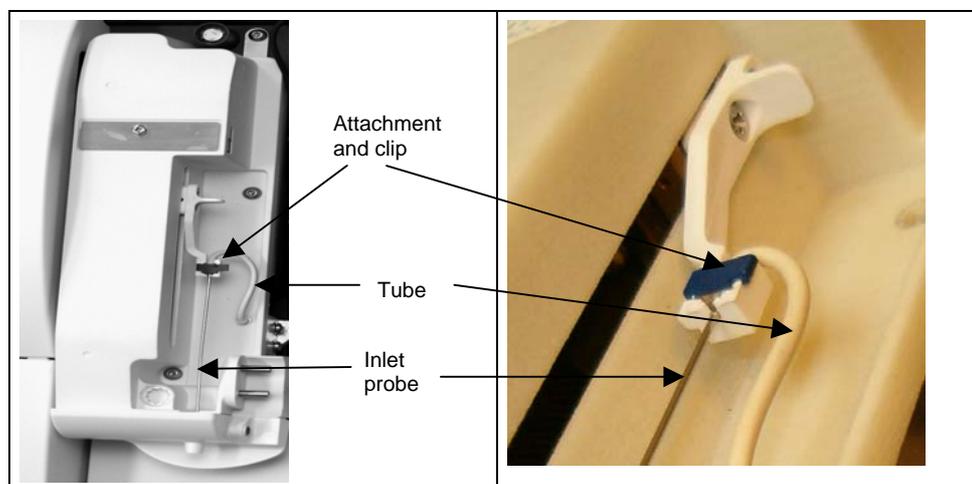
To replace the inlet gasket, do the following:



Step	Action
1.	Remove the capillary and then the syringe inlet flaps and record the action in the Hold mode.
2.	Remove the old inlet gasket unit by grabbing it on either side and lifting it upward.
3.	Slide the new inlet gasket unit onto the mount and press down the top of the unit to secure it in place. Mount the syringe inlet flap and then the capillary inlet flap.
4.	Press Restart .

Replacing the inlet probe

To replace the inlet probe, do the following:



Step	Action
1.	Remove the inlet flaps to enter the Hold mode.
2.	Remove the gasket unit - see <i>Replacing the inlet gasket unit</i> above.
3.	Lift the clip to open it.
4.	Lift the inlet probe out of the attachment.

Continued on next page

Replacing inlet gasket unit and inlet probe, *Continued*

Replacing the inlet probe (*continued*)

Step	Action
5.	Disconnect the tube from the inlet probe and the nipple on the inlet module.
6.	Connect the new tube to the nipple on the inlet module and to the new probe. Then insert the inlet probe with the tube into the groove of the attachment and seat it properly. Close the clip.
7.	Mount the inlet gasket unit and inlet flaps, then press <i>Restart</i> .

Replacing waste container, fan filter, printer paper

Replacing the waste container

To replace the waste container, do the following:

Step	Action
1.	Remove the existing container by gripping its sides and pulling it off the connector.
2.	Place a new waste container onto the connector. Use an empty rinse solution container as waste container. Prior to use, remove the rinse label to reveal the underlying waste label.
3.	Close the filled waste container with a cap immediately.

To monitor the volume of fluid in the waste container:

- look at the waste bottle in the *Analyzer Status – Reagents*.
- check the waste bottle under the analyzer's cover with the naked eye.

If the waste container is critically full, the analyzer will enter the Forced Standby mode.

If required by local authorities, a concentrated disinfectant can be added to the waste container before use or disposal. The final concentration of disinfectant in a filled container should be 20 % household bleach (1 % sodium hypochlorite), 10 % formalin (3.7 % formaldehyde), or 20 % glutaraldehyde*.

* **Reference:** Protection of laboratory workers from occupationally acquired infections; Approved Guideline – second edition. NCCLS document M29-A2. Wayne, Pa: NCCLS, 2001.

Replacing the fan filter

If the filter is noticeably dirty, replace it to avoid unnecessary heating of the analyzer. To replace the fan filter (at the rear of the analyzer), do the following:

Step	Action
1.	Remove the existing filter from the fan compartment.
2.	Place the new filter in position on top of the fan.

To have this replacement recorded, replace the fan filter in the Hold mode.

Replacing the printer paper

WARNING/ CAUTION: Avoid contact of paper with direct sunlight, water, high temperature and humidity, alcoholic and organic solvents, PVC-containing materials, freshly developed diazo copy sheets, extensive pressure and scratching. For storage, use folders and cases made of polyethylene, polypropylene, polyester, etc.

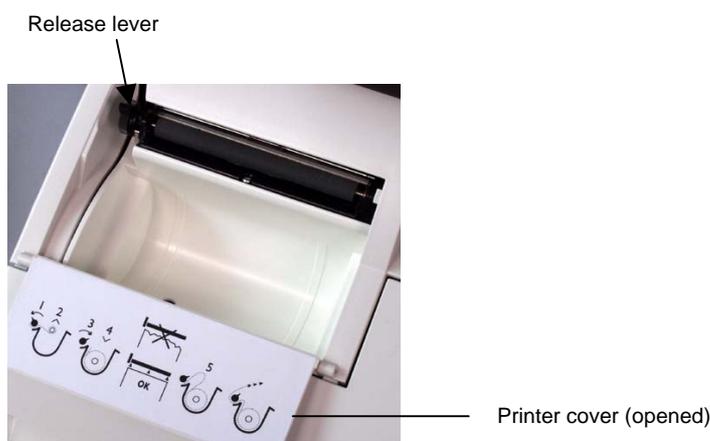
Prepare the new roll as follows:

Tear off and discard approximately the first 25 cm of paper and cut the leading edge of the paper straight.

Continued on next page

Replacing waste container, fan filter, printer paper, *Continued*

Replacing the printer paper (*continued*)



To replace the printer paper, do the following:

Step	Action
1.	Move the release lever fully back to the nearly horizontal position.
2.	Remove any leftover paper from the printer.
3.	Move the release lever forward.
4.	Make sure that the paper edge is cleanly cut. Place the new roll into position in the printer so that the paper unreels from underneath the roll. The thermal side of the paper is on the outside of the roll.
5.	Aligning the leading edge of paper straight, feed it behind the drive roller. The paper will feed through the printer automatically once the internal sensor detects the edge of the paper. Check that alignment is satisfactory. Realign as required.
6.	Close the printer cover, making sure the paper feeds out of the printer.

To realign the paper or to remove a paper jam, do the following:

Step	Action
1.	Place the release lever in the down position.
2.	Grip the paper edges close to the printer and gently pull the paper through the printer until alignment is satisfactory. Draw enough paper through the printer so that all damaged paper is removed.
3.	Place the release lever in the upright position.
4.	Close the printer cover making sure the paper feeds out of the printer through the provided slot.

Replacing solutions and gases

Preparing the Cleaning Solution

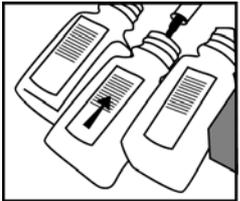
Before a new container with Cleaning Solution is mounted on the analyzer, it is necessary to add to it S5370 Cleaning Additive – see the procedure described in "Cleaning additive" further in this chapter.

Replacing solutions

To replace a solution container, do the following:

- | Step | Action |
|------|---|
| 1. | Remove the solution container by gripping its sides and pulling it off the connector.

The Recording Fluid Replacements screen is displayed. |
| 2. | Remove the cap from the new bottle. |
| 3. | Enter the barcode on the new solution container

<i>Always enter the barcode for each new solution container to provide precise concentration of the installed solution.</i> |
| 4. |  Place the new bottle in position label upward, and push it firmly and completely onto the connector. |
| 5. | Repeat steps 1-4 for the other solutions if required. |
| 6. | Press Restart to start the proper restarting sequence. |

Replacing gas cylinders

To replace a gas cylinder, do the following:

- | Step | Action |
|------|---|
| 1. | Press Replace on the Analyzer Status screen.

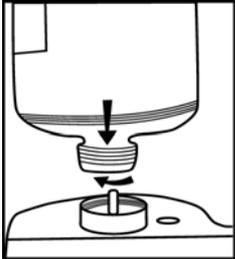
The Recording Fluid Replacements screen is displayed. |
| 2. | Remove the gas cylinder by turning it counter-clockwise until it becomes free.

WARNING/CAUTION: Before discarding an empty cylinder remove the safety valve using the Valve Key (code 922-509). |
| 3. | Remove the cap covering the valve on the new gas cylinder. Check that the valve is clear of any debris. |
| 4. | Enter the barcode on a new gas cylinder. |

Continued on next page

Replacing solutions and gases, *Continued*

Replacing gas cylinders (*continued*)

Step	Action
5.	 <p>Place the gas cylinder valve into position on the socket of the regulator. To ease alignment, use the analyzer enclosure as a guide.</p>
6.	<p>The replaced items appear in the “Recorded replacements” box as soon as the code has been scanned or typed.</p> <p>To remove an item from the recorded replacements list, highlight it with the up/down arrow buttons in the box and press Undo.</p>
7.	<p>Press Restart to start the proper restarting sequence.</p>

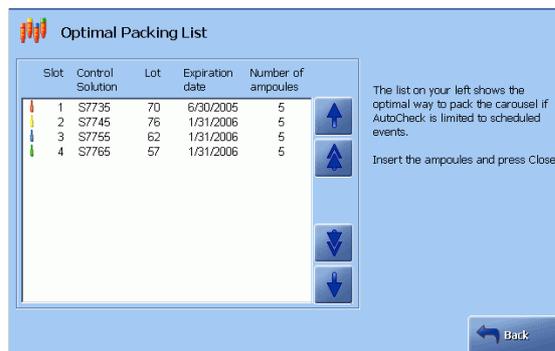
WARNING/CAUTION: *Pressurized container. Non-flammable compressed gas. Do not breathe gas. Gas mixtures containing less than 19.5 % oxygen may cause suffocation. Protect from sunlight and do not expose to temperatures exceeding 50 °C (122 °F). Store and use with adequate ventilation. Keep away from oil and grease. Do not refill.*

Refilling the AutoCheck carousel

Refilling AutoCheck carousel

To refill the AutoCheck carousel, do the following:

- | Step | Action |
|------|--|
| 1. | Open the retractable cover or go to the Analyzer Status screen and press AutoCheck - More - Open Module . |
| 2. | Remove the carousel. |
| 3. | Fill the carousel with the control solutions according to the Optimal Packing List screen (the packing list is based on the selected quality control schedule). |



- Place the packed carousel in the module and check that it sits properly in the module.

NOTE: Do not refill the carousel when it sits in the AutoCheck module as the analyzer would not register the action and will not scan the carousel contents.

- Close the cover either from the screen or on the module.

Messages after refilling AutoCheck carousel

After a packed carousel has been placed in the AutoCheck module and scanned, the following messages can be observed:

Message	Explanation
"AutoCheck Packing list confirmed"	Appears for 10 seconds in the status field if the carousel has been packed according to the list. This message can, however, be overwritten in case of an activity that updates the status field.
"Carousel packing not optimal"	Appears at the bottom of the status field if the carousel has not been packed according to the list.

If, however, you have exited the screen and, for example, started a sample measurement, no message will be displayed in the status field.

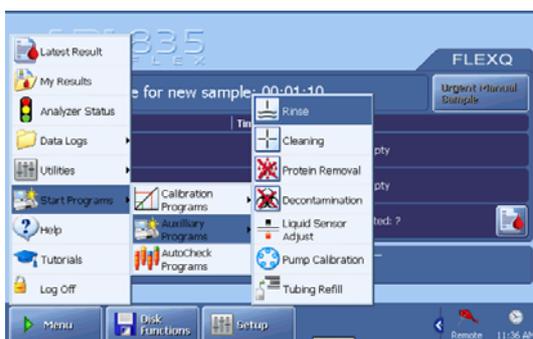
Automatic auxiliary programs

Purpose The following programs might be requested:

Program...	Is used...
Rinse	To remove traces of a sample, calibrating solution or a quality control solution from the liquid transport system.
Cleaning	To remove lipid deposits from the liquid transport system and the electrodes by using the Cleaning Solution. The program is followed by a rinse. To make Cleaning start automatically – see <i>Calibration in chapter 3</i> for details.
Tubing refill	To fill the liquid transport system with solution (is performed automatically during restart after replacement of any solution container).
Liquid sensor adjustment	To adjust the liquid sensors in the Wet Section.
Pump calibration	To calibrate the rotation of the analyzer's pumps (is performed automatically during restart after replacement of the pump tubes).

Starting a program To start one of the above programs, do the following:

- | Step | Action |
|------|--|
| 1. | Go to the Auxiliary programs menu: Menu - Start Programs - Auxiliary Programs . |



- | | |
|----|--------------------------------------|
| 2. | Press the button to start a program. |
|----|--------------------------------------|

Interrupting a program The following programs can be interrupted by pressing the **Stop** button:

- Cleaning
- Tubing refill
- Liquid sensor adjustment
- Pump calibration.

The Rinse Program, once started, cannot be interrupted.

Decontamination and Protein Removal programs

Decontamination program

The Decontamination Program disinfects the liquid transport system and items in direct contact with blood such as electrodes, pump tubing, etc. Therefore it should be run before the replacement of any items that come in direct contact with blood.

WARNING/CAUTION: Do not perform the Decontamination Program without first replacing the Cl, Glucose and Lactate electrodes with dummy electrodes, unless the membranes are to be replaced at this time. The Hypochlorite Solution used in decontamination will damage the membranes.

To perform Decontamination, do the following:

Step	Action
1.	Replace the Cl, Glucose, and Lactate electrodes with dummy electrodes, code 945-626.
2.	Fill a syringe with 0.5 mL of S5362 Hypochlorite Solution.
3.	Press Menu > Start Programs > Auxiliary Programs > Decontamination . (To cancel the program at this time, press Close .)
4.	Open the syringe inlet flap and place the syringe tip up to the inlet.
5.	Press Start to start aspiration of the solution and the program to begin.
6.	Remove the syringe and close the inlet flap as prompted on the screen.
7.	When the program is completed, the analyzer returns to the Ready screen.
8.	Replace the dummy electrodes with the Glucose, Lactate and Cl electrodes.
9.	Perform a 2-point calibration.

Protein Removal Program

The Protein Removal Program is a shorter version of the Decontamination Program and is used when required to clean the pH/BG and oximetry modules, pump tubings and the inlets. Replacement of the Glucose, Lactate and Cl electrodes with dummy electrodes is not required.

To perform Protein Removal, do the following:

Step	Action
1.	Fill a syringe with 0.5 mL of S5362 Hypochlorite Solution.
2.	Press Menu > Start Programs > Auxiliary Programs > Protein Removal . (To cancel the program at this time, press Close .)
3.	Open the syringe inlet flap and place the syringe tip up to the inlet.

Continued on next page

Decontamination and Protein Removal programs, *Continued*

Protein Removal Program (*continued*)

Step	Action
4.	Press Start to start aspiration of the solution and the program to begin.
5.	Remove the syringe and close the inlet flap as prompted on the screen.
6.	When program is completed, the analyzer returns to the Ready screen.

NOTE: *The program can be terminated at any time by pressing the **STOP** button.*

Cleaning Additive

Using Cleaning Additive To prevent repeating fluid transport error messages, it is recommended to add Cleaning Additive to Cleaning Solution. It is especially recommended to add the Cleaning Additive if the analyzed blood samples are from patients with increased risk of blood clotting due to medical treatment.

WARNING/CAUTION: *Very toxic by inhalation, in contact with skin and if swallowed. Danger of cumulative effects. May cause sensitisation by inhalation and skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. After contact with skin, wash immediately with plenty of water. Wear suitable protective clothing. In case of accident or if you feel unwell seek medical advice immediately (show the label if possible). The material and its container must be disposed of as hazardous waste.*

To add S5370 Cleaning Additive to Cleaning Solution, do the following:

Step	Action
1.	Remove the lid from the bottle with Cleaning Solution and pierce the foil with the adapter supplied with the Cleaning Additive.
2.	Fill a syringe with 5 mL Cleaning Solution. Mount a sterile needle on the syringe.
3.	Remove the plastic cover from the bottle with the Cleaning Additive.
4.	Pierce the rubber lid on the Cleaning Additive bottle. Due to under-pressure, the syringe will be emptied on its own.
5.	Turn the bottle upside down and refill the syringe with the dissolved additive.
6.	Remove the needle and place the adapter on the syringe tip.
7.	Inject the syringe contents into the bottle of Cleaning Solution. Move the plunger up and down a few times to remove all the additive from the syringe.
8.	Set the analyzer to perform Cleaning every eight hours.

Stability: The Cleaning Solution with the Cleaning Additive is stable for two months at room temperature.

Cleaning the analyzer

WARNING/ CAUTION:

The use of rubber gloves is recommended when cleaning the analyzer

Cleaning the measuring chambers

To clean the measuring chamber, do the following.

- | Step | Action |
|------|--|
| 1. | Lift the window to the measuring modules to enter the Hold mode automatically. |
| 2. | Remove the electrode from the measuring chamber. |
| 3. | Clean the measuring chamber using a cotton swab moistened in distilled water. Check that no cotton fibers are left in the chamber. |
| 4. | Clean the electrode contact with a dry tissue if dirty or wet. |
| 5. | Remount the electrode in the measuring chamber. |
| 6. | Remount cover and press Restart to restart the analyzer. |

Cleaning the inlet flaps and inlet gasket

To clean the syringe or capillary inlet, do the following.

- | Step | Action |
|------|--|
| 1. | Remove the capillary inlet flap by sliding it off to the right. |
| 2. | Remove the syringe inlet flap by sliding it to the right. |
| 3. | The analyzer is placed in the Hold mode after draining. |
| 4. | Remove the inlet gasket by pulling it vertically upwards. |
| 5. | Clean the flaps and inlet area as required. |
| 6. | Soak the inlet gasket in Deconex™ or a similar detergent. (Deconex is used in soaking baths and ultrasonic cleaning systems for cleaning laboratory utensils and precision components to remove moderate to most resilient contamination of organic nature.) |
| 7. | Slide the inlet gasket onto the inlet mount, the syringe inlet flap onto the mounting post, followed by the capillary inlet flap. Check that the inlet probe is in the correct position. |
| 8. | Ensure that both flaps are closed and press Restart to restart the analyzer. |

Cleaning the analyzer exterior

When cleaning the analyzer covers and outer case, use soapy water or a mild detergent.

Do not use abrasive cleansers or pads, ethanol-based substances or aggressive detergents.

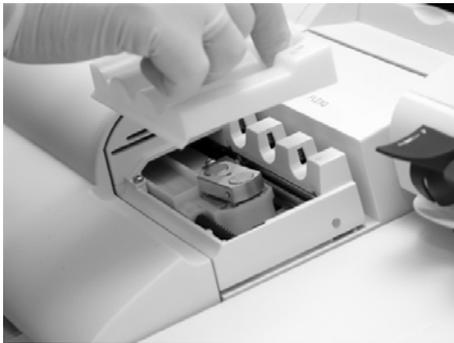
Continued on next page

Cleaning the analyzer, *Continued*

Cleaning the analyzer touch screen Use a dry or lightly dampened soft lint-free cloth to clean the analyzer's touch screen. Wipe the screen gently to remove fingerprints and/or dirt. To avoid streaking, an approved screen cleaner is recommended.

Cleaning the FLEXQ sampler tray cover Use a tissue lightly dampened in mild soapy water.
If you wish to clean the sampler tray cover separately, do the following:

Step	Action
1.	
2.	Use a tissue lightly dampened in mild soapy water to clean it.
3.	Remount the sampler tray cover



Carefully lift the empty sampler tray cover as shown.

Use a tissue lightly dampened in mild soapy water to clean it.

Remount the sampler tray cover

8. Disk Functions

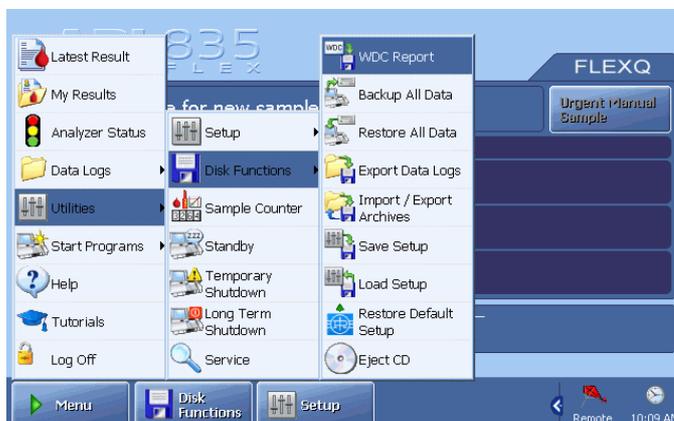
Overview

Introduction This chapter describes the disk functions available on your analyzer. The Disk Functions programs are a data management tool for storing and retrieving data logs, analyzer setup configurations, and other data and system files.

Contents	This chapter contains the following topics.	
	General information	8-2
	Creating a WDC report	8-4
	Backing up all data.....	8-6
	Restoring all data	8-8
	Exporting data logs	8-9
	Importing/exporting archives	8-11
	Saving setup	8-13
	Loading/restoring setup.....	8-14

General information

Disk Functions programs Press the following buttons to access the Disk Functions programs: **Menu - Utilities - Disk Functions**.



The following programs are available by pressing a corresponding button:

Button	Function
WDC Report	To make a Worldwide DATACHECK report.
Backup All Data	To make a backup of all data. Data is stored as a backup on a designated location.
Restore All Data	To restore a backup of all data files to the analyzer hard drive from a designated location.
Export Data Logs	To export selected records from selected data logs.
Import/Export Archives	To export or delete archived data logs. To import externally archived data logs.
Save Setup	To save the current setup of your analyzer.
Load Setup	To load a previously saved setup.
Restore Default Setup	To restore all or only some Radiometer default settings.
Eject CD	To eject a CD from the CD-drive. Similar buttons will be on the Source and Destination screens.

Continued on next page

General information, *Continued*

Definitions	<p>Setup data refers to information or files that configure the analyzer to operate according to settings entered through the Setup programs.</p> <p>All data refers to data contained in the analyzer's internal database, including but not limited to data logs, setup and system files.</p>
Data storage options	Information is stored on or retrieved from an internal hard disk, a network, CD-RW, CD-R/RW or a removable drive (USB mass storage device).
Disk handling rules	The CD-RW, CD-R/RW and a removable drive (USB mass storage device) should be handled according to the instructions printed on the packaging.

Creating a WDC report

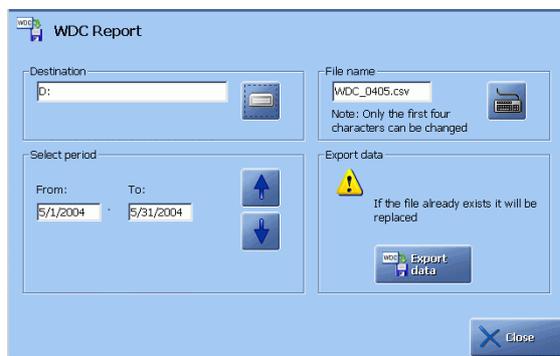
Purpose This function allows you to make a Worldwide DATACHECK (WDC) file for reporting monthly quality control data.

For information regarding Worldwide DATACHECK reporting, refer to the *Worldwide DATACHECK Manual*.

Storing a WDC Report To make a WDC report, do the following:

Step	Action
------	--------

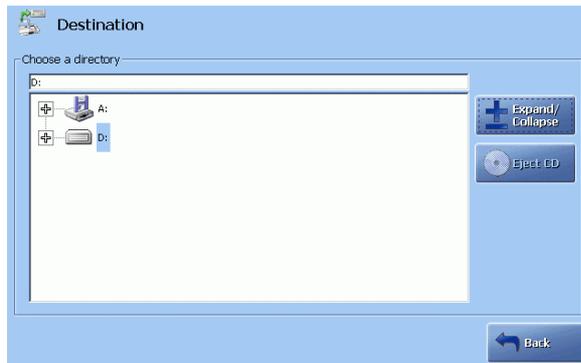
1. Touch the “From:” box and set the dates for the desired month, using the up/down arrow buttons.



The date in the “To:” box will change automatically.

- 2.

Select destination by pressing the destination icon .



Highlight the desired destination (removable or CD-RW drive, or another directory) by touching it on the screen.

Use the *Expand/Collapse* button to choose a source directory/drive.

Press the *Back* button to return to the previous screen.

Continued on next page

Creating a WDC report, *Continued*

Storing a WDC Report (*continued*)

Step	Action
3.	In the "File name box (the WDC Report screen), press the keyboard icon to type the file name: you can change the four characters "WDC_". Confirm the entry on the keyboard and return to the WDC Report screen.
4.	Send the file to the selected destination by pressing <i>Export Data</i> . Or insert a disk and press <i>Export Data</i> in the Export Data box. Wait until the WDC Report screen appears and remove the disk with the WDC report.

Error messages The following error messages may appear in the analyzer status:

"Could not create output file"	if the wrong disk type (e.g. filled or read-only) is inserted.
"No statistical data found. WDC data not generated"	if no data is available for the selected month.

Backing up all data

Purpose This function is intended as a protection or security against the loss of data or system files that includes, but is not limited to, the following:

- Patient report data
- Patient profile data
- Setup data
- Quality control data (i.e. results, statistics, plots)
- Calibration results and setup (i.e. schedule)
- Activity data (i.e. replacement actions, system messages)

Manually performed backup: data can be stored on the internal hard disk, the network, CD-RW or removable drive.

Automatic backup (can be selected – see *Disk Functions Setup* in chapter 3): data can be stored on the internal hard disk or the network.

In case of data loss or similar problem, the loss can be minimized by using the backup file and the Restore All Data function.

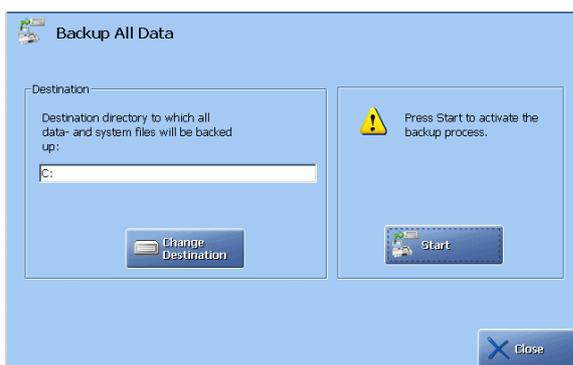
NOTES: *It is the user's responsibility to ensure that all valuable data is regularly backed up. During the warranty period of the AB800 FLEX analyzers Radiometer accepts warranty responsibility for the original storage hardware and installed software only.*

Creating a backup of all data

To make a backup of all data, do the following:

Step	Action
------	--------

1. Press **Change Destination** to choose the destination.



2. Select the drive/directory by touching it on the screen.
If a CD-RW is used, place it in the CD-drive.
If a removable drive is used, connect it to the USB port.

Use the **Expand/Collapse** button to choose a destination directory, then press **Back** to return to the previous screen.

Continued on next page

Backing up all data, *Continued*

Creating a backup of all data (*continued*)

Step	Action
3.	On the Backup All Data screen press Start to continue. (Or press Back to cancel and return to the Ready screen.)
4.	The backup process begins. <ul style="list-style-type: none">• Network drive or internal hard disk drive: backup continues without any further action from the operator.• CD- or removable drive: wait for the data to be prepared (see the timer in the current task field located beside the status indicator in the upper left corner of the screen) and press Start.
5.	If the analyzer status shows a “Backup done” message, the process is complete. Press Close to return to the Ready screen.

Restoring all data

Purpose You can restore all data in case of loss or damage, provided the backup of all your data is available.

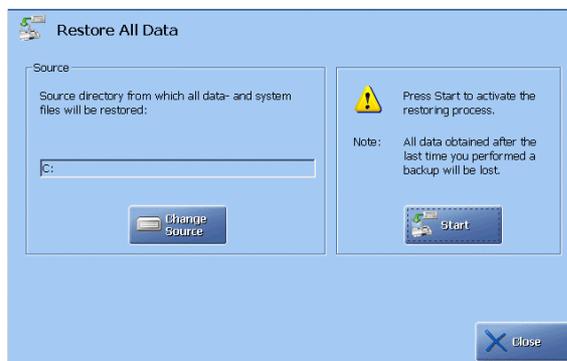
WARNING/CAUTIONS:

- When restoring all data, any existing data will be overwritten by the data obtained from the backup files.
- When restoring all data is complete, the analyzer will automatically and without warning shut down and restart.

Restoring all data To restore a backup of data files, do the following:

Step	Action
------	--------

1. Press **Change Source** to choose the source drive/directory.



2. Select the drive/directory by touching it on the screen.
If a CD-RW is used, place it in the CD-drive.
If a removable drive is used, connect it to the USB port.
Use **Expand/Collapse** to choose a source directory, then press **Back** to return to the previous screen.
3. On the **Restore All Data** screen press **Start** to continue.
(Or press **Close** to cancel and return to the **Ready** screen.)

4. The restore process begins.
 - Network drive or internal hard disk drive: restoring does not require any further action.
 - CD or removable drive: press **Start**.

5. Complete restoring all data.

When restoring is complete, the analyzer shuts down and then restarts automatically, configured to the information obtained from the backup file.

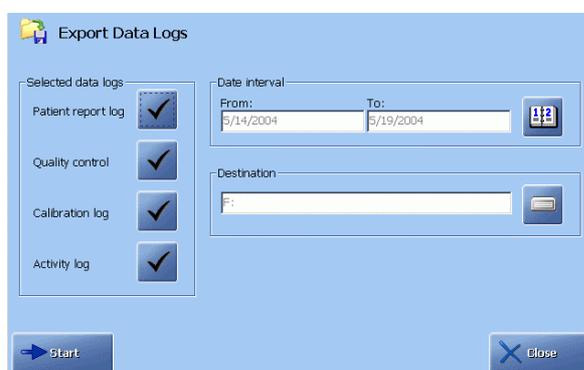
Exporting data logs

Purpose You can export data from the data logs to a CD-RW, removable disk, network. The exported files are made in a form of a compressed "comma separated value (CSV)" file which can be read using a number of standard database and spreadsheet programs, e.g. Microsoft Excel®, Access®, Lotus 123®, etc.

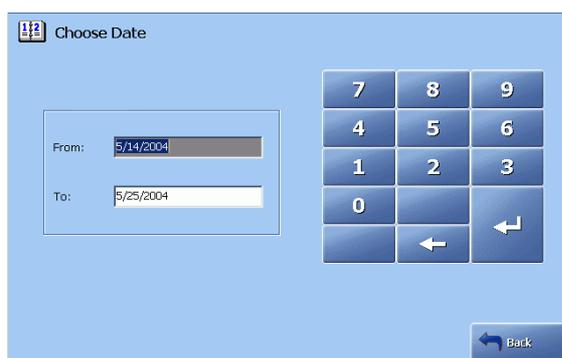
NOTE: *It is important that the disk to which data is being exported is not ejected from the disk drive during the process.*

Exporting data logs To export data logs, do the following:

- | Step | Action |
|------|--|
| 1. | Activate the check buttons beside the data logs that are to be exported. |



2. Activate the calendar icon.



Type the "From:" date; confirm with ENTER. Type the "To:" date; confirm with **Enter**.

Press **Back** to return to the **Export Data Logs** screen.

Continued on next page

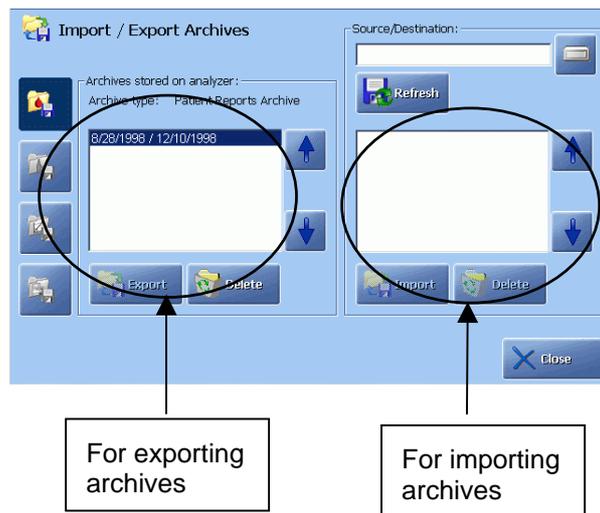
Exporting data logs, *Continued*

Exporting data logs (<i>continued</i>)	Step	Action
	3.	On the Export Data Logs screen press the drive icon. Activate the desired drive by touching it on the screen. Press <i>Expand/Collapse</i> to select the destination directory. Press <i>Back</i> to return to the Export Data Logs screen.
	5.	On the Export Data Logs screen press <i>Start</i> to begin the export of data to the selected destination.
	6.	If the dates are different for each exported data log, repeat steps 2-5 for each data log.

Importing/exporting archives

Purpose This function allows you the following:

1. To export (or delete) archived data logs stored in a special directory on the analyzer's hard disk, onto any drive.
2. To import externally archived data logs into the analyzer's archive directory from any location.

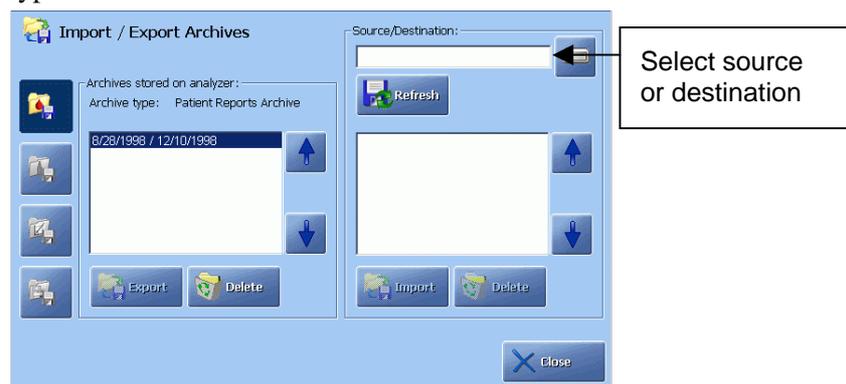


Exporting an archive

To export an archive, do the following:

Step	Action
------	--------

1. Select the desired archive type by activating one of the four archive type buttons.



2. Highlight the desired archive with the up/down arrow buttons.

Continued on next page

Importing/exporting archives, *Continued*

Exporting an archive (*continued*)

Step	Action
3.	To export the highlighted archive, select the location by pressing the



icon.

Touch and highlight the desired location on the **Source/Destination** screen.

To open a folder contained in a drive or within a folder, highlight the drive or folder, then press **Expand/Collapse**.

Press **Back** to return to the **Import/Export Archives** screen.

4. On the **Import/Export Archives** press the **Export** button.

Press **Refresh** to update the contents of a drive or directory.

Importing an archive

To import an archive, follow the procedure for exporting an archive, using the right-hand section of the screen and the **Import** button.

Deleting an archive

To delete an archive from a directory, use the **Delete** button.

Saving setup

Purpose You can copy your analyzer's current setup configuration onto a CD-RW, removable drive, hard disk or network. It can be reloaded in the event the current setup is lost or damaged or the same setup configuration should be loaded on other analyzers without performing all the Setup programs.

Storing the setup To store the current analyzer setup, do the following:

Step	Action
------	--------

1. Press **Edit Location** to select destination.



2. Select required location by touching and highlighting it on the screen. If a CD is used, place a CD in the CD-drive. If a removable drive is used, connect it to the USB port. Press **Expand/Collapse** to select the destination directory. Press **Back** to return to the **Save Setup** screen.
3. On the **Save Setup** screen press **Start**. When saving is complete, the **Ready** screen is displayed.
4. Remove CD-RW (use the **Eject CD** button) or removable drive.

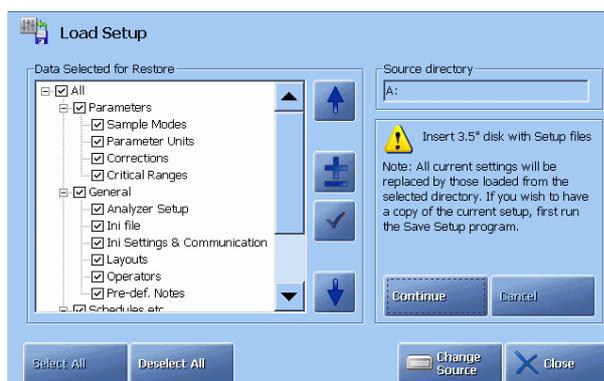
Loading/restoring setup

Purpose You can re-install a saved setup quickly and easily without performing the Setup programs. If desired, only part of the setup can be loaded, e.g. operators.

Loading a setup To load a setup, do the following:

Step	Action
------	--------

1. Press **Select All** to include all items from the list on the screen.
Or press **Deselect All** to exclude all items from the list.



2. To select single items, do the following:
 - Highlight the desired item, using the up and down arrow buttons.
 - Press the check button (✓) to include an item.
3. To open or close a group of items, highlight the group title (e.g. General) and press the ± button.
4. Press the **Change Source** button to select the source.
If a CD-RW is used, place it in the CD-drive.
If a removable disk is used, connect it to the USB port.
Select required source by touching and highlighting it on the screen.
5. Press the **Expand/Collapse** button to access the required folder. The chosen source appears in the “Choose a directory” box.
6. Press the **Back** button to return to the **Load Setup** screen.
7. Press **Continue**.
The analyzer will shut down and then restart with reloaded setup configuration.
Pressing **Cancel** will terminate loading the setup.

Contents of Setup settings See *chapter 15: Radiometer Settings* in this manual.

9. Data management

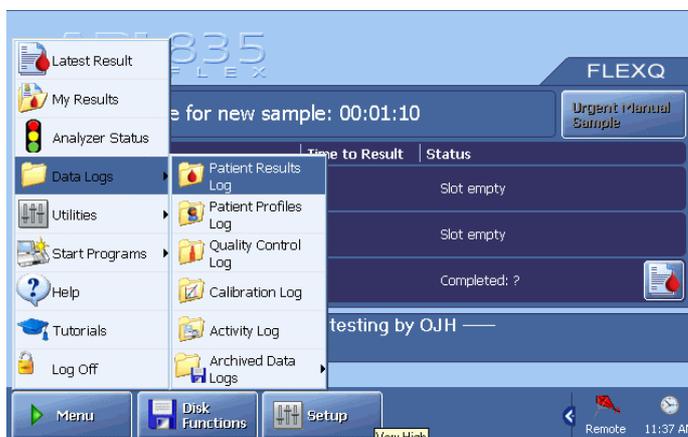
Overview

Introduction This chapter describes the functions of the Patient Results log, Patient Profile log, Quality Control log, Calibration log and Activity log. It also describes the archiving of data logs and the optional feature: RADIANCE browser.

Contents	This chapter contains the following topics.	
	General information	9-2
	Patient Results log.....	9-4
	Patient Profile log.....	9-7
	Quality Control log	9-11
	Calibration log.....	9-15
	Activity log	9-18
	Archived data logs	9-21
	RADIANCE browser (optional)	9-23

General information

Access to data logs To access Data Logs, press *Menu - Data Logs*.



The following data logs are available:

Log	Description
Patient Results Log	Contains up to 2000 patient reports from which you can view patient report, edit Patient ID, print and/or send patient report, search for a patient report, and make a parameter trend for the selected patient reports.
Patient Profiles Log	Provides a list of patient profiles containing general information about patients, from which you can find and view patient profiles, add, edit or remove a patient profile.
Quality Control Log	Contains up to 1500 quality control results from which you can view a quality control result, view statistics and plots of results, print and/or send result, search for a particular result, and make a parameter trend for the selected quality control results.
Calibration Log	Contains up to 1000 calibration results from which you can find and view result, make a parameter trend for the selected calibrations, print and/or send result.
Activity Log	Contains up to 5000 records of all measurements, replacements, system messages and operator messages. From the log, you can search an activity, add an operator message, print and/or send records.

NOTE: The total number of results and messages that can be contained in a log can be changed to suit needs. An increase in the total number will require more space when backing up data and possibly additional disks. Contact a qualified service technician for details

Continued on next page

General information, *Continued*

Archived data logs To avoid loss of "old" data, it can be archived into respective archived data logs.



Press **Menu - Data Logs - Archived Data Logs** to access the archived Patient Results log, Quality Control log, Calibration log and Activity log.

Patient Results log

Purpose The Patient Results Log is an historical file of patient reports automatically saved in the Patient Report Log after a measurement.

Time	Sample #	Sample type	Status	Patient Id	Last Name
5/18/2004 03:04 PM	31	Not specified	Interrupted		
5/18/2004 02:33 PM	30	Venous	?	7020150304	White
5/18/2004 01:43 PM	29	Not specified	?	7020150304	White
5/18/2004 01:40 PM	28	Capillary	?	7020150304	White
5/18/2004 01:35 PM	27	Not specified	?	7200130504	Patrick
5/18/2004 01:30 PM	26	Not specified	?	7200130504	Patrick
5/18/2004 12:59 PM	25	Expired Air	?	5010100404	White
5/18/2004 12:55 PM	24	Not specified	?	7020150304	White
5/18/2004 12:51 PM	23	Not specified	?	7020150304	White
5/18/2004 12:48 PM	22	Not specified	?	7410260204	Green
5/18/2004 12:44 PM	21	Not specified	?	5010120304	Black
5/18/2004 12:42 PM	20	Not specified	?	7020150304	White
5/18/2004 12:37 PM	19	Not specified	?	7020150304	White
5/18/2004 12:34 PM	18	Not specified	?	7410260204	Green
5/18/2004 11:52 AM	17	Not specified	?	7020150304	White

Each patient report contained in the log is listed as an individual record. The reports are listed chronologically, the latest report being at the top of the screen.

Each report is identified as follows:

Item	Description
Sample #	Indicates the number of the sample.
Time	Date and time sample measurement was performed.
Sample type	Shows the type of blood sample specified in Patient ID.
Status	Indicates the status of the sample measurement: <ul style="list-style-type: none"> OK a successful measurement ? an error detected or a parameter exceeded the reportable range Interrupted a measurement stopped by the operator Aborted a measurement stopped by the analyzer most likely due to insufficient sample.
Patient ID	Patient identification number, up to 20 characters.
Last Name	Patient's last name, up to 50 characters.

NOTE: The columns displayed in the log and their positions can be changed. Contact a qualified service technician.

Continued on next page

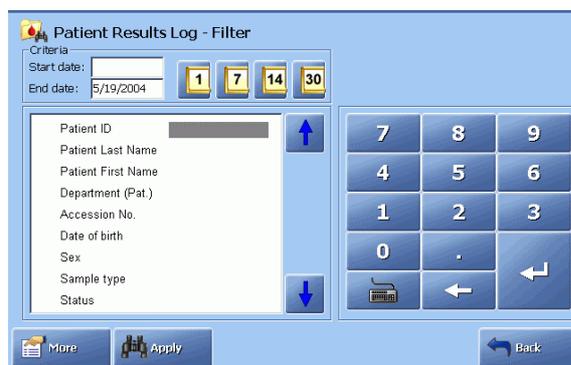
Patient Results log, *Continued*

Button functions The following functions are available by activating a button:

Button	Function
Result	Displays the highlighted patient report – see <i>chapter 4: Sample measurements</i> for the detailed information.
Filter	Sets conditions for finding a patient report or for trend function – see below.
Close	Returns to the Ready screen.
Trend and Print	Are inactive until the filter criteria are chosen and applied.

Filter function To set the filter criteria in order to find a patient report or to select a number of patient reports, do the following:

Step	Action
1.	Set the start date by using the 1-day, 7-day, 14-day or 30-day icons in the “Criteria” box. Or type in the date using the keypad and confirming the entry with Enter .



- Change if necessary the end date by highlighting it and typing date other than the current date. Confirm with **Enter**.
- Use the arrow buttons to highlight the desired search criteria. Press **More** to display more filter criteria.
Note that the right side of the screen changes to show choices for the highlighted search criterion.
- Select the desired choice and confirm each entry with **Enter**. Or use the keyboard to enter the desired data and confirm each entry with **Enter**.
- When all the criteria have been selected, press **Apply** to start the search.

Continued on next page

Patient Results log, *Continued*

Trend function To make a parameter trend for the selected patient reports, do the following:

Step	Action
------	--------

1. Set up search criteria as described under *Filter Criteria* and apply them. The screen of the selected patient reports will be displayed.

Time	Sample #	Sample type	Status	Patient Id	Last Name
5/18/2004 03:04 PM	31	Not specified	Interrupted		
5/18/2004 01:43 PM	29	Not specified	?	7020150304	White
5/18/2004 01:35 PM	27	Not specified	?	7200130504	Patrick
5/18/2004 01:30 PM	26	Not specified	?	7200130504	Patrick
5/18/2004 12:55 PM	24	Not specified	?	7020150304	White
5/18/2004 12:51 PM	23	Not specified	?	7020150304	White
5/18/2004 12:48 PM	22	Not specified	?	7410260204	Green
5/18/2004 12:44 PM	21	Not specified	?	5010120304	Black
5/18/2004 12:42 PM	20	Not specified	?	7020150304	White
5/18/2004 12:37 PM	19	Not specified	?	7020150304	White
5/18/2004 12:34 PM	18	Not specified	?	7410260204	Green
5/18/2004 11:52 AM	17	Not specified	?	7020150304	White
5/18/2004 11:36 AM	16	Not specified	OK	7020150304	White
5/18/2004 11:32 AM	15	Not specified	OK	7410260204	Green
5/18/2004 11:28 AM	14	Not specified	OK	7410260204	Green

The **Trend** and **Print** buttons are now active.

2. Press **Trend** to select the parameter(s).
3. Press **View Trend** to display the trend of the selected parameter(s) for the selected patient reports.
4. To view the selected filter criteria, press **View Filter**.

The criteria can only be viewed, not changed.

To apply new criteria, repeat the Filter function procedure described in this topic and the procedure for the Trend function.

5. Press **Back** to return to the previous screen.

Patient Profiles log

About a patient profile

A patient profile is a record containing general information about a particular patient. It is created automatically whenever a new patient ID number is entered **during measurement** and recorded in the Patient Profile log. Alternatively, a patient profile can be added to the log. It is required to include patient data in the log before the patient pre-registration function can be used.

The given patient data recorded in a Patient Profile will be automatically used as soon as patient ID number is entered on the Patient Identification screen during a measurement.

NOTE: *If the analyzer is set up to request data from a LIS/HIS or RADIANCE, this patient information will always override that from the Patient Profile log.*

Patient Profiles log

The patient profiles are listed in the order they were created.



The following data can be entered in a patient profile (use the left/right scroll bar to see the items):

Item	Description
Patient ID	Lists the patient ID number
Last Name	Provides the patient's surname.
First Name	Provides the patient's first name.
Sex	Identifies the patient's sex.
Date of birth	Identifies the patient's date of birth.
Department (Pat.)	Identifies the department in which the patient is located.
Patient note	Lists a note regarding the patient.
Birth weight	Gives the weight at birth.
Gestational age	Gives the duration of pregnancy.

The functions available on the **Patient Profiles** screen are described in this section.

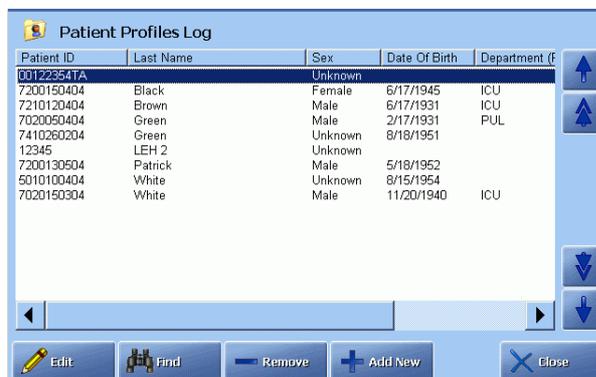
Continued on next page

Patient Profiles log, *Continued*

Editing a patient profile To edit a patient profile, do the following:

Step Action

1. Highlight the patient profile and press **Edit**.



2. Use a barcode reader to scan the patient data supported by the barcode (the "Enable General Barcode Support" should be activated in the Miscellaneous Setup) – see the procedure in *Entering Information with barcode reader* in chapter 4, section *Patient identification*.
Or request (if connected) the data from LIS/HIS by verifying the patient ID and pressing the **Request** button.
3. To edit data on the screen, highlight an item using the arrow buttons and type in the data using the screen keyboard or keypad. Confirm each entry with **Enter**.



4. When completed, press **Back** to return to the previous screen.

Continued on next page

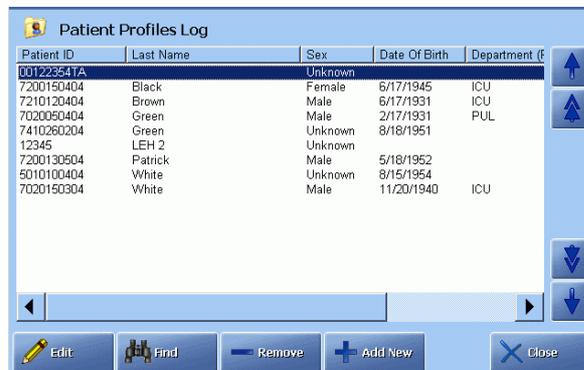
Patient Profiles log, *Continued*

Adding a new patient profile

To add a new patient profile, do the following:

Step	Action
------	--------

1. Press **Add New** to display the screen below.



2. Use a barcode reader to scan the patient data supported by the barcode (the "Enable General Barcode Support" should be activated in the Miscellaneous Setup) - see the procedure in *Entering Information with Barcode Reader* in chapter 4, section *Patient Identification*.
Or request (if connected) the data from LIS/HIS by verifying the patient ID and pressing the **Request** button.
3. To edit data on the screen, highlight an item using the arrow buttons and type in the data using the screen keyboard or keypad.
Confirm each entry with **Enter**.
4. When completed, press **Back** to return to the previous screen.

Deleting a patient profile

To delete a patient profile from the log, do the following:

Step	Action
------	--------

1. Highlight the desired patient profile.
2. Press **Remove**.

Continued on next page

Patient Profiles log, *Continued*

Finding a patient profile

To find a patient profile, do the following:

Step	Action
------	--------

1. Press **Find** on the screen.

Patient ID	Last Name	Sex	Date Of Birth	Department (f)
00123541A		Unknown		
7200150404	Black	Female	6/17/1945	ICU
7210120404	Brown	Male	6/17/1931	ICU
7020050404	Green	Male	2/17/1931	PUL
7410260204	Green	Unknown	8/16/1951	
12345	LEH 2	Unknown		
7200130504	Patrick	Male	5/18/1952	
5010100404	White	Unknown	8/15/1954	
7020150304	White	Male	11/20/1940	ICU

2. Using the arrow buttons, highlight the search criterion and enter the data using the screen keypad or keyboard. Confirm with **Enter**.
Or use a barcode reader for Patient ID to scan the barcode.
3. Press **Find**.

If a patient profile is found, it will be highlighted on the **Patient Profile Log** screen.

If a patient profile is not found, "No item found that match search criteria" message appears in analyzer status. Repeat step **2** or press **Back** to cancel.

NOTE: The patient data entered in the Patient Profile log are also used for sample pre-registration during a measurement.

Quality Control log

Purpose

The Quality Control log is a historical file of all quality control results automatically saved in the Quality Control Log after a measurement. Each quality control result is listed chronologically as an individual record.



Each result is identified as follows (use the left/right scroll bar to see the items):

Item	Description
Time	Date and time the measurement was performed.
QC#	The ID number of a quality control measurement.
Slot	Control solution slot as defined in setup.
Solution	Control solution type as defined in setup.
Lot	Lot number of the control solution.
Status	Indicates the status of the quality control measurement: <ul style="list-style-type: none"> OK a successful measurement ? an error detected or a measured value exceeded a control, statistical or measuring range. Interrupted a measurement stopped by the operator Aborted a measurement stopped by the analyzer most likely due to insufficient sample.

NOTE: To change the columns displayed in the log and their position, contact a qualified service technician for details.

The functions of the buttons available on the **Quality Control Log** screen are described in this section.

Continued on next page

Quality Control log, *Continued*

Viewing a result To view a result, do the following:

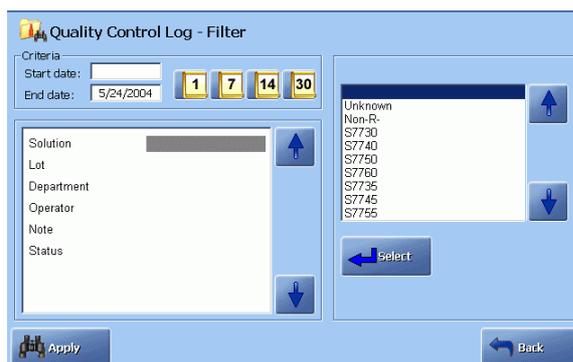
- | Step | Action |
|------|---|
| 1. | Highlight the desired quality control result using scroll facilities. |
| 2. | Press the Result button. For details – see <i>Quality Control Result</i> in chapter 5. |

Filter/trend function

This function allows you to find a quality control result or to select a number of results in order to make a trend.

To set the filter criteria, do the following:

- | Step | Action |
|------|---|
| 1. | Press the Filter button on the Quality Control log screen. |
| 2. | Set the start date by using the 1-day, 7-day, 14-day or 30-day icons in the “Criteria” box. |



Or type in the date using the keypad and confirming the entry with **Enter**.

Change if necessary the end date by highlighting it and typing a date other than the current date. Confirm with **Enter**.

- | | |
|----|---|
| 3. | Use the up and down arrow buttons to highlight the desired search criteria. |
| 4. | Select the desired choice and confirm each entry with Enter . |

Or use the keyboard to enter the desired data and confirm each entry with **Enter**.

Continued on next page

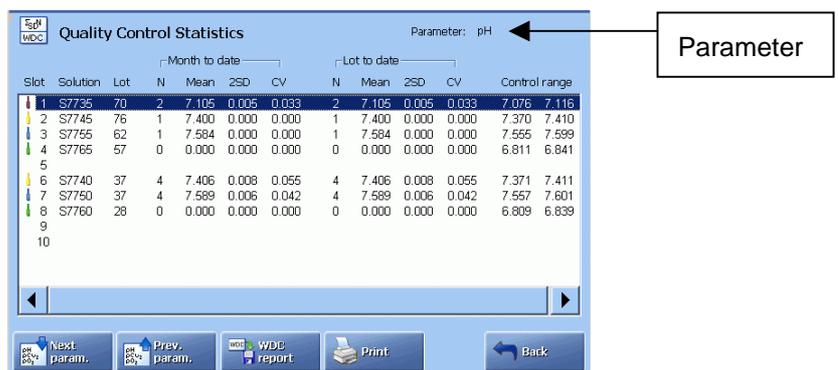
Quality Control log, *Continued*

Filter/trend function
(*continued*)

Step	Action
5.	When all the criteria have been selected, press Apply to make the search. Press Trend to select the parameters.
6.	Select the desired parameter(s) by activating the check buttons (e.g. pH, pCO ₂ , pO ₂). Press View Trend .
7.	The trend of the selected parameter(s) is displayed. To view the filter criteria, press the View Filter (the criteria cannot be changed, only viewed). To print the displayed trend, press Print . To return to the screen in step 5, press Back .

Viewing quality control statistics

Only those measurement values that fall within the statistical range are included into the statistical data. Therefore parameters outside the measuring range or with a "?" are not included.



- The screen shows statistics for each control solution (identified by its slot, type and lot number) for a single parameter.
Press **Next param.** or **Previous param.** to view other parameters.
- Press **WDC Report** to create a WDC Report disk – see *Creating a WDC Report* in chapter 8.

Continued on next page

Quality Control log, *Continued*

Viewing quality control statistics (continued) **Month-to-date** statistics are obtained from all measurements taken on the current lot of a control solution over the course of the month - see *Quality Control Statistics Setup* in *chapter 3* for information.

Lot-to-date statistics are obtained from all measurements taken over the entire course of the current lot of the control solution.

The **Month-to-date** and **Lot-to-date** statistics give the following information:

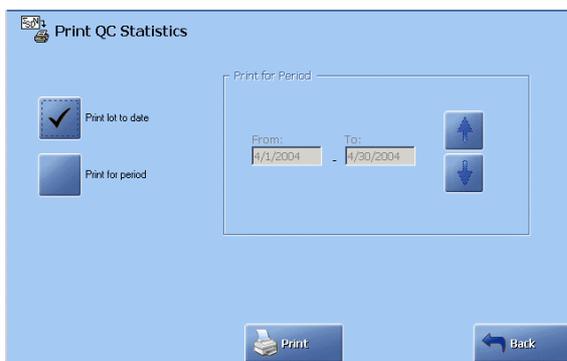
Item	Description
N	Number of measurements included in statistics for the slot.
Mean	Calculated mean of the measurement values*.
2 SD	Calculated ($2 \times$ standard deviation) of measurement values*.
CV	Coefficient of variation*.
Control Range	Current control range for the control solution level.

* See *Quality Control Systems Reference Manual* for detailed information.

Printing QC statistics

To print QC statistics, do the following:

- | Step | Action |
|------|---|
| 1. | Press Print on the Quality Control Statistics screen. |
| 2. | To print QC statistics for an entire lot, activate Print lot to date button and press Print . |



- | | |
|----|--|
| 3. | To print monthly QC statistics activate Print for period . Select the month, using up and down buttons. Then press Print . |
| 4. | Press Back to return to the Quality Control Statistics screen. |

Calibration log

Purpose The Calibration log is a historical file of calibrations automatically saved in the Calibration log after a calibration.

Time	Cal #	Type	Status
5/19/2004 08:00 AM	108	2 point calibration	OK
5/19/2004 04:00 AM	107	1 point calibration	OK
5/19/2004 12:14 AM	106	2 point calibration	OK
5/18/2004 08:00 PM	105	1 point calibration	OK
5/18/2004 04:00 PM	104	2 point calibration	OK
5/18/2004 02:46 PM	103	1 point calibration	Interrupted
5/18/2004 01:22 PM	102	1 point calibration	OK
5/18/2004 12:00 PM	101	1 point calibration	OK
5/18/2004 08:00 AM	100	2 point calibration	OK
5/18/2004 04:00 AM	99	1 point calibration	OK
5/18/2004 12:14 AM	98	2 point calibration	OK
5/17/2004 08:00 PM	97	1 point calibration	OK
5/17/2004 04:00 PM	96	2 point calibration	OK
5/17/2004 12:00 PM	95	1 point calibration	OK
5/17/2004 08:00 AM	94	2 point calibration	OK

Each calibration report is listed as an individual record. The reports are listed chronologically, the latest report being at the top of the screen.

Each reports is identified as follows (use the left/right scroll bar to see the items):

Item	Description
Time	Date and time the calibration was performed.
Cal #	The ID number of a performed calibration.
Type	Indicates the calibration type: 1-point, 2-point or tHb.
Status	Indicates the calibration status: <ul style="list-style-type: none"> OK a successful calibration ? an error detected or a parameter exceeded the measuring range Interrupted a calibration stopped by the operator Aborted a calibration stopped by the analyzer most likely due to missing calibration solution.

NOTE: The columns displayed in the log and their positions can be changed. Contact a qualified service technician.

Continued on next page

Calibration log, *Continued*

Viewing a calibration result

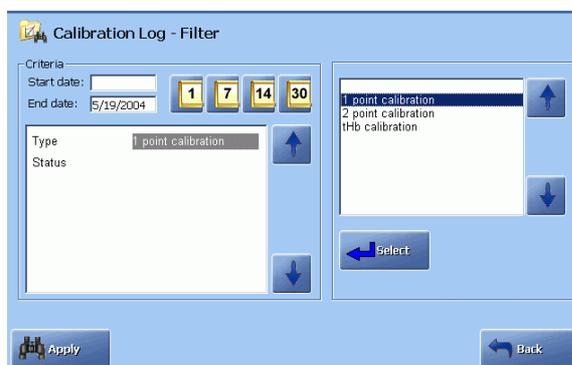
To view a calibration result, do the following:

- | Step | Action |
|------|---|
| 1. | Highlight the desired calibration. |
| 2. | Press Result – see <i>Chapter 6</i> for details about calibration results. |

Filter function

This function allows you to find a calibration or to select a number of calibrations. To set the filter criteria, do the following:

- | Step | Action |
|------|---|
| 1. | Press the Filter button on the Calibration Log screen. |
| 2. | Set the start date by using the 1-day, 7-day, 14-day or 30-day icons. |



Or type in the date using the keypad and confirm with **Enter**.

Change if necessary the end date by highlighting it and typing the date other than the current date. Confirm with **Enter** or **Select**.

- | | |
|----|---|
| 3. | Select the desired calibration type and status using the relevant arrow buttons.
Confirm each entry with Enter or Select . |
| 4. | When the criteria have been selected, press Apply to start the filter. |

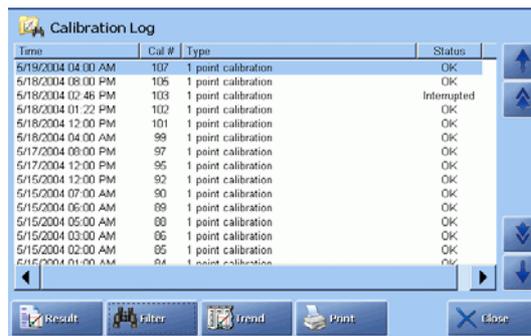
Continued on next page

Calibration log, *Continued*

Trend function This function allows you to make a parameter trend for the selected calibrations. To make a trend, do the following:

Step	Action
------	--------

1. Set up the search criteria as described above and apply them.



Press **Trend** to select a parameter.

2. Select a parameter (only one for calibrations) and press **View Trend**.
3. To view the filter criteria, press the **View Filter** (the criteria cannot be changed, only viewed).

To print the displayed trend, press **Print**.

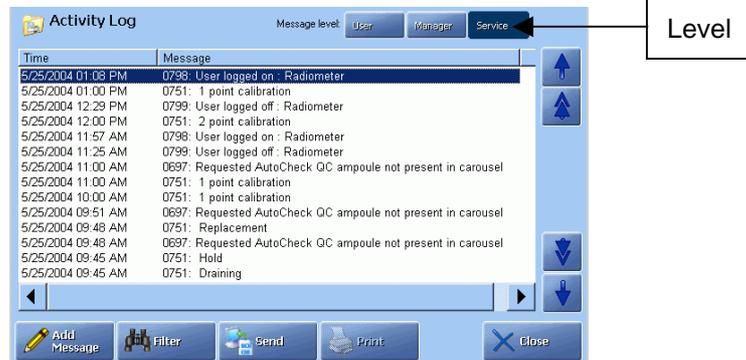
To return to the screen in step 5, press **Back**

4. To apply the new criteria, repeat the Filter function procedure described in this topic and the procedure for the Trend function.

Activity log

Purpose

The Activity Log provides an historical record of all replacements, system messages, and errors during operation. It also lists any operator messages and allows for the entry of additional notes.



The records are listed chronologically and can be displayed at user, manager or service level.

The record is identified as follows (use the left/right scroll bar to see the items):

Time: Shows the date and time when the activity occurred.

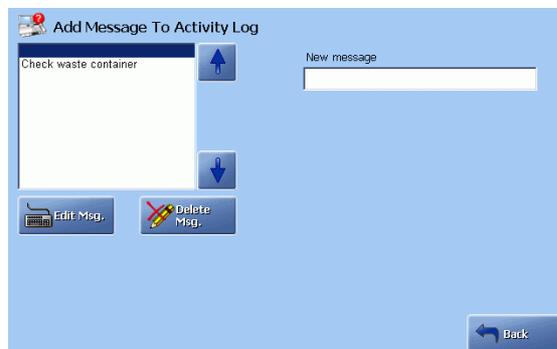
Message: Gives a message number and an explanation of the activity. Operator note text appears as written.

NOTE: To change the Activity Log columns and position, contact a qualified service technician.

Adding a message

To add a message to the log, do the following:

- | Step | Action |
|------|---|
| 1. | Press Add Message on the Activity Log screen. |
| 2. | If Notes were entered in Setup program <u>User-defined Notes</u> (see <i>Parameters and Input</i> in chapter 3: <i>Installation and Setup</i>), then you can edit a highlighted message by pressing Edit Msg. to display the keyboard and make the changes. |

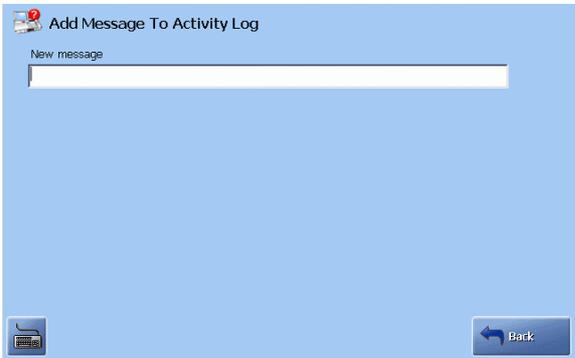


To delete a message, highlight it and press **Delete Msg.**

Continued on next page

Activity log, *Continued*

Adding a message (*continued*)

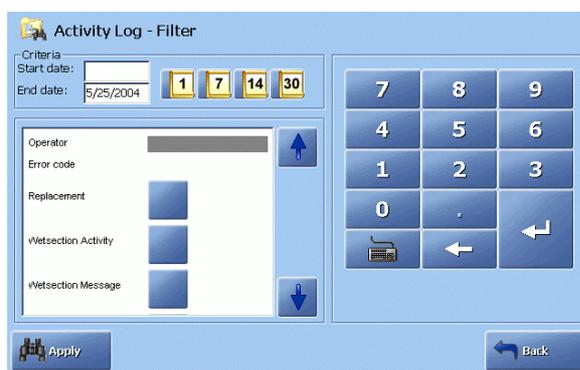
Step	Action
2 (cont.).	<p>If Notes were not entered in Setup program User-defined Notes</p> 
3.	<p>Press Back to return to the Activity Log screen</p>

To key in a note, press the keyboard touch-key to display the keyboard, type a message and press **Enter** to confirm and return to the **Activity Log** screen

Filter function

This function allows you to find an activity or to select a number of activities. To set the filter criteria, do the following:

Step	Action
1.	Press the Filter button on the Activity Log screen.
2.	Set the start date by using the 1-day, 7-day, 14-day or 30-day icons.



Or type in the date using the keypad and confirm with **Enter**.

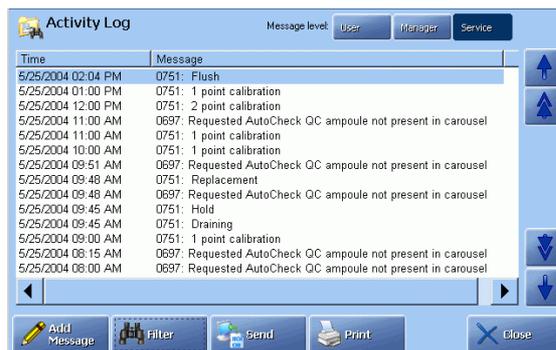
Change if necessary the end date by highlighting it and typing the date other than the current date. Confirm with **Enter**.

Continued on next page

Activity log, *Continued*

Filter function (*continued*)

- | Step | Action |
|------|--|
| 3. | Use the arrow buttons to highlight the desired search criterion or criteria. |
| 4. | When all the criteria are selected, press Apply Filter to start. |
| 5. | The Activity Log displays the list of selected activities. |



By selecting the message level, you can see messages on the user, manager or service levels.

The **Add Message** button is available on all levels.

- Press **Filter** to set other search criteria if desired.
Press **Back** to return to the **Ready** screen.

Archived data logs

Purpose You can view the old patient reports, quality control results, calibration results and activities which have been archived automatically when maximum log size (2000 patient reports, 1500 quality control results, 1000 calibration results, and 5000 activity log entries) has been reached.

The archives are located on the analyzer's hard disk and can be exported to a CD-RW, removable disk, network, etc. - see *Importing/Exporting Data Logs* in *chapter 8: Disk functions*.

The archives are archived after date: 500 reports from each log, and 2000 entries from the Activity log.

Press **Menu - Data Logs - Archived Data Logs** and select the log archives.



Press the button on the screen to select the log archives. As the functions are similar for all archives, the Calibration Archive is used as an example.

Selecting archive stored on the analyzer

To select an archive saved on the analyzer, do the following:

- | Step | Action |
|------|---|
| 1. | Highlight the desired archive with the up/down arrow buttons (if a few archives are present). |



Information about analyzer type and installation number and the date this archive was generated is on the screen.

Continued on next page

Archived data logs, *Continued*

Selecting archive stored on the analyzer (*continued*)

Step	Action
2.	Press Select Archive to import and obtain it for viewing.
3.	Press, if desired, Filter to enter the search criteria and apply the filter.
4.	Highlight the desired report by touching it on the screen and press Result to display the result.
5.	Press Close to exit to the Ready screen.

Moving an archive

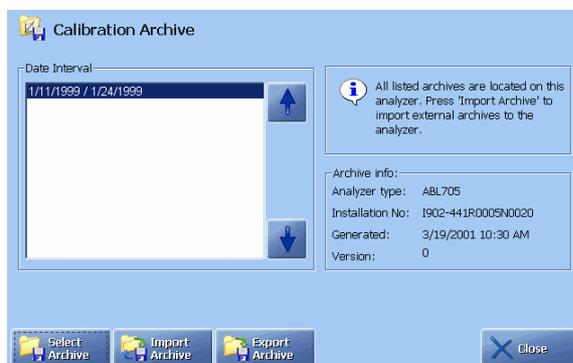
To move an archive to another media (e.g. computer) or from another media to the analyzer, do the following:

Step	Action
1.	Press Import Archive to move it. The Import/Export Archives screen will be displayed.
2.	Proceed as described in <i>Importing/Exporting Archives, chapter 8: Disk functions</i> .

Converting an archive into .csv format

To convert an archive into .csv format, do the following:

Step	Action
1.	Highlight an archive and press Export Archive .



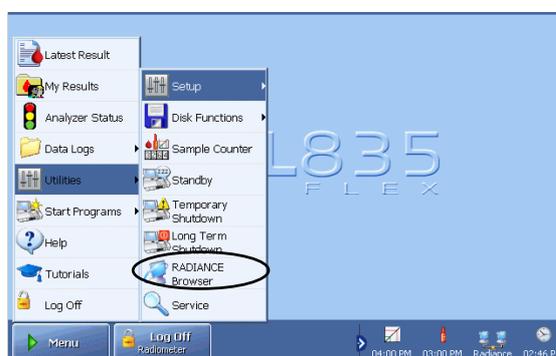
- Press **Start** to start conversion.
Press **Back** to cancel and return to the previous screen.
- Export the converted archive to a disk as described in *Importing/Exporting Archives, chapter 8: Disk functions*.

RADIANCE browser (optional)

Purpose This option allows you to get in touch with RADIANCE in order to find information on patients, quality control, calibrations, from all analyzers connected to the RADIANCE network.

Access to RADIANCE To get access to RADIANCE, do the following:

- | Step | Action |
|------|--|
| 1. | Make sure that a connection to the RADIANCE server is established in the RADIANCE Communication Setup program. |
| 2. | Press <i>Menu - Utilities - RADIANCE Browser</i> . |



The analyzer will exchange information with RADIANCE about your access profile, and the contents of the RADIANCE main page will reflect the scope of your privileges.



- Refer to the *RADIANCE Operator's Manual* on how to browse on RADIANCE.

10. Analyzer shutdown

Overview

Introduction This chapter describes the Standby mode, Temporary Shutdown, Long Term Shutdown programs and the Forced Standby mode.

Contents This chapter contains the following topics.

General information	10-2
Standby mode.....	10-3
Full waste container	10-5
Temporary shutdown	10-6
Long-term shutdown	10-8

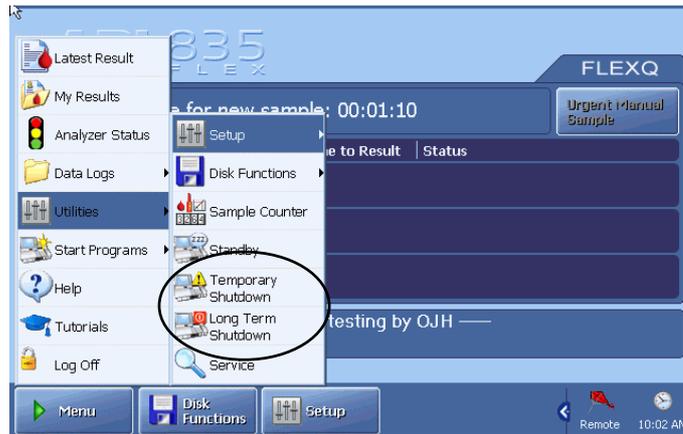
General information

Shutdown programs

The following programs are available:

- Standby
- Temporary Shutdown
- Long Term Shutdown.

To access the programs, press *Menu - Utilities*.



Then press the desired button to enter the program.

When the waste container becomes critically full, the analyzer automatically enters Forced Standby mode.

Standby mode

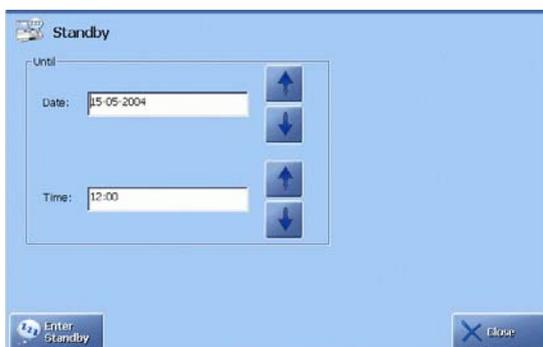
Purpose The Standby mode is used for the following:

- to keep the analyzer ready for measurements (the electrodes conditioned and solutions thermostatted) during short-term time periods such as weekends or holidays.
- to prevent spillage from the waste container when it gets critically full.

By placing the analyzer on standby the consumption of solutions is reduced.

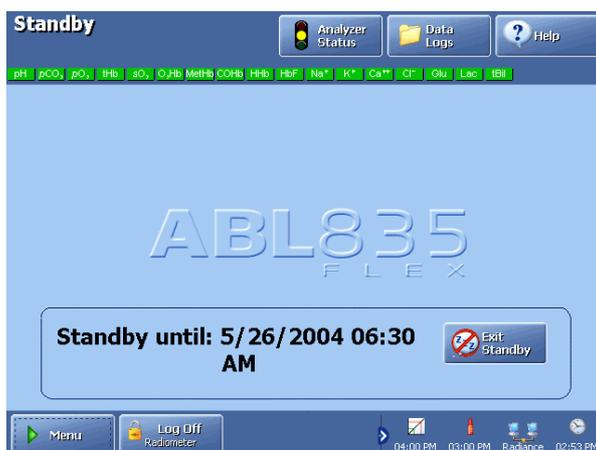
Entering Standby To put the analyzer into Standby mode, do the following:

Step	Action
1.	Enter date and time for the analyzer to automatically exit the Standby mode, using the arrow buttons.



- | | |
|----|---|
| 2. | Press Enter Standby to enter the Standby mode. The button changes to Exit Standby . |
|----|---|

Exiting Standby The analyzer automatically exits the Standby mode on the selected day and time.



To exit standby before the scheduled date, press **Menu – Log** on and type in your password.

Continued on next page

Standby mode, *Continued*

Exiting Standby If your access profile allows the exit from the Standby mode, the *Exit Standby*
(*continued*) button will be visible.

Before the analyzer returns to the Ready mode, all pending tasks will be performed:

On exiting Standby mode analyzer...	If the pending task is...
Performs one 2-point calibration.	One or more calibrations with at least one 2-point calibration.
Performs one 1-point calibration.	One or more 1-point calibrations.
Performs Cleaning program once.	One or more automatic cleanings.
Indicates that a QC measurement is pending.	One or more QC measurements.
A replacement is indicated as due.	Any replacement.

Full waste container

Forced Standby When the waste container gets critically full, the analyzer enters the Forced Standby mode.



To return the analyzer to the Ready mode, do the following:

- | Step | Action |
|------|---------------------------------------|
| 1. | Replace the waste container. |
| 2. | Press the <i>Exit Standby</i> button. |

For users with limited access (selected in the Operators and Passwords program – see *chapter 3*), this button may not be visible. Press **Menu** – **Log** on and type in your password.

If your access profile allows the exit from the Standby mode, the *Exit Standby* button will be visible.

Temporary Shutdown

Purpose This program prepares the analyzer software for switching off power, and is used for temporary (short-term) shutdown of the analyzer.

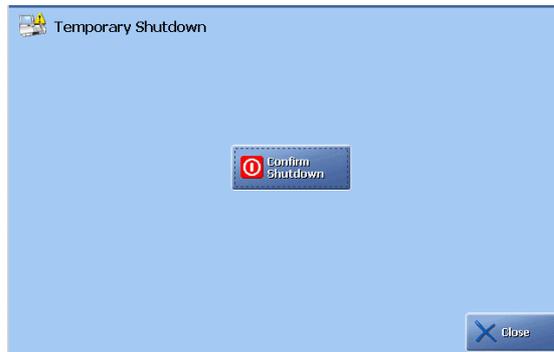
This program differs from the Long Term Shutdown used for a long-term storage of an analyzer and requires removal of system components.

Executing Temporary Shutdown program

To switch the analyzer for a short time, do the following:

Step	Action
------	--------

1. Enter the program.



2. Press *Confirm Shutdown* to continue.
Press *Close* to cancel.
3. Wait for the prompt to be displayed, then switch off the power.

Restarting the analyzer

To restart the analyzer after Temporary Shutdown, do the following:

Step	Action
------	--------

1. Verify that the system requirements are met and all components are installed.
2. Place the power switch in the ON or I position.
The startup procedure begins. When completed, the analyzer's **Ready** screen appears

Depending on the length of the shutdown, the analyzer performs either a cold start or a warm start.

Continued on next page

Temporary Shutdown, *Continued*

Restarting the analyzer (*continued*)

Start	Is performed if...
Cold	<p>The thermostating temperature is outside predefined limits. It lasts approximately 25 minutes and includes:</p> <ul style="list-style-type: none"> • Loading of software • Inlet Calibration (not shown in status) • Leak test • Initializing • Liquid Sensor Adjustment • Pump Calibration • Rinse • Startup (conditioning of the electrodes) • 2-point calibration.
Warm	<p>The thermostating temperature is within the predefined limits. It lasts approximately 5 minutes and includes:</p> <ul style="list-style-type: none"> • Loading of software • Inlet Calibration (not shown in status) • Leak test • Rinse

Over the first 24 hours after the cold start, the analyzer will automatically perform a number of calibrations at specific intervals as follows:

- The first four hours: 1-point calibration every 30 minutes
 2-point calibration every hour
- remaining 20 hours: 1-point calibration every hour
 2-point calibration every four hours.

During the startup, available analyzer functions are indicated by the appearance of the buttons. A greyed-out button indicates that the function is not available.

Long Term Shutdown

Purpose This program gives the procedure for emptying the analyzer of solutions before transport or storage for an extended period of time.

The Shutdown procedure takes approximately 15 minutes.

Before shutdown You will need the following:

- Four ~50 cm long tubes with an internal diameter capable of fitting onto the solution connectors.
- One large glass beaker filled with distilled water

The shutdown procedure Enter the Long Term Shutdown program and follow the prompts on the screen.

Screen	Prompts and operator actions
1	<p>Perform Decontamination (use the button on the screen to enter the program).</p>  <p>Press Confirm Shutdown to continue, or Close to cancel the procedure. After this point there is no opportunity to cancel the shutdown.</p>
2	Remove the Rinse, Cal 1, Cal 2 and Cleaning Solution containers. Press Continue .
3	Wait for the fluid transport path to drain.
4	Place tubes on the Rinse, Cal 1, Cal 2, and Cleaning solution connectors and the free ends in a beaker filled with distilled water. Press Continue .
5	Wait while the fluid transport path is rinsed with distilled water.
6	Remove beaker with distilled water and disconnect the tubes. Press Continue .
7	Wait for the fluid transport path to drain.

Continued on next page

Long Term Shutdown, *Continued*

The shutdown procedure
(*continued*)

Screen	Prompts and operator actions
8	<p>Read the steps below prior to performing any actions.</p> <ul style="list-style-type: none"> • Remove Gas 1 and Gas 2 cylinders. • Remove all electrodes and place them in their respective protective jackets. • Remove waste container. • Place covers on all solution connectors and gas inlets. • Press <i>Finish</i> to power down. When the message "You can now turn off your PC" appears, turn off the power (the power switch at the back of the analyzer). • Remove pump tubings. • Remove paper from printer, and network and power cables from the back of the unit. <p>Shutdown is now complete.</p>

Storing the analyzer

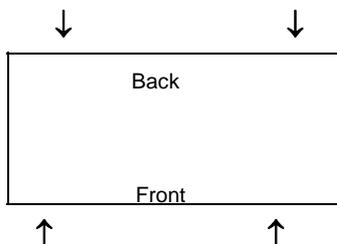
Radiometer recommends to place the analyzer on a trolley in its normal position, and protect it from dust using a plastic cover.

Transporting the analyzer

To transport the analyzer from one location to another, put it back in its original packaging and seal.

To transport the analyzer without its original packaging, follow the recommendations below:

- A minimum of two persons is recommended.
- Remove all solutions and gas containers; disconnect power and peripheral devices prior to lifting.
- The analyzer can be lifted and carried from any position along the base apart from the gas regulator. As a recommendation, see the diagram below outlining the analyzer base. Hand positions are indicated by the arrows.



**WARNING/
CAUTION:**

Do not lift analyzer by the gas regulator. Damage to the analyzer can occur.

11. Troubleshooting

Overview

Introduction This chapter describes Hold causes and standard troubleshooting procedures.

Contents This chapter contains the following topics.

General information	11-2
Forced Hold causes	11-5
Analyzer messages	11-7
Fluid transport troubleshooting procedure	11-55
Inlet probe troubleshooting procedure	11-56
Inlet troubleshooting procedure	11-57
Leak troubleshooting procedure.....	11-58
Electrode troubleshooting procedures	11-59
Pump troubleshooting procedure	11-61
Fluid transport system description	11-62

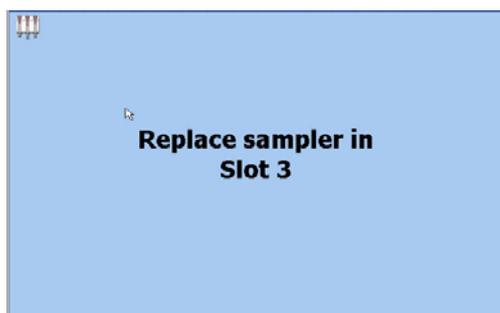
General information

Analyzer action in case of error Depending on the severity of the error the analyzer will do one of the following:

- continue its activity, but mark relevant parameter results with a “?”
- interrupt and abort its activity
- enter the Hold mode
- deny measurements and calibrations.

FLEXQ – sampler messages

- If a sampler was accidentally removed from the slot, the following screen appears:

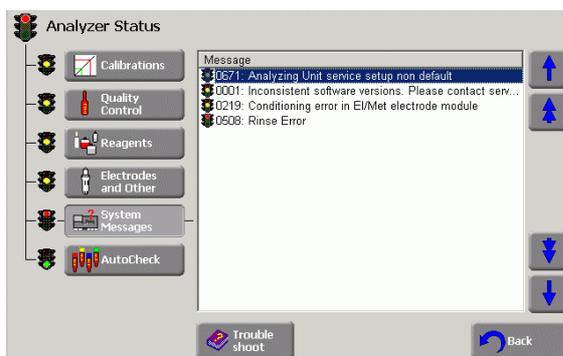


- If the batch mode was selected, but the analyzer is not connected to RADIANCE, the message “Remove sampler” will appear on the screen
- If two samplers were placed in the sampler tray one immediately after the other so that the FLEXQ had no time to register the first sampler, the message “Remove sampler” will appear on the screen.

Operator actions in case of error

To locate and remedy messages/errors, do the following:

- | Step | Action |
|------|--|
| 1. | Check which of the status button indicators is red or yellow on the Analyzer Status screen. |
| 2. | Press the relevant button (example: <i>System Messages</i> was pressed). |



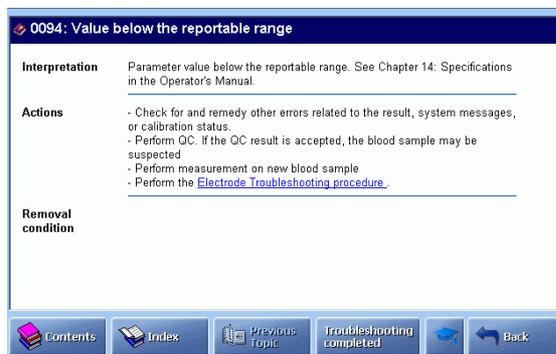
Highlight the error (the first line is automatically highlighted).

Continued on next page

General information, *Continued*

Operator actions in case of error
(*continued*)

- | Step | Action |
|------|--|
| 3. | Press Troubleshoot for error description and operator action. |



Is placed in the top right corner of the screen so that you can continue troubleshooting.



Use Tutorials to assist in the troubleshooting procedure.



Online Help at the bottom of the screen.



Returns to the previous help topic.



Press to return to the **Analyzer Status** screen when all messages were remedied.



Press to return to the **Analyzer Status** screen.

- Remedy the error as described in the Actions on the screen.
- Remedy other error(s) if present.
- Press **Troubleshooting completed** after all errors have been remedied. (The **Help** button will then reappear in the top right corner of the screen if that position has been chosen for it in Button Configuration, Operators and Passwords setup program).

NOTE: For description of analyzer messages and operator actions see Analyzer messages.

Continued on next page

General information, *Continued*

Logging system messages All system messages are automatically recorded in the Activity Log at the time of their occurrence. The items in the Activity log are listed in chronological order and form a permanent record for the user of all system messages that have taken place.

Using the filter function (see description in *Activity log, chapter 9* in this manual), you can select the desired type of messages and view them on the user, manager and service levels.

Forced Hold causes

Purpose Forced Hold mode suspends all the wet section activities in case certain analyzer conditions occur. Until the condition has been corrected the analyzer cannot be restarted.



The causes for the Forced Hold mode are as follows:

Condition	Screen message	Corrective action
Forced Standby	Replace waste container	Replace the waste container. Press the <i>Exit Standby</i> button.
Rinse error	Rinse Error	Replace the Rinse Solution bottle – see the procedure in <i>chapter 7: Replacements</i> .
Operator intervention required	Intervention Required	Check Analyzer Status and remedy the condition/error.
Cover to the measuring modules removed or the window opened.	Cover removed or window opened	Verify the cover is properly mounted and the window shut prior to restart.
Both inlet flaps removed.	Inlet flaps removed	Verify the inlet flaps are properly mounted prior to restart.
The inlet cannot obtain proper position.	Inlet positioning error	Contact service representative.
Inlet calibration failed	Inlet calibration error	Perform the procedure described on the next page.
Leakage test failed	Leak detected	Perform the procedure described on the next page.

Inlet Calibration error This condition occurs when the calibration of the inlet fails, most likely caused by a problem with the inlet components.

To correct the error, do the following:

Step	Action
1.	Remove the analyzer cover and the inlet flaps.
2.	Check that the inlet probe and gasket are mounted properly.
3.	Remove the inlet gasket and check for wear or damage. Replace as required.

Continued on next page

Forced Hold causes, *Continued*

Inlet Calibration error (*continued*)

Step	Action
4.	Check the condition of the inlet probe. If it appears bent or damaged, replace it.
5.	Mount all components, then restart the analyzer by pressing Restart . If the error is corrected, the analyzer performs an inlet calibration during restart and enters the Ready mode. If the Hold mode remains, contact a service representative.

Leak Detected error

This condition occurs when a leakage test has failed, indicating a leak in the fluid transport system.

To correct the error, do the following:

Step	Action
1.	Remove the analyzer covers and inspect the fluid transport system for leaks.
2.	Check for poor tube connections or worn tubes. Repair as required.
3.	Check the inlet gasket; change if required.
4.	Ensure that electrodes are properly mounted in the measuring chamber and the electrode connector is latched shut.
5.	Mount all items, restart the analyzer by pressing Restart . If the error has been corrected, the analyzer performs a restart sequence (includes a leakage test) and enters the Ready mode. If the Hold mode remains, contact a service representative.

Analyzer messages

Messages on user and manager levels

The following messages will be seen on the manager levels. The messages are listed in numerical order.

Operator actions are listed in order of priority. Perform the first action in the list; if unsuccessful, try the next action, etc.

No.	Message	Interpretation	Operator action
1	Inconsistent software versions	Inconsistent versions of different software modules. May appear after replacing a complete module or as a result of an incomplete software upgrade.	Contact Radiometer service representative. Removal condition: Successful software consistency check.
83	Value above reference range	Parameter value is above the user-defined reference range. This is only a message, not an error.	No action required.
84	Value below reference range	Parameter value is below the user-defined reference range. This is only a message, not an error.	No action required.
85	Value is below the critical limit	Parameter value is below the user-defined critical limit. This is only a message, not an error.	No action required.
86	Value is above the critical limit	Parameter value is above the user-defined critical limit. This is only a message, not an error.	No action required.
89	Measured QC value above the control range	Measured parameter value is above the upper limit of the control range.	-Verify procedure and repeat measurement. - Refer to the <i>Quality Control Systems Reference Manual</i> .

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
90	Measured QC value below control range	Measured parameter value is below the lower limit of the control range.	<ul style="list-style-type: none"> - Verify procedure and repeat measurement. - Refer to the Quality Control Systems Reference Manual.
93	Value above the reportable range	Parameter value is above the reportable range. See <i>chapter 13: Specifications</i> .	<ul style="list-style-type: none"> - Check for and remedy other errors related to the result, system messages, or calibration status.
94	Value below the reportable range	Parameter value is below the reportable range. See <i>chapter 13: Specifications</i> .	<ul style="list-style-type: none"> - Perform QC. If the QC result is accepted, the blood sample may be suspected. - Repeat measurement on a new blood sample. - Perform the Electrode Troubleshooting procedure.
117	LIS/HIS: Invalid connection configuration	The communication configuration or the protocol definition was invalid.	Check the communication parameters specified in Communications setup.
128	LIS/HIS: Failed to open connection	The communication hardware was busy or the remote system did not respond.	<ul style="list-style-type: none"> - Check that the remote system is running, correctly configured and responding. - Check communication parameters, e.g. baud rate, parity, IP address, etc., as defined in Communication setup. - Reboot the analyzer.
129	LIS/HIS: Failed to close connection	Messages were queued when the communication channel was closed. Results and other messages sent by the analyzer to a remote system may be lost.	If the problem persists, check the communication hardware. The remote system may lack buffer capacity.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
131	LIS/HIS: Failed to send packet	A communication error occurred while sending a message. The message was not sent.	- Check that the remote system is running and responding. - Check communication hardware including cables. - Repeat sending.
132	LIS/HIS: Failed to receive packet	An error occurred while receiving a message. The analyzer was not able to recognize the received message.	- Check that protocol types are correctly configured on both the analyzer and the remote system. - Contact Radiometer service representative.
133	LIS/HIS: Connection lost	A previously established LIS/HIS connection has been lost.	- Check that the remote system is running and responding. - Check cables.
134	LIS/HIS: Connection established	The connection was successfully established.	No action required. The message is informative.
165	LIS/HIS: High level protocol could not generate high level packet	An error occurred while formatting a message.	- Check protocol configurations. - Contact Radiometer service representative.
166	LIS/HIS: General communication error	An internal error occurred in the LIS/HIS communication module.	Contact Radiometer service representative if the problem persists.
167	LIS/HIS: High level protocol received packet in wrong format	An error occurred while parsing (interpreting) a message.	- Check protocol configurations. - Contact Radiometer service representative.
200	User msg:	This is only a message. An operator has entered a note in the log.	No action required.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
201	Westgard Rule (1.2s) violation	Measured parameter value is outside the mean \pm 2 SD range.	<ul style="list-style-type: none"> - Verify procedure and repeat measurement. - Check Replacement Status for pending replacements. - Refer to the <i>Quality Control Systems Reference Manual</i> for detailed evaluation procedure.
202	Westgard Rule (1.3s) violation	Measured parameter value is outside the mean \pm 3 SD range.	
203	Westgard Rule (2.2s) violation	Two consecutive measurements are outside the mean \pm 2 SD range on the same side of the mean. This may indicate a shift.	
204	Westgard Rule (R.4s) violation	The difference between two consecutive measurements exceeds 4 SD. This may indicate an inconsistency in your procedure or an unstable analyzer.	
205	Westgard Rule (4.1s) violation	Four consecutive measurements are outside the mean \pm 1 SD range on the same side of the mean. A trend or shift is indicated. Patient results should be considered unreliable until the problem is remedied.	<ul style="list-style-type: none"> - Check the electrode drift during last calibration. - Check Replacement Status for pending replacements.
206	Westgard Rule (10.x) violation	Ten consecutive measurements are on the same side of the mean. A trend or shift is indicated. Patient results should be considered unreliable until the problem is remedied.	

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
207	Calibration schedule reminder(s) present	One or more scheduled calibrations are overdue.	Check the Calibration Status and perform any pending calibrations.
208	Quality control schedule reminder(s) present	One or more scheduled QC measurements are overdue.	Check the Quality Control Status and perform the pending quality control.
209	Replacement schedule reminder(s) present	One or more scheduled replacements are overdue.	Check the Replacement Status and perform any pending replacement actions.
210	Calibration error(s) present	An error registered on one or more parameters during the last calibration.	Check the Calibration Status for errors in latest calibration results for the given parameter. View calibration error messages and take required corrective action.
211	Quality control error(s) present	One or more errors registered during last QC measurement in one of the installed QC levels.	Check the Quality Control Status for errors. View QC error messages and take required corrective action.
212	System message(s) present	One or more systems errors are present.	Check the System Messages Status for errors. Take required corrective action.
213	Automatic backup failed	An error occurred during the scheduled data backup.	<ul style="list-style-type: none"> - Check Automatic Backup Setup. - Check network and servers used for the backup. - Contact your IT engineer.
214	Automatic backup succeeded	The scheduled automatic backup was completed successfully.	No action required.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
216	Printer error	The printer is out of paper, paper is jammed, or some other printer problem has occurred.	<ul style="list-style-type: none"> - Check printer paper. Clear any jam or mount a roll. - Press Temporary Shutdown in the Utilities menu. Confirm shutdown and wait for the prompt to be displayed. Switch off the power, then switch the analyzer on again. - If the error persists, contact Radiometer service representative.
217	Replacement:	The message is used in the Activity log to indicate a performed replacement.	No action required.
219	Conditioning error in El/Met electrode module	Rinse Solution was not detected in El/Met electrode module. The glucose and lactate results will be reported as "....." in the next measurement.	<ul style="list-style-type: none"> - Check Rinse Solution for adequate volume, proper installation or obstructions in container opening. Replace as necessary. - Perform the Fluid transport troubleshooting procedure. <p>Removal condition: Successful Rinse.</p>
232	Oximetry calibration error	The Oxi spectrum contains invalid or missing data.	<ul style="list-style-type: none"> - Perform a 2-point calibration. - Contact Radiometer Service Representative if the problem persists.
234-238, 245-252, 254-258, 269, 314- 316	Oximetry hardware error	The Oxi module has a hardware error.	<ul style="list-style-type: none"> - Perform a 2-point calibration. - Contact Radiometer Service Representative if the problem persists.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
259, 270, 354-357	Temperature error	Analyzer temperature is outside 37.0 ± 0.2 degrees Celsius.	<ul style="list-style-type: none"> - Ensure the ambient temperature is between 15 and 32 degrees Celsius. - If the system has just performed a cold start, wait for error to disappear. - Replace the fan filter if dirty. - Shield analyzer from direct sunlight and other heat sources. - Contact Radiometer service representative.
290	Warning: SHb detected	<i>F</i> SHb detected in the range of 1-10 %.	No action required. For information only.
291	SHb too high	Detected <i>F</i> SHb is greater than 10 %. Measurement accuracy is affected.	Repeat the measurement.
292	Turbidity too high	Turbidity is greater than 5 %: too high for reliable measurements.	<ul style="list-style-type: none"> - Check pump tubes and inlet tube for leaks. Repair as necessary. - Hyperlipemic sample; decrease the lipemic content by, e.g. centrifuge or extraction. - Perform the measurement on a blood sample from a healthy donor. - Contact Radiometer service representative.
293	Warning: HbF detected and compensated for	Detected <i>F</i> HbF is greater than 20 % of ctHb. Oxi parameters are automatically corrected.	No action required. For information only.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
326	Empty Gas 1 cylinder	Gas 1 cylinder is detected as empty.	- Enter Replacement mode via Replacement Status.
327	Empty Gas 2 cylinder	Gas 2 cylinder is detected as empty.	- Scan the barcode of a new Gas 1 or 2 cylinder. - Replace Gas 1 cylinder. (See chapter 7: <i>Replacements</i> for detailed information.) Removal condition: Gas pressure in Gas 1 or 2 cylinder.
328	No leading air segment in inlet's liquid sensor within time frame	Air segment in front of sample is too small or missing during sample aspiration, possibly due to obstructions in inlet or problems with liquid sensors. Measurement is aborted.	- Check inlet for obstructions and clean as required. - Perform liquid sensor adjustment. - Perform the Fluid Transport Troubleshooting procedure.
329	QC expiration date exceeded	The quality control measurement was performed on an expired control solution.	Discontinue the use of the lot and set up a valid lot for the control solution.
331	No sample detected during sample aspiration	No sample detected in the pH/BG module. Measurement is aborted.	- Ensure that adequate sample volume is used. - Check the sample for clots. - Perform the Fluid Transport Troubleshooting procedure.
332, 333	pH/BG module not filled	Sample did not fill the pH/BG module properly during aspiration. Measurement is aborted.	- Ensure that adequate sample volume is used. - Check the sample for clots. - Perform the Fluid Transport Troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
339-340. 342-343, 345-346	Pump calibration error	The pump calibration failed for one or more pumps. The previous pump calibration is used. A successful pump calibration should be attempted as soon as possible.	- Repeat pump calibration. - Perform the Pump Troubleshooting procedure. Removal condition: Successful pump calibration.
367	pH/BG not filled within time frame	pH/BG module did not fill properly with calibration solution. Calibration is aborted.	- Check the solution containers for adequate volume. Replace as required. - Perform the Fluid Transport Troubleshooting procedure. Removal condition: Successful calibration.
369, 370	El/Met not filled within time frame	El/Met module did not fill properly with calibration solution. Calibration is aborted.	- Check the solution containers. Replace as required. - Perform the Fluid transport troubleshooting procedure. Removal condition: Successful calibration.
374	Inhomo- geneous sample at pH/BG module	pH/BG lower liquid sensor detected air bubbles in the sample; they might affect the measurement. All parameters are marked with "?".	- Ensure the sample is free of air bubbles and that sufficient volume is used. - Check the condition of the inlet gasket. Replace as necessary.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
375	Calibration status out of limits	The status value is outside the range for the given parameter: pH: 6.7-8.1 $p\text{CO}_2$: 6.2-260 mmHg or 0.83-34.66 kPa $c\text{K}^+$: 0.5-12 mmol/L $c\text{Na}^+$: 10-250 mmol/L $c\text{Ca}^{2+}$: 0.1-20 mmol/L $c\text{Cl}^-$: 30-900 mmol/L	<ul style="list-style-type: none"> - Check for and remedy any System Messages. - Perform any pending electrode replacements. - Check that electrodes are properly installed. - Verify that proper solutions and gases are being used. - Perform the Electrode Troubleshooting procedure. <p>Removal condition: Successful 1- or 2-point calibration.</p>
376	Calibration Drift 1 out of range	The Drift 1 value exceeds the user-defined tolerance.	<ul style="list-style-type: none"> - Check for and remedy any System Messages. - Perform any pending electrode replacements.
377	Calibration Drift 2 out of range	The Drift 2 value exceeds the user-defined tolerance.	<ul style="list-style-type: none"> - Check that electrodes are properly installed. - Verify that proper solutions and gases are being used. - Perform the Electrode Troubleshooting procedure. <p>Removal condition: Successful 1- or 2-point calibration.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
378	Calibration sensitivity out of range	The sensitivity value is out of range for the given parameter: pH: 92-103 % pCO ₂ : 85-100 % pO ₂ : 5-40 pA/mmHg or 37.5-300 pA/kPa cK ⁺ : 92-105 % cNa ⁺ : 90-105 % cCa ²⁺ : 90-105 % cCl ⁻ : 85-100 % cGlu: 100-1800 pA/mM cLac: 150-2000 pA/mM	<ul style="list-style-type: none"> - Check for and remedy any System Messages. - Check that electrodes are properly installed. - Verify that proper solutions and gases are used. - Perform the Electrode Troubleshooting procedure. <p>Removal condition: Successful 1- or 2-point calibration.</p>
379	Calibration unstable. (response fault)	An electrode response fault occurred during calibration.	<ul style="list-style-type: none"> - Check for and remedy any System Messages. - Perform any pending replacements including electrodes. - Check that electrodes are properly installed. - Verify that proper solutions and gases are used. - Perform the Electrode Troubleshooting procedure. <p>Removal condition: Successful 1- or 2-point calibration.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
386	Barometer out of range	The barometer reading is out of the range: 450-800 mmHg or 60.0-106.7 kPa. Measurement results are marked with "?".	<ul style="list-style-type: none"> - Check the measured pressure in Barometer Setup program and compare it to that of an external barometer. Adjust the analyzer pressure accordingly. - Contact Radiometer service representative.
408	Zero current error	Zero current was too high during calibration.	<ul style="list-style-type: none"> - Check for and remedy System Messages. - Perform any pending replacements, including electrodes. - Perform the Electrode troubleshooting procedure. - Contact Radiometer service representative.
443	Ca(7.4) not usable	cCa^{2+} at pH 7.4 is not usable as pH is out of the range 7.2-7.6.	No action required.
452	Interference during measurement	Interference was detected during measurement.	Check the patient record for medication containing possible interfering substances.
467	Inhomogeneous sample at EI/Met module	Lower liquid sensor at EI/Met module detected air bubbles. The affected parameters are marked with "?".	<ul style="list-style-type: none"> - Repeat the measurement ensuring that the sample is free of air bubbles and that proper sample volume is used. - Replace pump tubing in pH/BG and EI/Met modules and solution pump. - Contact Radiometer service representative.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
474	No sample in EI/Met upper liquid sensor within time limit	The sample did not fill the EI/Met module properly.	<ul style="list-style-type: none"> - Check the sample for clots. - Ensure sample volume matches the selected sample mode. - Perform the Fluid Transport Troubleshooting procedure.
475	No sample in Oxi liquid sensor within time limit	The sample did not fill the oximetry module properly.	<ul style="list-style-type: none"> - Check the sample for clots. - Ensure sample volume matches the selected sample mode. - Perform the Fluid Transport Troubleshooting procedure.
476	Measurement unstable	The electrode response fault occurred during measurement.	<ul style="list-style-type: none"> - Check for and remedy other errors in System Message or Calibration Status. - Repeat the measurement. - Perform any pending replacements, including electrodes. - Ensure the electrode is properly installed. - Ensure the analyzer is properly grounded. - Perform QC. If the QC result value is within the control range, the blood sample may be suspected. Continue troubleshooting. - Perform the Electrode Troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
478	$p\text{CO}_2$ drifting	The $p\text{CO}_2$ drift value exceeds the user-defined limits + 0.3 kPa during flush.	<ul style="list-style-type: none"> - Call 1-point calibration. - Check for and remedy any specific errors in the last calibration result, then call another 1-point calibration. - Contact Radiometer service representative.
480	$p\text{O}_2$ drifting	The $p\text{O}_2$ drift value exceeds the user defined limits + 0.3 kPa during flush.	<ul style="list-style-type: none"> - Contact Radiometer service representative.
481-482	Conditioning error	Conditioning error is possible due to missing Rinse Solution or gas. This could result in impaired $p\text{CO}_2$, $c\text{Glu}$ and $c\text{Lac}$ results.	<ul style="list-style-type: none"> - Check the Rinse Solution container and gas cylinders for sufficient content. Replace as required. - Perform the Fluid Transport Troubleshooting procedure. <p>Removal condition: Successful rinse.</p>
484	Today is last day in current statistical month – remember to print QC statistics	After the current day, quality control statistics obtained over the month will be deleted and new statistics started.	Print the QC statistics if a copy is required.
487	A new statistical month has begun – remember to export WDC data	A new statistical month has begun.	<p>Make a WDC report disk.</p> <p>Removal condition: A WDC report disk has been made.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
493	Warning: Bilirubin detected and compensated for	The detected bilirubin concentration is greater than 50 $\mu\text{mol/L}$. $ct\text{Bil}(\text{blood}) = (1-\text{Hct}) \times ct\text{Bil}(\text{plasma})$ is the diluted plasma $ct\text{Bil}$. The dilution occurs due to hemolyzation of the red blood cells. It is a warning only.	No action required.
494	Bilirubin too high	The detected bilirubin concentration is greater than 2000 $\mu\text{mol/L}$. $ct\text{Bil}(\text{blood}) = (1-\text{Hct}) \times ct\text{Bil}(\text{plasma})$ is the diluted plasma $ct\text{Bil}$. The dilution occurs due to hemolyzation of the red blood cells. It is a warning only.	No action required.
499	Sample too early in Oxi liquid sensor.	The Oxi module detected liquid prematurely during sample aspiration. The activity is aborted.	<ul style="list-style-type: none"> - Check the sample for clots. - Repeat measurement. - Replace inlet gasket. - Perform the Fluid transport troubleshooting procedure.
500	Rinse detected by pH/BG module when not expected	The pH/BG module detected liquid unexpectedly.	Perform the Fluid transport troubleshooting procedure.
501	Rinse not aspirated into the pH/BG module within time limit	The pH/BG module was not filled properly with Rinse Solution.	<ul style="list-style-type: none"> - Check the Rinse Solution for sufficient volume and proper mounting. Replace as necessary. - Perform the Fluid transport troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
503	Unable to fill inlet with continuous rinse segment during Pump Calibration	Three attempts to fill the inlet probe with a continuous rinse segment have failed; the Pump Calibration program aborts.	<ul style="list-style-type: none"> - Check Rinse Solution for sufficient volume. Replace as necessary. - Perform the Pump troubleshooting procedure.
504	No sample in EI/Met lower liquid sensor within time limit	The sample did not fill EI/Met module properly. The activity is aborted.	<ul style="list-style-type: none"> - Check the sample for clots. - Ensure that sample volume matches selected sample mode. - Perform the Fluid transport troubleshooting procedure.
506	EI/Met upper liquid sensor did not detect Cleaning Solution	The EI/Met module was not filled properly during Cleaning program. Cleaning is aborted.	<ul style="list-style-type: none"> - Check the Cleaning solution for sufficient volume. Replace as required. - Perform Fluid transport troubleshooting procedure.
507	pH/BG upper liquid sensor did not detect Cleaning solution	The pH/BG module was not filled properly during Cleaning program. Cleaning is aborted.	Removal condition. Successful Cleaning.
508	Rinse error	<p>Rinse Solution was not detected during Rinse program.</p> <p>Measurements and calibrations cannot be performed until the condition is removed.</p>	<ul style="list-style-type: none"> - Check the rinse solution for sufficient volume. Replace as required. - If the message "Inlet flow impeded" (765) has been reported, replace or clean inlet probe. - Perform Fluid transport troubleshooting procedure. <p>Removal condition: Successful Rinse.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
509	pH/BG upper liquid sensor did not receive Rinse from above	The pH/BG module was not filled properly during Rinse program; automatic Refill is attempted.	<ul style="list-style-type: none"> - Check the Rinse Solution for sufficient volume. Replace as required. - Perform Fluid transport troubleshooting procedure.
510	El/Met upper liquid sensor did not receive Rinse from above	The El/Met module was not filled properly during Rinse program; automatic Refill is attempted.	<ul style="list-style-type: none"> Removal condition. Successful Rinse.
512	Temperature error	<p>The temperature was outside the required range during measurement or calibration.</p> <p>All results are marked with "?".</p>	<ul style="list-style-type: none"> Ensure ambient temperature is between 15 and 32 °C. - If the analyzer has recently performed a Cold start, wait for temperature error to disappear. - Shield analyzer from direct sunlight or heat sources. - Contact Radiometer service representative.
513	No gas	<p>Measurement or calibration was performed with Gas error present.</p> <p>Activity is aborted.</p>	<ul style="list-style-type: none"> - Check pressure in gas cylinders. Replace as required. - Verify that cylinders are properly installed. - Enter the Replacement screen (via Replacement Status) and re-scan the barcode labels of the gas cylinders.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
521	Inhomogeneous sample	Air bubbles were detected in the sample. Results may have "?".	<ul style="list-style-type: none"> - Ensure sampler and sample volume match the selected sample mode. - Repeat measurement. - Check pump tubes and inlet for leaks. Replace tubing and inlet gasket as required.
529, 531-532, 534, 537	Liquid sensor calibration error	One or more of the liquid sensors failed calibration.	<ul style="list-style-type: none"> - Repeat liquid sensor calibration. - Perform Fluid transport troubleshooting procedure.
538	pH/BG pump error	The pH/BG module pump failed to calibrate. Previous calibration is used until a successful pump calibration is performed.	<ul style="list-style-type: none"> - Perform Pump troubleshooting procedure. - Contact Radiometer service representative.
539	El/Met pump error	The El/Met module pump failed to calibrate. Previous calibration is used until a successful pump calibration is performed.	<ul style="list-style-type: none"> - Perform Pump troubleshooting procedure. - Contact Radiometer service representative.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
541	Solution pump error	The solution pump failed to calibrate. Previous calibration is used until a successful pump calibration is performed.	<ul style="list-style-type: none"> - Perform Pump Troubleshooting procedure. - Contact Radiometer service representative.
564	No Cleaning Solution detected by Oxi liquid sensor during initializing.	No Cleaning Solution was detected by Oxi module during Startup.	<ul style="list-style-type: none"> - Check the Cleaning solution for sufficient volume. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
567	No Cal 2 Solution detected by Oxi liquid sensor during initializing	No Cal 2 Solution was detected by Oxi module during Startup.	<ul style="list-style-type: none"> - Check the Cal 2 solution for sufficient volume. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
569	No Cal 1 Solution detected by Oxi liquid sensor during initializing	No Cal 1 Solution was detected by the Oxi module during Startup.	<ul style="list-style-type: none"> - Check the Cal 1 solution for sufficient volume. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
571	No Rinse Solution detected by Oxi liquid sensor during initializing	No Rinse Solution was detected by the Oxi module during Startup.	<ul style="list-style-type: none"> - Check the Rinse solution for sufficient volume. Replace as necessary. - Perform Fluid transport troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
573	Oximetry hardware error	The Oxi module has a hardware error.	<ul style="list-style-type: none"> - Perform a 2-point calibration. - Contact Radiometer service representative. Removal condition: Successful 2-point calibration.
574	Oximetry calibration error	The Oxi spectrum contains invalid or missing data.	<ul style="list-style-type: none"> - Perform a 2-point calibration. - Contact Radiometer service representative. Removal condition: Successful 2-point calibration.
577-578	Option key error	An error occurred in the analyzer protection system. The analyzer cannot be used.	<ul style="list-style-type: none"> - Shut down the analyzer using Temporary Shutdown, then restart it. - Contact Radiometer service representative. Removal condition: Option keys correctly installed and accepted by analyzer.
579	Oximetry hardware problem. Not possible to measure.	Parameter cannot be reliably measured because of a hardware problem.	<ul style="list-style-type: none"> Perform a 2-point calibration. - Contact Radiometer service representative. Removal condition: No errors detected by oximetry hardware.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
580	Oximetry hardware problem. Possible to measure.	A hardware problem exists in the Oxi module. Parameter can be measured.	<ul style="list-style-type: none"> - Perform a 2-point calibration. - Contact Radiometer service representative. <p>Removal condition: No errors detected by oximetry hardware.</p>
581	Oximetry measuring error	Oximetry spectrum deviates from the expected blood or QC spectrum. The measurement may be unreliable.	<ul style="list-style-type: none"> - Check patient record for medication containing possible interfering substances. - Repeat the measurement. - Call a 2-point calibration. - Contact Radiometer service representative.
582	tHb calibration outside limits	tHb calibration failed.	<p>Repeat calibration.</p> <p>Removal condition: Successful tHb calibration.</p>
583	Measured value outside reportable range for the parameter	The parameter value is outside the defined reportable range or the analyzer measurement range.	<ul style="list-style-type: none"> - Check for and remedy other errors in the result, and any errors in System Messages or Calibration Status. - Perform QC. If the QC result value lies within the measuring range, the blood sample may be suspected. - Perform the Electrode Troubleshooting procedure.
588	Measured QC value lower than statistical range	The parameter value is below the lower limit of the user-defined statistical range. Measurement is not included in statistics.	<ul style="list-style-type: none"> - Verify procedure and repeat the measurement. - Refer to the <i>Quality Control Systems Reference Manual</i> for details on the evaluation of the results.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
589	Measured QC value higher than statistical range	The parameter value is above the upper limit of the user-defined statistical range. Measurement not included into statistics.	<ul style="list-style-type: none"> - Verify procedure and repeat the measurement. - Refer to the <i>Quality Control Systems Reference Manual</i> for details on the evaluation of the results.
593	Insufficient sample	Sample volume is too small for the selected measuring mode. Affected parameters will be marked with "?".	<ul style="list-style-type: none"> - Make sure sample volume matches the selected measuring mode. - Repeat the measurement, ensuring sufficient sample volume. - Contact Radiometer service representative.
597	Liquid detected in pH/BG module during Gas Calibration	Unexpected liquid is detected by the pH/BG module during calibration. Calibration is aborted.	<ul style="list-style-type: none"> - Repeat calibration. - Perform Fluid transport troubleshooting procedure.
600	Demo option will expire soon	One or more currently installed demo options will expire and be removed within the next seven days.	<p>To have the option permanently, contact a Radiometer sales or service representative.</p> <p>Removal condition: Options expired or permanent options installed.</p>
604	Parameter not installed	Parameter was not installed or is corrupted. Parameter cannot be measured.	Contact Radiometer service representative.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
605	Cal expired	Too long time elapsed since the last successful calibration of the parameter. Calibrations of the parameter are considered invalid and values reported as ".....".	Perform 1- or 2-point calibration. Removal condition: Successful 1- or 2-point calibration.
606	Cal expired (pH)		
608	Cal expired (pCO ₂)		
609	Cal expired (pO ₂)		
610	Cal expired (K)		
611	Cal expired (Na)		
612	Cal expired (Ca)		
613	Cal expired (Cl)		
614	Cal expired (Glu)		
615	Cal expired (Lac)		
616	Cal expired (Oxi)		
618	Waste detector error	The waste detector may be faulty or damaged.	Contact Radiometer service representative. Removal condition: Functioning waste detector installed.
619	Waste container missing	The waste container is missing or improperly mounted.	Mount the waste container properly. Removal condition: Waste container properly mounted.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
620	Waste container full	Waste container is filled to near-maximum capacity. Unless replaced soon, the analyzer will enter Standby until the container is replaced.	Replace waste container. Removal condition: Empty Waste container installed.
621	Waste container critically full	The waste container is filled to maximum capacity. The analyzer enters Standby mode; no measurements or calibrations can be performed.	Replace waste container. Removal condition: Empty Waste container installed.
622	Expected liquid level below 0	One or more of the solution barcodes was entered incorrectly during replacement. The analyzer cannot monitor solution consumption.	Check the solution containers and replace as necessary. Remember to scan barcodes. Removal condition: Solution containers correctly installed and solution barcodes correctly recorded by the analyzer.
623	Solution empty	Wet section activities are suspended due to one or more empty solution containers.	Check the solution levels and replace containers as necessary. Removal condition: Sufficient level of all solutions.
624	Solution missing	One or more solution containers is missing or improperly mounted.	Check that all solution containers are properly mounted. Removal condition: All solution containers are mounted correctly.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
628	No Cleaning Solution detected by Oxi liquid sensor during Refill	Oxi module was not filled correctly with Cleaning Solution.	- Check Cleaning Solution level in the container. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
630	No Cal 2 Solution detected by Oxi liquid sensor during Refill	Oxi module was not filled correctly with Cal 2 Solution.	- Check Cal 2 Solution level in the container. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
632	No Cal 1 Solution detected by Oxi liquid sensor during Refill	Oxi module was not filled with Cal 1 Solution.	- Check Cal 1 Solution level in the container. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
634	No Rinse Solution detected by Oxi liquid sensor during Refill	Oxi module was not filled with Rinse Solution.	- Check Rinse Solution level in the container. Replace as necessary. - Perform Fluid transport troubleshooting procedure.
636	Gas 1 cylinder low pressure	Low pressure level is detected in Gas 1 cylinder.	Replace the Gas 1 cylinder within a few days. Removal condition: Sufficient pressure in Gas 1 cylinder.
637	Gas 2 cylinder low pressure	Low pressure level is detected in Gas 2 cylinder.	Replace the Gas 2 cylinder within a few days. Removal condition: Sufficient pressure in Gas 2 cylinder.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
641	ABL/DMS PC restarted	The analyzer was restarted from power off.	No action required. For information only.
644	Missing sample at EI/Met measuring module in Capillary 95 μ L mode	The EI/Met module was not filled properly with sample. Measurement is aborted.	- Check pump tubing in pH/BG module and solution pump. Replace as necessary. - Contact Radiometer service representative.
648	Calibration failed or not accepted	The last calibration was aborted or not accepted.	- Check solution levels and replace containers as necessary. - Check for and remedy System Messages. - Repeat the calibration. Removal condition: Successful calibration.
652	Oxi liquid sensor did not receive Rinse from the Fluidic module	Rinse solution was not detected by the Oxi module.	- Check Rinse Solution for sufficient volume and proper mounting. Replace as necessary. - Perform Fluid transport troubleshooting procedure. Removal condition: Successful Rinse.
653	Sample in pH/BG upper liquid sensor prematurely during aspiration	pH/BG module was not filled correctly during sample aspiration.	- Repeat measurement. - Perform Fluid transport troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
654	Sample in EI/Met upper liquid sensor detected prematurely during aspiration	EI/Met module was not filled correctly during sample aspiration.	<ul style="list-style-type: none"> - Ensure sample is free of clots. - Repeat measurement. - Perform Fluid transport troubleshooting procedure.
655	Sample in pH/BG upper liquid sensor detected prematurely during aspiration	pH/BG module was not filled correctly during sample aspiration.	<ul style="list-style-type: none"> - Repeat measurement. - Perform Fluid transport troubleshooting procedure.
656	Sample in Oxi liquid sensor detected prematurely during aspiration	Oxi module was not filled correctly during sample aspiration.	<ul style="list-style-type: none"> - Ensure sample is free of clots. - Repeat measurement. - Perform the Fluid Transport Troubleshooting procedure.
658	Inlet flaps removed	The analyzer entered Hold because both inlet flaps were removed.	<p>Ensure the inlet flaps are properly mounted prior to restart.</p> <p>Removal condition: Inlet flaps properly mounted.</p>
659	Cover removed or window opened	The analyzer entered Hold because the cover was removed or the window to the electrode modules opened.	<p>Position the cover and close the window prior to restart.</p> <p>Removal condition: Cover in position and window closed.</p>
660	Inlet calibration error	An error occurred during Inlet calibration. Analyzer entered Hold mode.	<ul style="list-style-type: none"> - Remove the inlet gasket. - Inspect the gasket and inlet probe. Replace as necessary. - Press Restart. <p>Removal condition: Successful Inlet calibration</p>

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
661	Leak detected	A leak was detected. The analyzer entered Hold mode.	<ul style="list-style-type: none"> - Remove the analyzer covers and inspect the fluid transport system for leaks. - Check the inlet gasket, pump tubes and ensure electrodes are mounted correctly. Repair as necessary - Restart the analyzer. During restart the analyzer performs a leak detection. <p>Removal condition: Leak test completed without any leaks detected.</p>
662	Barometer out of range	Measured barometer value is outside the measuring range: 60-106.7 kPa.	Contact Radiometer service representative.
663	Leakage	A leak was detected in the fluid transport system.	<ul style="list-style-type: none"> Remove the analyzer covers and inspect the fluid transport system for leaks. - Check the inlet gasket, pump tubes and ensure electrodes are mounted correctly. Repair as necessary. - Restart the analyzer. During restart the analyzer performs a leak detection. <p>Removal condition: Leak test completed without any leaks detected.</p>
664	Sample transport problem	A problem was detected during sample transport through the analyzer.	<ul style="list-style-type: none"> - Check the sample for clots. - Ensure sample volume matches selected sample mode. - Perform the Fluid Transport Troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
671	Analyzing Unit service setup non-default	An option in the service setup was changed from default setting.	Contact Radiometer service representative. Removal condition: Options restored to default values.
677	Unreliable	A measurement or calibration was attempted during "Conditioning error in EI/Met electrode module".	- Check whether Conditioning error (525) was reported during the last analyzer activity. If not, repeat measurement/calibration. - Check Rinse Solution level in the container. - Perform Rinse. Removal condition: Rinse without Conditioning error.
678	Heater error	One or more measuring modules are over-heated.	- Ensure the ambient temperature is between 15 and 32 °C. - Shut down the analyzer using Temporary Shutdown, then restart the analyzer. - Replace fan filter if dirty. - Shield analyzer from direct sunlight and other heat sources. - Contact Radiometer service representative.
679	Barometer error	Measured parameter may be unreliable due to barometer error.	Contact Radiometer service representative.
680	pH/BG module not active	The pH/BG module is not responding due to internal communication problem.	Shut down the analyzer using Temporary Shutdown, then restart it. - Contact Radiometer service representative. Removal condition: pH/BG module ready.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
681	El/Met module not active	The El/Met module is not responding due to internal communication problem, or software configuration does not match the analyzer type.	<ul style="list-style-type: none"> - Shut down the analyzer using Temporary Shutdown, then restart it. - Contact Radiometer service representative. Removal condition: El/Met module ready, or software configured without El/Met module support.
682	Oxi module not active	The Oxi module is not responding due to internal communication problem, or software configuration does not match the analyzer type.	<ul style="list-style-type: none"> - Shut down the analyzer using Temporary Shutdown, then restart it. - Contact Radiometer service representative. Removal condition: Oxi module ready, or software configured without Oxi module support.
683	Inlet module not active	The inlet module is not responding due to internal communication problem.	<ul style="list-style-type: none"> - Shut down the analyzer using Temporary Shutdown, then restart it. - Contact Radiometer service representative. Removal condition: Inlet module ready.
688	ctHb/ceHb too low for Oxi calculation	ctHb < 1 mmol/L or ceHb < 0.75 mmol/L. If ctHb is too low FHHb, FO ₂ Hb, FCOHb and FMetHb are not calculated. If ceHb = cHHb + cO ₂ Hb is too low sO ₂ is not calculated.	Informative message. No analyzer error detected.
689	Gas pressure offset voltage out of range.	The gas pressure offset voltage measured by the transducer is out of range: 0.07-0.35 V.	<ul style="list-style-type: none"> - Restart analyzer. - Contact Radiometer service representative. Removal condition: Gas pressure transducer offset within the required range.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
692	ABL not connected to RADIANCE	The analyzer is not connected to RADIANCE.	Contact your RADIANCE /IT engineer. - Check RADIANCE communication setup including TCP/IP address, port No. and password. - Check that RADIANCE is responding. - Check network connections. Removal condition: RADIANCE connection established or disabled.
693	ABL not connected to RADIANCE - incorrect password.	The analyzer was refused connection to RADIANCE due to incorrect password.	Enter the correct password in the analyzer's RADIANCE Communication setup. Removal condition: RADIANCE connection established or disabled.
694	ABL connected to RADIANCE	The analyzer is connected to RADIANCE.	No action required.
695	ABL disconnected from RADIANCE	The analyzer was disconnected from RADIANCE.	No action required.
696	ABL<> RADIANCE communication error	Communication error between the analyzer and RADIANCE.	Contact Radiometer service representative.
697	Requested AutoCheck QC ampoule not present in carousel	A scheduled QC ampoule was absent in the carousel.	Refill AutoCheck carousel according to the packing list.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
698	Performing AutoCheck on last ampoule in schedule instead of non-present	If the scheduled QC ampoule was absent in the carousel, the analyzer performs QC measurement on the ampoule scheduled previously.	Refill AutoCheck carousel according to the packing list.
699	AutoCheck QC measurement started due to calibration error	The analyzer was set up to perform AutoCheck measurements in case of 1- or 2-point calibration errors.	Check Calibration Status and remedy any reported calibration errors.
700	Scheduled AutoCheck not run due to errors in last calibration	Last calibration contained an error, and the analyzer was set up to suspend AutoCheck measurements in case of calibration errors.	Check Calibration Status and remedy calibration errors.
703	QC expired	QC measurement is 25 % overdue (corrective action "Lock analyzer" has been selected in Setup program Corrective Actions).	Perform a quality control measurement. Removal condition: No QC measurements are pending.
704	AutoCheck QC measurement is repeated	The scheduled QC measurement was not accepted; the measurement was repeated as requested in Setup program Corrective Actions.	No action required.
705	AutoCheck QC measurement is repeated twice	The scheduled and the next QC measurements were not accepted; the measurement was repeated twice as requested in Setup program Corrective Actions.	No action required.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
707	Replacement overdue by 10 %. Analyzer locked	Replacement is overdue by 10 % (corrective action "Lock analyzer" was selected in Setup program Corrective Actions).	- Check Replacement Status and replace as required. - Unlock analyzer in Miscellaneous Setup program. Removal condition: No replacement pending.
708	Corrective action not possible due to empty AutoCheck carousel	Scheduled AutoCheck measurement was requested, but the carousel was empty.	Refill AutoCheck carousel.
709	El/Met module not expected	Software configuration does not match analyzer type.	Contact Radiometer service representative. Removal condition: Matching software and hardware configuration.
710	Oxi module not expected.	Software configuration does not match analyzer type.	Contact Radiometer service representative. Removal condition: Matching software and hardware configuration.
711	Warning: DysHb high	Blood sample has a high level of DysHb. $FCO_{Hb} + F_{MetHb} > 5\%$.	Informative message. No analyzer error was detected.
712	FHbF measurement not possible	Composition of blood sample makes FHbF measurement too inaccurate, but Oxi parameters are corrected for HbF. See explanation in the <i>Reference Manual</i> .	Informative message. No analyzer error was detected.
713	ctBil measurement not possible	Blood sample ctHb is so high (ctHb > 15.5 mmol/L) that nearly no plasma is left to measure plasma bilirubin on.	Informative message. No analyzer error was detected.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
714	AutoCheck mechanical error	A mechanical error occurred in one of the AutoCheck sub-modules.	<ul style="list-style-type: none"> - Check the AutoCheck module cover. Close if opened. - If error persists, contact Radiometer service representative.
715	AutoCheck communication error	Communication error between AutoCheck submodules.	<ul style="list-style-type: none"> - Shut down the analyzer using Temporary Shutdown, then restart the analyzer. - Contact Radiometer service representative.
716	AutoCheck cover missing	The cover was removed from the AutoCheck module.	<p>Mount the AutoCheck cover.</p> <p>Removal condition: AutoCheck cover is mounted correctly.</p>
717	Carousel packing not optimal	The AutoCheck carousel was not packed according to the schedule.	<p>Repack AutoCheck carousel according to the packing list.</p> <p>Removal condition: AutoCheck carousel packed according to Packing list.</p>
718	AutoCheck carousel will need refilling soon	AutoCheck ampoule stock is low.	<p>Refill AutoCheck carousel when convenient.</p> <p>Removal condition: AutoCheck refilled.</p>
719	Insufficient sample at pH/BG module	Air bubbles were detected in the sample with possible implications on measurement accuracy. All parameters are marked with "?".	<ul style="list-style-type: none"> - Ensure that sample is free of air bubbles. - Ensure that sample volume matches the selected sample mode. - Check inlet tube. Replace if necessary. - Repeat the measurement.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
720	Insufficient sample at EI/Met module	Air bubbles were detected in the sample with possible implications on measurement accuracy. All affected parameters are marked with "?".	<ul style="list-style-type: none"> - Ensure that sample is free of air bubbles. - Ensure that sample volume matches the selected sample mode. - Check inlet tube. Replace if necessary. - Repeat measurement.
722	Sample error	Insufficient or inhomogeneous sample during measurement.	<ul style="list-style-type: none"> - Check and remedy other fluid transport errors. - Repeat the measurement.
723	No Cleaning Solution detected by inlet during Startup	pH/BG module was not filled correctly with Cleaning Solution during Startup.	<ul style="list-style-type: none"> - Check Cleaning Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
724	No Cal 2 Solution detected by inlet during Startup	pH/BG module was not filled correctly with Cal 2 Solution during Startup.	<ul style="list-style-type: none"> - Check Cal 2 Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
725	No Cal 1 Solution detected by inlet during Startup	pH/BG module was not filled correctly with Cal 1 Solution during Startup.	<ul style="list-style-type: none"> - Check Cal 1 Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
726	No Rinse Solution detected by inlet during Startup	pH/BG module was not filled correctly with Rinse Solution during Startup.	<ul style="list-style-type: none"> - Check Rinse Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
727	No Cleaning Solution detected by inlet during Refill	pH/BG module was not filled correctly with Cleaning Solution during Refill.	<ul style="list-style-type: none"> - Check Cleaning Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
728	No Cal 2 Solution detected by inlet during Refill	pH/BG module was not filled correctly with Cal 2 Solution during Refill.	<ul style="list-style-type: none"> - Check Cal 2 Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
729	No Cal 1 Solution detected by inlet during Refill	pH/BG module was not filled correctly with Cal 1 Solution during Refill.	<ul style="list-style-type: none"> - Check Cal 1 Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
730	No Rinse Solution detected by inlet during Refill	pH/BG module was not filled correctly with Rinse Solution during Refill.	<ul style="list-style-type: none"> - Check Rinse Solution level. Replace container if necessary. - Perform Fluid transport troubleshooting procedure.
734	DMS not connected to Analyzing Unit	Data management system establishes connection to the Analyzing Unit, or the connection is lost.	<ul style="list-style-type: none"> - Wait a few minutes for the connection to establish. - Restart the analyzer. - If the error persists, contact Radiometer service representative.
738	Ampoule(s) in AutoCheck carousel not installed	AutoCheck carousel contains an ampoule which was not selected in Control Solutions Setup program.	<p>Read in the barcodes for all ampoules present in AutoCheck carousel – use inserts.</p> <p>Removal condition: Barcodes read in for all ampoules present in the AutoCheck carousel.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
739	Solution's composition not identifiable	AutoCheck ampoule solutions do not match labeling.	- Repeat measurement. - Contact Radiometer service representative if the problem persists.
740-743	AutoCheck mechanical error	A mechanical error occurred in one of the AutoCheck sub-modules.	- Check the AutoCheck module cover. Close if opened. - If the error persists, contact Radiometer Service Representative.
744	AutoCheck Laser Setup Error	AutoCheck barcode reader has failed.	- Restart analyzer. - If the error persists, contact Radiometer service representative.
745	Low hard disk space	Free hard disk space is below 100 Mb.	Move archive files to another storage device. Removal condition: More than 100 Mb of free hard disk space.
746	Rinse Solution low warning	Rinse Solution level is below the defined warning level.	Replace container if required. Removal condition: Solution level above warning level.
747	Cal 1 solution low warning	Cal 1 Solution level is below the defined warning level.	Replace container if required. Removal condition: Solution level above warning level.
748	Cal 2 Solution low warning	Cal 2 Solution level is below the defined warning level.	Replace container if required. Removal condition: Solution level above warning level.
749	Cleaning Solution low warning	Cleaning Solution level is below the defined warning level.	Replace container if required. Removal condition: Solution level above warning level.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
750	Solution projection adjusted	The estimated solution level was adjusted by the operator.	No action required.
751	<p>Message 751 is only found in the Activity Log to inform the user about activities that have taken place.</p> <p>The message is blank (empty) in the database, and when an activity occurs the actual status information is appended to it resulting in the logged 751-message.</p> <p>If the setting "Log All Measuring Activities" is enabled in Miscellaneous Setup, all wet section activities will be logged in the Activity Log as 751-messages.</p>		
753	Service Electrode Updatings enabled	Logging of sensor signals was enabled. This may be due to ongoing technical service activities on the analyzer. The condition does not affect analyzer functions.	<p>Contact Radiometer service representative if logging was not enabled on purpose.</p> <p>Removal condition: Electrode signal logging disabled by Radiometer service representative.</p>
763	AutoCheck temperature out of required range	The QC temperature was outside the range valid for the temperature correction algorithms.	<ul style="list-style-type: none"> - Ensure the ambient temperature is between 15 and 32 °C. - If the system has just performed a Cold start, wait for error to disappear. - Replace fan filter if dirty. - Shield analyzer from direct sunlight and other heat sources. - Contact Radiometer service representative. <p>Removal condition: AutoCheck temperature within the required range.</p>
764	Liquid detected in pH/BG module during Expired Air sample	Liquid sample detected during aspiration in the Expired Air mode.	Do not use the Expired Air mode for liquid samples.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
765	Inlet flow impeded	Inlet flow is impeded by some foreign matter.	- Perform Inlet troubleshooting procedure. - Perform the Protein Removal program. Removal condition: Inlet has no obstructions.
766	ABL not connected to RADIANCE – no RADIANCE connection license	The analyzer has been refused connection to RADIANCE because there is no connection licence available on RADIANCE.	Contact RADIANCE /IT engineer or Radiometer service representative. Removal condition: Connection to RADIANCE established.
767	ABL not connected to RADIANCE – ABL StatLink version too high	The analyzer has been refused connection to RADIANCE because the ABL StatLink version is higher than the RADIANCE StatLink version.	Contact RADIANCE /IT engineer or Radiometer service representative. Removal condition: Connection to RADIANCE established.
768	ABL not connected to RADIANCE – ABL StatLink version too low	The analyzer has been refused connection to RADIANCE because the ABL StatLink version is lower than the RADIANCE StatLink version.	Contact RADIANCE /IT engineer or Radiometer service representative. Removal condition: Connection to RADIANCE established.
769	ABL <> RADIANCE communication error	Communication error between the analyzer and RADIANCE.	Contact Radiometer service representative.
770	Failed to restore Custom Setup	The setup could not be restored.	- Download the setup data from another floppy disk, hard disk or network. - Contact Radiometer service representative if the error persists.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
771	Succeeded to restore Custom Setup	Restoring of setup is completed.	No action required.
772	User Activity:	User activity logged by operator.	No action required.
773	Remote operator logged on with user:	A remote operator has logged on the analyzer via NetOp	No action required.
774	Remote operator logged off with user:	An operator, remotely logged on via NetOp, has logged off or has been logged off by a local operator.	No action required.
775	Failed to restore Default Setup	Restoring analyzer setup to default values has failed.	Contact Radiometer service representative.
776	Succeeded to restore Default Setup	Restoring setup to default values is completed.	No action required.
778	Inlet gasket should be replaced soon	Inlet gasket is nearly worn out and should be replaced soon.	Replace inlet gasket.
779	Cleaning failed	The last Cleaning was aborted or interrupted.	<ul style="list-style-type: none"> - Check solution level and replace container as necessary. - Check for and remedy System Messages. - Repeat Sleaining. Removal condition: Successful Cleaning.
780	RADI-ANCE communication enabled	RADIANCE communication has been enabled as part of the RADIANCE Connection Setup.	Informative message. No action required.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
781	RADIANCE communication disabled	RADIANCE communication has been disabled as part of the RADIANCE Connection Setup.	Informative message. No action required.
782	RADIANCE output queue cleared	The output queue was cleared in RADIANCE Connection Setup.	Informative message. No action required.
783	Automatic backup started	Automatic backup (selected in Disk Functions Setup) has started.	Informative message. No action required.
785	Automatic archiving started	Automatic archiving (selected in Disk Functions Setup) has started.	Informative message. No action required.
786	Automatic archiving completed	Automatic archiving (selected in Disk Functions Setup) completed successfully.	Informative message. No action required.
787	Export of data logs started	Export of data logs was started by the user.	Informative message. No action required.
788	Hypochlorite detected: remembrane Glu, Lac and Cl electrodes.	<p>Measurement on a substance resembling hypochlorite has been performed.</p> <p>Any installed Glu, Lac and Cl electrodes have been damaged and must be remembraned before blood measurements can be performed.</p> <p>As a precaution, all parameters are marked with "Calibration Expired".</p>	<p>- Remembrane any installed Glu, Lac and Cl electrodes.</p> <p>- Perform a 2-point calibration.</p> <p>Removal condition: Successful 2-point calibration.</p>

Continued on next page

Analyzer messages, *Continued*

**Messages on
user and
manager levels
(*continued*)**

No.	Message	Interpretation	Operator action
790	Adaptive sample handling applied	Due to insufficient or inhomogeneous sample, the analyzer has automatically chosen an adaptive sample handling in order to report as many of the desired parameters as possible.	If missing parameters are needed, repeat the measurement with sufficient sample free of clots and air bubbles.
791	Parameter could not be measured	Due to insufficient or inhomogeneous sample, the parameter in question could not be measured.	If missing parameters are needed, repeat the measurement with sufficient sample free of clots and air bubbles.
792	Liquid sensor calibration error	One or more of the liquid sensors failed calibration.	- Repeat liquid sensor calibration. - Perform Fluid transport troubleshooting procedure.
793	pH/BG pump failed asymmetric calibration	The pH/BG module pump failed to calibrate pump asymmetry. The same calibration values will be used for both directions until a successful calibration of pump asymmetry is performed.	- Perform the Pump troubleshooting procedure. - Contact Radiometer service representative.
794	EI/Met pump asymmetry error	The EI/Met module pump failed to calibrate pump asymmetry. The same calibration values will be used for both directions until a successful calibration of pump asymmetry is performed.	- Perform the Pump troubleshooting procedure. - Contact Radiometer service representative.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
796	Solution pump asymmetry error	The Solution module pump failed to calibrate pump asymmetry. The same calibration values will be used for both directions until a successful calibration of pump asymmetry is performed.	- Perform the Pump Troubleshooting procedure. - Contact Radiometer service representative.
797	Waste pump asymmetry error	The Waste pump in the Solution module failed to calibrate pump asymmetry. The same calibration values will be used for both directions until a successful calibration of pump asymmetry is performed.	- Perform the Pump Troubleshooting procedure. - Contact Radiometer service representative.
798	User logged on	User logged on successfully.	No action required. Informative message.
799	User logged off	User logged off successfully.	Informative message. No action required.
800	Logon attempt failed	User tried to log on but did not provide a valid password.	Provide a valid password to log on.
801	Hard disk S.M.A.R.T. threshold(s) exceeded	The analyzer's hard disk drive has given a warning. This may mean imminent hard disk drive failure.	Contact Radiometer service representative.
807	Unauthorized software	Software option key is not installed. Analyzer cannot be used.	Contact Radiometer service representative.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
808	Calibration drift not available	<p>A calibration drift value could not be calculated, since this is the first calibration result after calibration drift monitoring was started.</p> <p>This message may appear on the first calibration result after the analyzer has been turned on or after the parameter in question has been enabled.</p> <p>A drift value will be calculated for the next calibration result.</p>	No action required. Informative message.
809	Service electrode updatings disabled	The message is used in the Activity log to indicate that Service Electrode Updatings has been disabled.	No action required. The message is for information only.
810-827	Parameter locked (pH, $p\text{CO}_2$, $p\text{O}_2$, $c\text{K}^+$, etc.)	<p>Parameter has been locked by a RADIANCE operator, as reflected in the Activity log.</p> <p>When a parameter is locked, presumably due to problems with QC, the parameter is respessed in patient results.</p>	<p>Await corrective actions initiated by the RADIANCE operator.</p> <p>Removal condition: Determined by the RADIANCE operator.</p>
831-848	Parameter unlocked (pH, $p\text{CO}_2$, $p\text{O}_2$, $c\text{K}^+$, etc.)	The message is used in the Activity log to indicate that a previously locked parameter has been unlocked.	No action required. The message is for information only.
852	RADIANCE	Message from RADIANCE	No action required. The message is for information only.

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels
(*continued*)

No.	Message	Interpretation	Operator action
853	LIS/HIS: Missing Communication Option key	No valid option key for LIS/HIS communication is installed on the analyzer.	Contact Radiometer service representative.
854	No leading air segment in inlet's lower liquid sensor within time frame	Air segment in front of sample is too small or missing during sample aspiration, possibly due to obstructions in inlet or problems with liquid sensor. Measurement is aborted.	<ul style="list-style-type: none"> - Check inlet for obstructions and clean as required. - Perform liquid sensor adjustment. - Perform the Fluid Transport Troubleshooting procedure.
855	Base Excess out of range	Base Excess exceeds +/- 30 mmol/L range	Informative message. No analyzer error was detected.
869	Adaptive sample handling applied (decay to pH/Oxi without Bil)	Due to insufficient or inhomogeneous sample, the analyzer has automatically chosen an adaptive sample handling in order to report as many of the desired parameters as possible.	If missing parameters are needed, repeat the measurement with sufficient sample free from clots and air bubbles.
870	Adaptive sample handling applied (decay to pH/Oxi)		
871	Adaptive sample handling applied (decay to pH/BG/Oxi)		

Continued on next page

Analyzer messages, *Continued*

Messages on user and manager levels (*continued*)

No.	Message	Interpretation	Operator action
872	Adaptive sample handling applied (decay to pH/Oxi (2))	Due to insufficient or inhomogeneous sample, the analyzer has automatically chosen an adaptive sample handling in order to report as many of the desired parameters as possible.	If missing parameters are needed, repeat the measurement with sufficient sample free from clots and air bubbles.
873	Adaptive measuring mode applied (decay to pH/BG/Met/Oxi)		
874	Adaptive measuring mode applied (decay to all micro-modes)		
875	Sample aged	The specified limit for sample age has been exceeded.	Draw and analyze new sample.
877	FLEXQ positioning error	A sampler in the sampler tray could not be aligned with the syringe inlet; aspiration of the sample was not possible.	<ul style="list-style-type: none"> - Remove all the samplers from the sampler tray (the sampler registration is lost). - If the sampler tray is blocking the syringe inlet or AutoCheck module, try to push it gently to its home position. - If the syringe inlet is not blocked, scan the sampler barcode, using the analyzer's barcode reader and perform a manual measurement.

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
877 (cont.)			<ul style="list-style-type: none"> - To get the FLEXQ operational again, restart the analyzer, using Temporary Shutdown and power off/on. - If the error persists, contact Radiometer service representative. <p>Removal condition: Successful FLEXQ sampler tray calibration.</p>
878	No Rinse solution during calibration	The analyzer was not able to retrieve Rinse solution during calibration.	Check level in Rinse Solution bottle. Replace bottle as necessary.
879	No Cal1 solution during calibration	The analyzer was unable to retrieve Cal1 solution during calibration.	Check level in Cal1 solution bottle. Replace bottle as necessary.
880	No Cal2 solution during calibration	The analyzer was unable to retrieve Cal2 solution during calibration.	Check level in Cal2 solution bottle. Replace bottle as necessary.
882	Mixer tray slip detected	A small positioning problem of the mixer tray has been detected and corrected.	<ul style="list-style-type: none"> - Lift the sampler tray cover and check for obstructions in the mixer tray area. - Remove any foreign objects. - Remount the sampler tray cover. <p>Removal condition: Alignment operation performed without slip.</p>

Continued on next page

Analyzer messages, *Continued*

Messages on
user and
manager levels
(*continued*)

No.	Message	Interpretation	Operator action
883	Mixer error	The sample may not have been adequately mixed.	<ul style="list-style-type: none"> - Lift the sampler tray cover and check for obstructions in the mixer tray area. - Remove any foreign objects. - Remount the sampler tray cover.
884	Sampler tray adjustment needed	<p>It was not possible to position one or more samplers directly below the syringe inlet.</p> <p>The affected sampler tray positions in the sampler tray must be adjusted.</p>	<p>Contact your service engineer to perform the Sampler Tray Adjustment procedure.</p> <p>Removal condition: All sampler tray positions are adjusted.</p>
885	Cyclic QC schedule reset from RADIANCE	The cyclic QC schedule has been reset and all related reminders have been removed as a result of a RADIANCE command.	No action required. Informative message only.
963	Leak currents detected	Leak currents are detected during calibration and may distort the measuring results. The affected parameters are marked with "?".	Contact Radiometer service representative.

Fluid transport troubleshooting procedure

Using the troubleshooting procedure The actions are listed in order of priority. It is recommended to perform a step in the procedure below and verify whether or not the error has been remedied. If the error persists, proceed to the next step of the procedure.

NOTES:

- For specific instructions on the replacement of components, refer to the relevant sections of Chapter 7.
- Record all replacement actions.

Fluid transport troubleshooting procedure Use the table of solutions below to identify and correct errors in the fluid transport system.

Step	Action
1.	Remove the analyzer cover to the solutions and call the Rinse program. Observe the flow of solution through the fluid transport system as this may help to identify the problem - see <i>Fluid transport system</i> description for details.
2.	Remove the cover to the measuring modules and check the following: <ul style="list-style-type: none"> • The electrodes are properly mounted in the measuring chamber and the electrode connector is latched shut. • The pump tubings and connectors have no leaks or damage. • The pump rotor seatings. • The inlet module has no leaks or damaged parts.
3.	Make any necessary repairs.
4.	Mount all the parts and press Restart .
5.	Call the Liquid Sensor Adjustment program (in the Auxiliary Programs).
6.	Call the Pump Calibration program (in the Auxiliary Programs).
7.	Clean the electrodes and the measuring chambers using distilled water and a cotton swab.
8.	Check the inlet probe and gasket unit for obstructions – see the Inlet probe troubleshooting procedure further in this chapter.
9.	If the error persists, contact a service representative.

Inlet probe troubleshooting procedure

Causes of error The following conditions are the causes of error:

Condition	Explanation
Inlet positioning error	This condition occurs when the inlet probe cannot obtain the proper position within a defined time limit.
Inlet calibration error	This condition occurs when the calibration of the inlet fails, most likely caused by a problem with the inlet components.

Procedure To correct the error, do the following:

Step	Action
1.	Remove the analyzer cover and the inlet flaps.
2.	Check that the inlet probe and gasket are mounted properly.
3.	Remove the inlet gasket and check for wear or damage. Replace as required. If the inlet probe has not retracted, move it in by pressing the probe attachment back. Note that you will feel resistance while moving the probe in.
4.	Check the condition of the inlet probe. If it appears bent or damaged, replace it.
5.	Mount all parts and press Restart . The inlet calibration is performed automatically during restart. The error is corrected when the analyzer enters the Ready mode. If the error persists, the analyzer remains in the Hold mode. Contact a service representative.

Inlet troubleshooting procedure

Indication of obstructions in the inlet

The following conditions may indicate an obstruction somewhere in the inlet system.

- No sample flow through the fluid transport system.
- Solution dripping from the inlet.
- Excessive suction noise coming from inlet when waste pump is activated.
- Fluid flowing upwards in the electrode measuring modules during the wrong stage of a rinse.
- Erratic flow of fluid through all three modules and/or excessive air bubbles flowing through the system.
- Lack of fluid movement through the small canals off the waste pump tubes, just above the pump rotor.

If one or more of the above conditions are present, perform the following Inlet troubleshooting procedure.

Procedure

To troubleshoot possible obstructions in the inlet, do the following:

Step	Action
1.	Remove the inlet gasket unit and inspect its condition. If it appears worn or damaged, replace it. Rinse the gasket and its openings by filling a syringe with distilled water and injecting the water through both the syringe and capillary openings.
2.	Remove the inlet probe and tube.
3.	<ul style="list-style-type: none"> • Fill a syringe with distilled water. • Take the end of the inlet tube, press it firmly against the tip of the syringe and inject the distilled water. The water should stream freely out of the opening at the end of the probe. If not, replace the inlet probe and tube.
4.	Install all parts and press Restart .

For detailed instructions on removal and/or replacement of parts, refer to *Chapter 7: Replacements*.

NOTE:

The spillage of liquid from the inlet may be caused by damaged waste pump tubes, improper mounting of the inlet gasket unit, clots, etc., so all these factors should be inspected, then corrected or replaced.

Leak troubleshooting procedure

Leak error This condition occurs when a leak detection program has failed, possibly indicating a leak in the fluid transport system.

Procedure To correct the error, do the following:

Step	Action
-------------	---------------

-
1. Remove the analyzer covers and inspect the fluid transport system for poor tube connections or worn tubes. Repair as required.
 2. Ensure that electrodes are properly mounted in the measuring chamber and the electrode connector is latched shut.
 3. Mount all parts and press ***Restart***.

The leak detection is performed automatically during the restart. The error is corrected when the analyzer enters the Ready mode.

If the error persists, the analyzer remains in the Hold mode. Contact a service representative.

Electrode troubleshooting procedures

Using the procedures

The actions are listed in order of priority. It is recommended to perform each action and verify whether or not the error has been remedied. If not, proceed to the next step.

pH, K, Na, Ca, and Cl troubleshooting procedure

To troubleshoot pH, K, Na, Ca, and Cl electrodes, do the following:

Step	Action
1.	<u>The pH electrode only:</u> Clean the electrode, using a cotton swab moistened with Cleaning Solution.
2.	Check the measuring chamber for clots: clean the measuring chamber with a cotton stick moistened with distilled water. Make sure that no cotton fibers are left in the measuring chamber.
3.	Replace the electrode membrane (not the pH electrode).
4.	Call a 2-point calibration. If the error persists, replace the electrode.

If an error has occurred on two or more parameters, troubleshoot the reference electrode.

Reference electrode troubleshooting procedure

To troubleshoot the reference electrode, do the following:

Step	Action
1.	Remove the electrode and check the measuring chamber for clots: clean the measuring chamber with a cotton stick moistened with distilled water. Make sure that no cotton fibers are left in the measuring chamber.
2.	Replace the electrode membrane.
3.	Call a 2-point calibration. If the error persists, replace the electrode.

pCO₂ and pO₂ troubleshooting procedure

To troubleshoot the pCO₂ and pO₂ electrodes, do the following:

Step	Action
1.	Remove the electrode and check for air bubble(s) trapped between the electrode tip and the membrane. If any air bubbles exist, remove them by pressing the tabs on the electrode jacket and moving the electrode slightly up and down until they dissipate.
2.	Replace the electrode membrane. The pO ₂ electrode: brush the electrode tip with the supplied brush before remembraning the electrode.
3.	Call a 2-point calibration. If the error persists, replace the electrode.

Continued on next page

Electrode troubleshooting procedures, *Continued*

Glucose and Lactate troubleshooting procedure

To troubleshoot the Glucose and Lactate electrodes, do the following:

- | Step | Action |
|------|--|
| 1. | Remove the electrode and check the measuring chamber for clots; clean the measuring chamber with a cotton stick moistened with distilled water. Make sure that no cotton fibers are left in the measuring chamber. |
| 2. | Replace the electrode membrane. |
| 3. | Call a 2-point calibration. If the error persists, replace the electrode. |

NOTE:

Refer to chapter 7 for specific instructions on replacing electrodes and membranes. Remember to record all replacements.

Pump troubleshooting procedure

Procedure To troubleshoot pumps, do the following:

Step	Action
1.	Check the Rinse Solution container for sufficient volume and proper mounting. Replace as required.
2.	Inspect the pump tube(s) for leaks, wear and proper seating. Replace as required.
3.	Call the Liquid Sensor Adjustment program.
4.	Call the Pump Calibration program. This program is performed automatically after any replacements made in step 2 above.
5.	If the error persists, contact a service representative.

Fluid transport system description

Diagram of fluid transport system The description of the fluid transport system and a detailed explanation of the rinse process aim to help troubleshooting.

The fluid transport system of the analyzer is shown below.

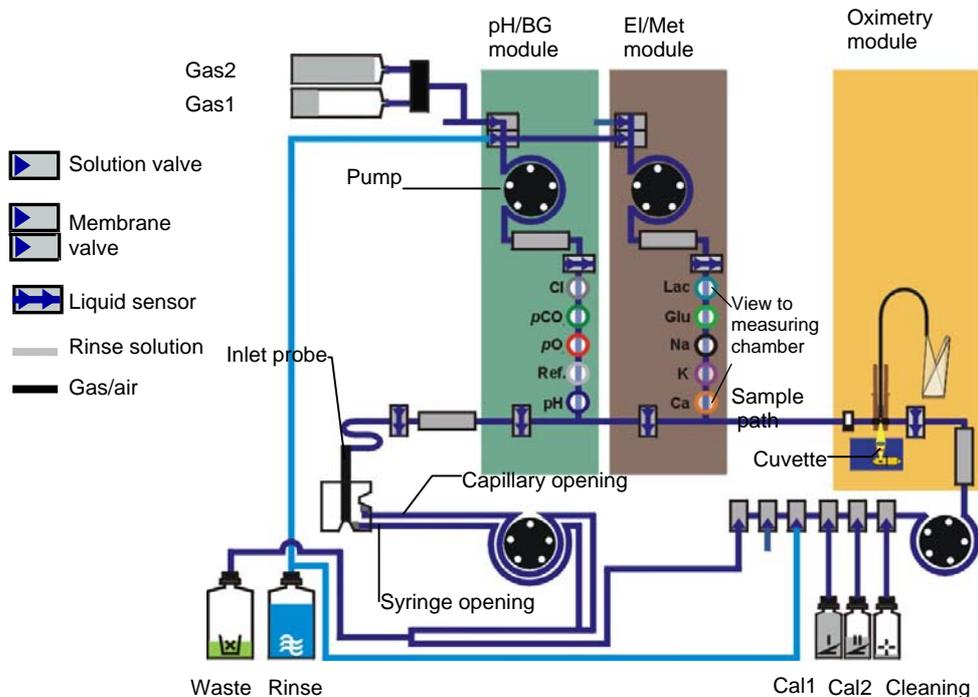
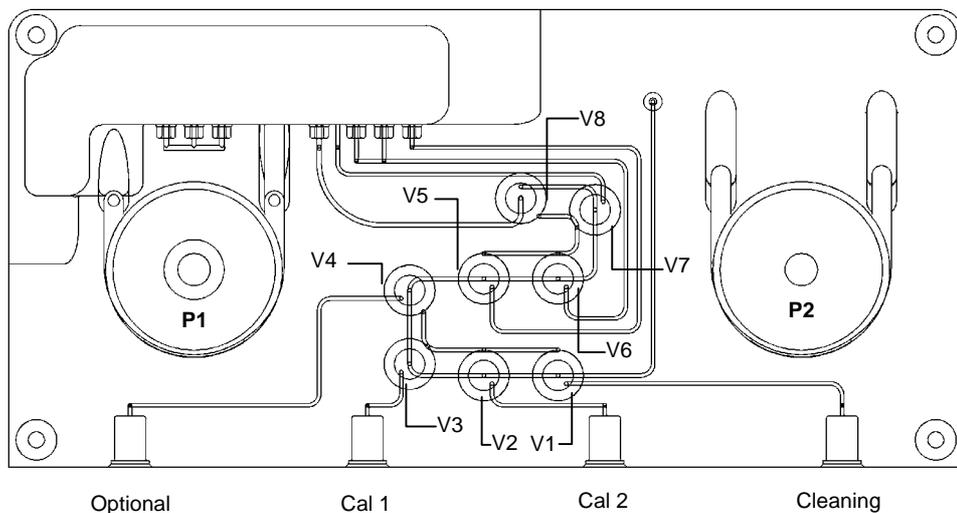


Diagram of the fluidic module

A detailed illustration of the fluidic module is given below.



Continued on next page

Fluid transport system description, *Continued*

Description of the fluidic module

The function of the fluidic module is to transport solutions from the containers to the measuring modules, and to transport samples from the inlet and measuring modules to the waste container.

The right fluidic module consists of a transparent fluid unit including all flow lines and four solution connectors. Eight membrane valves and two pumps select the flow path and control the flow.

The functions of the principal parts are given below.

Part	Function
V1	Pulled to enable supply of cleaning solution to the wet section.
V2	Pulled to enable supply of Cal 2 solution to the wet section.
V3	Pulled to enable supply of Cal 1 solution to the wet section.
V4	Not used.
V5	Not used.
V6	Pulled to enable supply of Rinse Solution to the wet section.
V7	Pulled to enable supply of air to the wet section.
V8	Pulled to enable flow to the waste container (used when the sample is transported into the measuring modules).
P1	Waste pump. Includes two tubes with larger inner diameter than the other pump tubes. It aspirates from the inlet and transports solutions and sample to the waste container. The pump rotation is always counterclockwise.
P2	Solution pump. Includes one tube. Transports solutions from the containers to the measuring modules, and solutions from the measuring modules to the waste container (when sample is transported into the measuring modules). Rotates in both directions.

Rinse process

The basic stages of the rinse process are described below.

Stage	Description
1	The measuring modules are drained of fluid flowing through the inlet and out to the waste. The pH/BG and EI/Met measuring chambers drain from the top down. Fluid from the Oxi module (cuvette) flows from right to left through the sample path.
2	The system is washed with alternating segments of air and Rinse Solution. The flow should be similar to that of Stage 1.

Continued on next page

Fluid transport system description, *Continued*

Rinse process (*continued*)

Stage	Description
3	The measuring modules are filled with Rinse Solution flowing through the measuring chambers from the bottom up.
4	The pH/BG module is filled with gas containing CO ₂ . The gas is filled from the top, expelling the Rinse Solution from the measuring chambers.
5	The outer portion of the inlet system is filled with air drawn from the exterior (not shown).

Evaluating the rinse

Carefully observe the flow of fluid through the system during the rinse. Use the table below to help identify possible sources of error.

Possible cause	Indication	Recommended action
Obstruction in inlet	<ul style="list-style-type: none"> Fluid flowing upwards through pH/BG and EI/Met modules during Stage 1. Erratic flow of fluid through all three modules that contains excessive air bubbles. Fluid does not move through the small canals off the waste pump tubes, just above the pump rotor. Excessive suction noise coming from inlet. 	Perform Inlet troubleshooting procedure.
Improper electrode installation	<ul style="list-style-type: none"> Fluid and air bubbles rising up into a measuring chamber. Leakage from electrode compartment. 	Ensure the electrodes are properly installed.
Obstruction in the measuring chamber of a measuring module	Fluid does not flow freely through all measuring chambers of a particular measuring module.	Clean the measuring chambers of the measuring module.

12. Sampling

Overview

Introduction This chapter provides guidelines and recommendations for blood sample collection prior to analysis, i.e. the preanalytical phase, in order to avoid errors and obtain the most accurate results.

For more comprehensive information regarding blood sampling, see the references at the end of this chapter.

Contents This chapter contains the following topics.

Causes of errors in preanalytical phase	12-2
Preparation prior to arterial/venous sampling	12-5
Preparation prior to capillary sampling	12-7
Sampling devices	12-8
Storage and preparation prior to analysis.....	12-9
Sampling procedures	12-12
References	12-14

Causes of errors in preanalytical phase

WARNING/ CAUTION

Blood sampling should be performed by authorized personnel only. Always handle blood and the collection devices with care. Avoid direct contact with the sample by using certified rubber gloves. Sterile techniques are required at all times to avoid infection.

Introduction

The major source of errors in blood sample analysis is the preanalytical phase, i.e. sample collection and handling prior to transfer into the analyzer. In order to avoid errors, it is necessary to observe certain guidelines during:

- preparation prior to sampling
- sampling
- transport
- storage
- preparation prior to transfer of the sample into the analyzer

Causes of error

The possible causes of errors during the preanalytical phase and preventative measures are given below.

Cause of error	Major affected parameters	Preventative measures
Air bubbles in sample	pO_2	Remove air bubbles immediately.
Sedimented samples	$ctHb, pO_2, pCO_2$	Mix sample prior to transfer into analyzer.
Hemolysis	$cK^+, cCa^{2+}, cCl^-, cNa^+$	<ul style="list-style-type: none"> • Sampling device construction, narrow needle diameter causes hemolysis – choose a proper device for sampling. • Avoid squeezing the tissue during sample collection into a capillary • Avoid mixing too vigorously • See section <i>Storage and preparation prior to analysis</i> further in this chapter
Dilution from liquid heparin	Electrolytes and metabolites, $cHCO_3^-, pCO_2, ctHb,$	Use preheparinized devices with dry heparin.

Continued on next page

Causes of errors in preanalytical phase, *Continued*

Causes of error (*continued*)

Cause of error	Major affected parameters	Preventative measures
Heparin interference	Electrolytes, especially cCa^{2+}	Use electrolyte-balanced heparin.
Arterial blood mixed with venous blood	pH, pO_2 , sO_2	Use proper sampling technique.
Instability of patient	pH and blood gases	<ul style="list-style-type: none"> • Sample at least 20 minutes after ventilatory adjustment • Inform patient of procedure
Leakage from red blood cells	cK^+	Store glass capillary samples for maximum 30 minutes in cold (0-4 °C/32-39.2 °F) condition.
Exposure to artificial light or sunlight	$ctBil$	For patients receiving phototherapy, lights should be extinguished prior to drawing the sample.
Inappropriate amount of flush solution is discarded from the catheter	Electrolytes and metabolites	Discard sufficient volume from the catheter before taking a blood sample.
Infusion solution given in the same arm	Electrolytes and metabolites	Stop infusion for a period or use another sampling site.

See also *Recommended literature* at the end of this chapter.

Selection of anticoagulant

To avoid introduction of clotted blood samples into the analyzer which may give inaccurate measurement results and cause analyzer damage, Radiometer recommends the following:

- Exclusive use of preheparinized sampling devices
- Exclusive use of dry heparin, preferably of sodium or lithium
- Do not use liquid heparin as this causes dilution of the sample [1]
- Use heparin in sufficient concentration. The recommended concentration depends on the sampling device and specific blood sample – please refer to documentation for specific sampling devices.

Continued on next page

Causes of errors in preanalytical phase, *Continued*

Selection of anticoagulant (*continued*)

- Use electrolyte-balanced heparin to minimize bias from heparin on electrolyte values

WARNING/ CAUTION: *Do not add sodium fluoride to the blood samples, as it gives erroneously high cNa^+ and low cCa^{2+} , $cGlucose$ and $cLactate$ results. Sodium fluoride also damages the Glucose and Lactate electrodes.*

Preparing the patient

The respiratory condition of the patient should be stable.

- The patient should preferably be in a steady state of ventilation before and during the collection of blood sample
- The patient should be informed about the procedure in order to avoid unnecessary anxiety. If the patient hyperventilates due to anxiety, for example, pH and blood gases may be affected.

Preparation prior to arterial/venous sampling



Sample types The recommendations and considerations for the sample type are as follows:

Sample type	Recommendations and considerations
Arterial	<p>The most preferred and recommended type of blood for pH/blood gas analysis.</p> <ul style="list-style-type: none"> • Gives the best information about oxygen uptake in the lungs and oxygen transport • Information is basically the same regardless of the sampling site
Venous	<p>Not generally recommended for blood gas analysis.</p> <ul style="list-style-type: none"> • Affected by peripheral circulatory efficiency and cellular metabolic needs • Should not be used to evaluate oxygen status • Can be used to reflect acid-base status (pH, $p\text{CO}_2$, $c\text{Base(Ecf)}$), $ct\text{Hb}$, $F\text{COHb}$, $F\text{MetHb}$, $F\text{HbF}$ and $ct\text{Bil}$

Arterial and venous sampling sites The recommendations and considerations for selecting a sampling site are as follows:

Sample	Site	Advantages/disadvantages
Arterial	Radial artery	<ul style="list-style-type: none"> • Good collateral circulation • Easy access <p>Prior to sampling from the radial artery, perform a Modified Allen's Test to confirm adequate collateral circulation.</p>
	Brachial artery	<ul style="list-style-type: none"> • Difficult to puncture due to location • Greater risk of damage to surrounding structures
	Femoral artery	<ul style="list-style-type: none"> • Large and easy to puncture • Poor collateral circulation • Should be avoided on newborns and elderly
Arterial line		Remove the flush solutions used in A-lines completely from the system to avoid dilution of the blood sample. It is recommended to withdraw a volume equal to three to six times the "dead space" of the catheter.
Venous	Brachial vein	<p>Convenient site.</p> <p>For sampling on venous blood, use the standard procedure of your institution.</p>

Continued on next page

Preparation prior to arterial/venous sampling, *Continued*

Arterial sampling guidelines

The following are guidelines for sampling by arterial puncture:

Sampling method	Guidelines
Puncture	<ul style="list-style-type: none"> • Be careful not to mix venous blood with the arterial sample. This can occur if a vein is punctured before locating the artery. Arterial blood (due to the higher pressure) will generally fill faster than venous blood, and is lighter in color. • It is important to expel any air bubbles immediately without prior agitation. An air bubble with a relative volume of 0.5 % or more of the blood volume in the syringe is a potential source of significant error [2, 3]. The effect of such an air bubble increases with the storage time and agitation of the sample. • Mix sample thoroughly with heparin immediately after sampling by inverting the sampler several times and then rolling the sample between your palms.
A-line	<ul style="list-style-type: none"> • If aspirating the sample, do so slowly in order to avoid hemolization of the sample • Expel any air bubbles immediately (see above) • Mix the sample thoroughly with heparin immediately after sampling by inverting the sampler several times and then rolling the sample between your palms.

Disposal of used sampling devices *WARNING/CAUTION: Discard the waste as infectious waste [4].*

Preparation prior to capillary sampling

Capillary sampling sites

The following are recommended capillary sampling sites:

- Earlobe
- Fetal scalp
- Finger tip
- Heel*
- Big toe*

* The heel and big toe should not be used on patients older than six months.

WARNING/CAUTION: *In general, results obtained from capillary samples, particularly pO_2 values, should be interpreted with caution.*

Capillary sampling guidelines

The guidelines for capillary sampling are as follows:

- Arterialize the puncture site by warming it up to approximately 42 °C (108 °F) for 5 to 10 minutes prior to actual sampling. Failure to do so will make the blood sample only representative of the local tissue, and not the general status of the patient.
- Make a puncture using a lancet or the like, so that blood flows freely. Do not squeeze the area.
- Remove the first drop of blood, since it may be diluted with tissue fluid. Take the sample from the center of the second blood drop. To prevent air from entering the capillary, take the sample from the center of the drop.
- Squeezing or milking the puncture site is to be avoided as this will result in an admixture of blood and tissue fluid, resulting in faulty measurements. It can also cause hemolysis of the blood sample (or part of the sample), resulting in cK^+ readings being too high.
- Mix the sample with heparin immediately after collection to prevent blood from clotting. (Clots can clog the analyzer and cause unnecessary downtime.) Use a mixing wire and magnet when mixing a capillary sample.

Disposal of used sampling devices

WARNING/CAUTION: *Discard the waste as infectious waste [4].*

Sampling devices

Introduction Radiometer has an assortment of specialized blood gas sampling devices. The PICO product line is used for puncture and A-line sampling, and CLINITUBES are used for capillary sampling.

For ordering information on sampling devices, see *chapter 14: Ordering Information* or contact your local distributor of Radiometer products.

Arterial blood samplers The following arterial blood samplers available from Radiometer are recommended:

- PICO70: Self-filling arterial blood sampler for arterial puncture or A-line sampling
- PICO50 (2 mL): Arterial blood sampler for the aspiration of arterial blood from A-lines
- *safe*PICO: Self-filling arterial blood sampler for arterial puncture or A-line sampling (contains a steel ball for automatic sample mixing in the FLEXQ sampler tray)

CLINITUBES The following CLINITUBES for capillary blood sampling available from Radiometer are recommended:

- D956G-70-210
- D956G-70-100
- D957P-70-100
- D941G-240-55 (do not use for measuring electrolytes)
- D956G-70-55
- D956G-70-35

(G = glass; P = plastic; the last figure designates volume in μL)

Storage and preparation prior to analysis

Storage recommendation Radiometer recommends the following for samples obtained in plastic and glass syringes:

Material	Storage recommendation
Plastic syringe	<ul style="list-style-type: none"> Storage should be avoided whenever possible or, at least, kept to a minimum If it is not possible to analyze the sample immediately, analyze it within 30 minutes after collection [5, 6, 7, 8, 9, 10, 11] Recommended sample storage temperature: room temperature [5, 6, 8] Samples with expected high pO_2 values or for special studies like shunt studies should be analyzed immediately or within 5 minutes. The use of glass syringes can also be considered [5, 7, 8]
Glass syringe	<ul style="list-style-type: none"> Storage should be avoided whenever possible or, at least, kept to a minimum If it is not possible to analyze the sample immediately, analyze it within 30 minutes after collection when stored at room temperature [5, 12] Alternatively, store the sample in ice-water (0-4 °C (32-39 °F)). The storage time should not exceed 1 hour [13] Samples with expected high pO_2 values or for special studies like shunt studies should be analyzed immediately or within 5 minutes [13]

Radiometer recommends the following for samples obtained in plastic and glass capillaries:

Material	Storage recommendation
Plastic capillary	Analyze the sample within 10 minutes. Note that for samples with $pO_2 > 80$ mmHg (10.7 kPa) a positive bias from 1 to 9 % is observed. The bias depends on the pO_2 , pH and time.
Glass capillary	Analyze the sample within 10 minutes. If storage is unavoidable, store the sample horizontally at 0-4 °C (32-39 °F) for maximum 30 minutes.

Continued on next page

Storage and preparation prior to analysis, *Continued*

Pay attention to the following:

- For some samples the recommendation above does not apply and individual guidelines should be used or developed. Examples of these samples are samples with an increased leukocyte or platelet count, fetal scalp samples, samples with atypical metabolism, fast-clotting samples, etc. [9, 14].
- Typical metabolic activity in blood samples causes an increase in the lactate concentration and a decrease in the glucose concentration. For samples within the typical reference range this corresponds to an average change in the lactate concentration of 0.25 mmol/L and of -0.2 mmol/L for glucose over 30 minutes at room temperature [15].

Preparation prior to analysis

Arterial puncture and A-line samples:

- If there is an air bubble in a sample that has been stored, pH and blood gas values should not be reported
- Thoroughly mix the sample by inverting the sampler several times and rolling it between the palms of your hands.

Capillary samples:

- Thoroughly mix the sample with heparin using a mixing wire and magnet.

Capillary blood sample measurements

In order to perform in accordance with the analyzer performance specifications, Radiometer highly recommends to follow the recommendations below.

<p>Capillary blood sample measurements:</p>	<ul style="list-style-type: none"> • When performing capillary blood sample measurements, use the mixing wire in order to ensure appropriate mixing of the sample and thereby prevent clots from being introduced into the analyzer. The sample should be mixed immediately after collection, moving the mixing wire with a magnet 20 times along the full length of the capillary. This procedure should be repeated immediately before analyzing the sample. • When performing capillary blood sample measurements and clots are suspected, use a clot catcher in order to prevent blockage of the measuring chamber. • Do not remove the mixing wire before the sample is aspirated for measurement. Slide the mixing wire to the end of the capillary opposite to that from which the blood is to be aspirated. <p>Remove both capillary end caps.</p>
---	--

Continued on next page

Storage and preparation prior to analysis, *Continued*

Capillary blood sample measurements (*continued*)

Capillary blood sample measurements on fetal scalp blood:

- When performing capillary blood sample measurements on fetal scalp blood, insert the mixing wire into the capillary tube **after** the sample has been collected.
- When performing measurements on fetal scalp blood, introduce the capillary sample into the analyzer from the cap end free from Vaseline smear. In case both capillary ends are smeared, dry one of the ends with a lint-free tissue before measurement.
- Due to their inherent characteristics fetal scalp blood samples are generally regarded as potentially difficult to work with. An important prerequisite for successfully analyzing fetal scalp blood samples is the sample quality and that the preanalytical precautions listed above are followed very closely.

Sampling procedures

NOTE: *This section describes non-Radiometer sampling devices. For information on use and handling Radiometer sampling devices, please refer to the inserts supplied with the sampling devices.*

Sampling with a standard syringe Prepare the following together with a standard syringe (dead space 2-6 %):

- Anticoagulant: lithium or sodium heparin (1000 IU per mL sample)
- Two needles, 20-25 gauge
- Tourniquet – for venous samples
- Skin antiseptic, e.g. 70 % alcohol
- Sterile gauze sponge or cotton wool
- Rubber stopper or syringe end cap (stainless steel)
- Adhesive tape and pressure dressing

Step	Action
1.	Mount a needle on the syringe and draw the heparin into the syringe.
2.	Change the needle and flush the barrel walls, then expel air and heparin through the needle.
3.	Extend the patient's arm. Apply the tourniquet for a venous puncture.
4.	Locate the blood vessel with the finger tip and clean the skin area with antiseptic and a sterile gauze sponge or cotton wool.
5.	Insert the needle in the vessel with the bevel upward. Withdraw the syringe plunger gently to collect blood.
6.	Release the tourniquet (if used), remove the needle and immediately apply dry gauze or cotton wool over the puncture site. Maintain pressure on an arterial puncture for at least 5 minutes.
7.	Apply a pressure dressing over the puncture site and elevate the site for at least 2-3 minutes, if possible.
8.	Expel any air bubbles from the syringe and remove the needle according to your standard procedure.
9.	Mix the sample by inverting the syringe several times and then rolling it between your palms.
10.	Mix the sample immediately before analysis. Analyze the sample immediately.

Continued on next page

Sampling procedures, *Continued*

Sampling with a test tube Prepare the following items:

- A test tube and cap
- Anticoagulant: lithium or sodium heparin (1000 IU per mL sample)
- Pipette or syringe and a needle for heparin dosage
- One hypodermic needle, 20-25 gauge
- Tourniquet
- Skin antiseptic, e.g. 70 % alcohol
- Sterile gauze sponge or cotton wool
- Adhesive tape and pressure dressing

Step	Action
1.	Transfer the heparin to the test tube using a syringe or a pipette: 50 μ L heparin per 5 mL blood.
2.	Extend the patient's arm. Apply the tourniquet for a venous puncture.
3.	Locate the vein with the fingertip. Clean the skin area with antiseptic and a sterile gauze sponge or cotton wool.
4.	Collect the sample according to the procedure in your institution.
5.	Apply dry gauze or cotton wool over the puncture site.
6.	Close the test tube with a cap, then mix the contents by inverting it or rolling it between your palms about 20 times.
7.	Apply a pressure dressing over the puncture site and elevate the site for at least 2-3 minutes, if possible.
8.	Mix the sample immediately before analysis. Analyze the sample immediately.

Expired air sampling

To collect an expired air sample, do the following:

Step	Action
1.	Collect the patient's expired air in the Douglas bag.
2.	Connect a syringe (minimum 20 mL, with a rubber cap) to the bag.
3.	Fill and empty the syringe twice, then fill it with the sample. Close the syringe with the rubber cap.

References

List of references

This section lists the references applicable to blood sampling and blood gas analysis associated with this chapter.

1. Avoid Errors in arterial blood sampling. Copenhagen: Radiometer Medical A/S, 1992. Code 919-467.
2. Biswas CK, Ramos JM, Agroyannis B, Kerr DNS. Blood gas analysis: effect of air bubbles in the syringe and delay estimation. *B Med J* 1982; 284: 923-27.
3. Mueller RG, Lang GE, Beam JM. Bubbles in samples for blood gas determinations – a potential source of error. *Am J Clin Pathol* 1976; 65: 242-49.
4. Clinical laboratory waste management. CLSI document GP5-A2.
5. Blonshine S, Alberti R, Olesinski RL. Procedures for the collection of arterial blood specimens; approved standard – Third Edition. NCCLS document H11-A3 (ISBN 1-56238-374-4). Wayne, Pa.: NCCLS, 1999: 12, 8.
6. Mahoney JJ, Van Kessel A. Arterial blood gas analysis. *Respiratory Care* 1997: 249-79.
7. Smeenk F, Janssen J, Arends B, Harff G, Bosch J, Schönberger J, Postmus P. Effects of four different methods of sampling arterial blood and storage time on gas tensions and shunt calculation in the 100% oxygen test. *Eur Respir J* 1996; 10: 910-13.
8. Mahoney JJ, Harvey JA, Wong RJ, Kessel VLA. Changes in oxygen measurements when whole blood is stored in iced plastic or glass syringes. *Clin Chem* 1991; 37: 1244-48.
9. Woolley A and Hickling K. Errors in measuring blood gases in the intensive care unit: Effect of delay in estimation. *Journal of Critical Care* 2003; 18: 31-37.
10. Blonshine S. To ice or not to ice. *AARC Times* 2000: 37-39.
11. Liss P, Payne P. Stability of blood gases in ice and at room temperature. *Chest* 1993; 103: 1120-21.
12. Burnett RW, Chatburn RL, Christiansen TF *et al.* Blood gas preanalytical considerations: specimen collection, calibration and controls; Approved guideline. NCCLS document C27-A (ISBN 1-56238-190-3). Villanova Pa.: 1993; 13, 6.
13. Burnett RW, Covington AK, Fogh-Andersen N *et al.* Approved IFCC recommendations on whole blood sampling, transport and storage for simultaneous determination of pH, blood gases and electrolytes. *Eur J Clin Chem Clin Biochem* 1995; 33: 247-53.

Continued on next page

References, *Continued*

List of references (*continued*)

14. Nickelsen CN. Fetal capillary blood pH. <http://www.bloodgas.org> /2002.
15. Wennecke G. Useful tips to avoid preanalytical errors in blood gas testing: metabolites. <http://www.bloodgas.org> / 2004.

Recommended literature

1. Capillary sampling. In: The whole-blood sampling handbook. Copenhagen: Radiometer Medical ApS, 2003. Code 989-466.
2. Christiansen TF. Heparin and blood sampling for pH, blood gases and direct potentiometric electrolyte analysis. Radiometer Publication AS96. Copenhagen: Radiometer Medical A/S, 1986.
3. The blood gas handbook. Copenhagen: Radiometer Medical ApS, 2004. Code 989-318
4. Bower LK, Barnhart SL, Betit P, Hendon B, Masi-Lynch J, Wilson BG. AARC Clinical practice guideline. Capillary blood gas sampling for neonatal and pediatric patients. *Respir Care* 1994; 39, 12: 1180-83.
5. Moran RF, Bergkuist C, Graham GA *et al.* Considerations in the simultaneous measurement of blood gases, electrolytes and related analytes in whole blood. Proposed Guideline. NCCLS Publication C32-P. Villanova Pa.: NCCLS, 1993; 13, 17.
6. Christiansen TF. Measurement of potassium in whole blood. Radiometer Publication AS92. Copenhagen: Radiometer Medical A/S, 1983. Code 918-231.
7. Wandrup JH. Clinical and analytical requirements and needs of glucose measurements on whole blood. Radiometer Publication AS122. Copenhagen: Radiometer Medical A/S, 1996. Code 918-549.
8. Wandrup JH, Tvede K, Grinsted J, Jordening H. STAT measurements of L-lactate in whole blood and cerebrospinal fluid assessed. *Clin Chem* 1989; 35, 8: 1740-43.
9. Wu E, Barazanji K, Johnson R. Sources of error in A - aDo₂ calculated from blood stored in plastic and glass syringes. *J Appl Physiol* 1997; 82: 196-202.

13. Specifications

Overview

Introduction This chapter lists specifications for the ABL800 FLEX analyzers.

Contents This chapter contains the following topics.

Measured parameters	13-2
Input parameters.....	13-5
Derived parameters	13-6
Sample handling.....	13-8
Calibration and maintenance programs.....	13-11
Analyzer requirements	13-12
Analyzer specifications	13-13
Approvals and patents	13-15

Measured parameters

Definitions The **measuring range** for a parameter is the range within which the analyzer is physically capable of measuring. The measuring range corresponds to the "range of indication" as defined in the "International vocabulary of basic and general terms in metrology (VIM).

The **test range** for a parameter is the range within which accuracy and precision of a measured parameter was specified and intended to lie within specified limits. The test range corresponds to the "measuring range" as defined in the "International vocabulary of basic and general terms in metrology (VIM).

Blood The following measured parameters are available independent of analyzer configuration.

Parameter	Unit	Measuring range	Test range
pH	pH scale	6.300-8.000	6.85-7.55
cH ⁺	nmol/L	10.0-501	28-141
pCO ₂	mmHg; torr	5.0-250	17-160
	kPa	0.67-33.3	2.27-21.3
pO ₂	mmHg; torr	0.0-800	20-580
	kPa	0.00-107	2.67-77.3
ctHb	g/dL	0.00-27.7	2.5-23
	g/L	0.0-277	25-230
	mmol/L	0.00-17.2	1.55-14.2
sO ₂	%	0.0-100.0*	0-100
	fraction	0.00-1.000*	0-1
FO ₂ Hb	%	0.0-100.0*	0-100
	fraction	0.00-1.000*	0-1
FCOHb	%	0.0-100.0*	0-20
	fraction	0.00-1.000*	0.0-0.2
FMetHb	%	0.0-100.0*	0-20
	fraction	0.00-1.000*	0.0-0.2
FHHb	%	0.0-100.0*	0-100
	fraction	0.00-1.000*	0-1

For (*) see explanation on the next page.

Continued on next page

Measured parameters, *Continued*

Blood
(continued)

Parameter	Unit	Measuring range	Test range
<i>FHbF</i>	%	0.0-100.0*	0-80
	fraction	0.00-1.000*	0.0-0.8
<i>cK⁺</i>	mmol/L; meq/L	0.5-25.0	2-8
<i>cNa⁺</i>	mmol/L; meq/L	7-350	120-180
<i>cCa²⁺</i>	mmol/L	0.20-9.99	0.51-2.2
	meq/L	0.40-19.98	1.0-4.4
	mg/dL	0.80-40.04	2.0-8.8
<i>cCl⁻</i>	mmol/L; meq/L	7-350	95-150
<i>cGlucose</i>	mmol/L	0.0-60	0.5-15
	mg/dL	0-1081	9.0-270
<i>cLactate</i>	mmol/L; meq/L	0.0-30	0.5-15
	mg/dL	0-270	4.5-135
<i>ctBil</i>	μmol/L	1-1000*	0-400
	mg/dL	0.0-58.5*	0.0-23.4
	mg/L	0-585*	0-234

* The values are for the analyzer with the activated "Out of range suppression" function. In case this function has not been activated, the measuring ranges will be as follows:

Parameter	Unit	Measuring range
<i>sO₂, FO₂Hb,</i> <i>FCOHb, FMetHb</i>	%	-2.0 % to 102.0 %
	fraction	-0.020 to 1.020
<i>FHbF</i>	%	-15 % to 102 %
	fraction	-0.15 to 1.02
<i>ctBil</i>	μmol/L	-20 to 1000
	mg/dL	-1.2 to 58.5
	mg/L	-12 to 585

Continued on next page

Measured parameters, *Continued*

Expired air	Parameter	Unit	Measuring Range	Test range
	$p\text{CO}_2$		mmHg	5.0-250
		kPa	0.67-33.3	2.00-20.00
$p\text{O}_2$		mmHg	0.0 800	15-530
		kPa	0.00-107	2-70

Baro	Parameter	Unit	Measuring Range	Test range
	$p(\text{amb})$		mmHg; Torr	450-800
		kPa	60.0 -106.7	60.0-106.7

Other fluids All parameters available on the analyzer.

Input parameters

List of parameters

All the input parameters available on the ABL800 FLEX analyzers, independent of configuration, are listed below.

Symbol	Parameter	Unit	Input range	Defaults
T	Patient temperature	°C	15.0-45.0	37
		°F	59.0-113.0	98.6
	QUALICHECK+/AutoCheck+ ampoule temperature	°C	18.0-32.0	25
		°F	64.4-89.6	77
$FO_2(I)$	Fraction of oxygen in dry inspired air	%	0.0-100.0	21.0
		fraction	0.000-1.000	0.210
$ctHb$	Total hemoglobin concentration (if not measured)	g/dL	0.0-33.0	-
		g/L	0.0-330	-
		mmol/L	0.0-20.5	-
RQ	Respiratory quotient - ratio of carbon dioxide production and oxygen consumption.	-	0.00-2.00	0.86
$pO_2(\bar{v})$	Oxygen tension in mixed venous blood.	mmHg	0.0-xxx.x*	-
		kPa	0.00-xx.xx*	-
$sO_2(\bar{v})$	Oxygen saturation in mixed venous blood.	%	0.0-100.0	-
		fraction	0.000-1.000	-
\dot{Q}_t	Cardiac output.	L/min	0.0-xxx.x*	-
$\dot{V}O_2$	Total oxygen consumption.	mL/min	0-xxxx*	-
		mmol/min	0.0-xxx.x*	-
VCO	Volume of carbon monoxide.	mL	0.0-xxx.x*	-
$p50(st)$	Half saturation tension of oxygen in blood at standard conditions.	mmHg	0.01-100.00	26.84
		kPa	0.001-13.332	3.578
$FCOHb(1)$	The fraction of COHb measured before the CO-injection	%	0.0 -100.0	-
		fraction	0.000-1.000	-
$FCOHb(2)$	The fraction of COHb measured after the CO-injection	%	0.0 -100.0	-
		fraction	0.000-1.000	-

* numerical format

Derived parameters

List of parameters

All derived parameters of the ABL800 FLEX analyzers are listed below.

Symbol	Input parameter required (if not determined by analyzer)
$pH(T)$	T
$cH^+(T)$	T
$pCO_2(T)$	T
$cHCO_3^-(P)$	-
$cBase(B)$	ctHb
$cBase(B,ox)$	ctHb
$cBase(Ecf)$	-
$cBase(Ecf,ox)$	-
$cHCO_3^-(P,st)$	ctHb
$ctCO_2(P)$	-
$ctCO_2(B)$	-
$VCO_2/V(\text{dry air})$	
$pH(st)$	-
Hct	ctHb
$pO_2(T)$	T
$pO_2(A)$	$FO_2(I) + RQ$
$pO_2(A,T)$	$FO_2(I) + RQ + T$
$pO_2(a)/FO_2(I)$	$FO_2(I)$
$pO_2(a,T)/FO_2(I)$	$FO_2(I) + T$
$p50$	-
$p50(T)$	T
$p50(st)$	-
$pO_2(A-a)$	$FO_2(I) + RQ$
$pO_2(A-a,T)$	$FO_2(I) + RQ + T$
$pO_2(a/A)$	$FO_2(I) + RQ$
$pO_2(a/A,T)$	$FO_2(I) + RQ + T$

Continued on next page

Derived parameters, *Continued*

List of parameters (*continued*)

Symbol	Input parameter required (if not determined by analyzer)
$pO_2(x)$	ctHb, p50(st)
$pO_2(x,T)$	ctHb, p50(st), T
ctO ₂ (B)	ctHb
ctO ₂ (a- \bar{v})	ctHb
BO ₂	ctHb
ctO ₂ (x)	ctHb, p50(st)
$\dot{D}O_2$	\dot{Q}
\dot{Q}_t	$\dot{V}O_2$
$\dot{V}O_2$	\dot{Q}
FShunt	ctHb + FO ₂ (I) + RQ
FShunt(T)	ctHb + FO ₂ (I) + RQ + T
RI	FO ₂ (I) + RQ
RI(T)	FO ₂ (I) + RQ + T
Qx	ctHb, p50(st)
VO ₂ /V(dry air)	
sO ₂	-
FO ₂ Hb	-
FHHb	
V(B)	ctHb, VCO, FCOHb(1), FCOHb(2)
Anion Gap(K ⁺)	
Anion Gap	
cCa ²⁺ (pH=7.4)	
mOsm	

NOTE: All parameters are calculated in SI units. If other units are selected, the results are obtained by converting the SI units into those selected. For detailed information please refer to the Reference Manual, chapter 6.

Sample handling

ABL835/25/15

Mode	Sample volume	Measuring time (sec)*	Cycle time (sec)	Samples per hour
Syringe – S195 Other fluids – S195	195 µL	80	150	24
Capillary – FLEXMODE Other fluids – FLEXMODE (no message)	195 µL	80	150	24
Capillary – FLEXMODE Other fluids – FLEXMODE (message 869 or 870)	30-40 µL or 40-55 µL	100	170	21
Capillary – FLEXMODE Other fluids – FLEXMODE (message 871 or 872)	50-70 µL	100	170	21
Capillary – FLEXMODE Other fluids – FLEXMODE (message 873)	65-100 µL	135	200	18
Capillary – FLEXMODE Other fluids – FLEXMODE (message 874)	> 90 µL	135	200	18
Syringe – S95 Capillary – C95	95 µL	135	200	18
Syringe – S85	85 µL	80	145	25
Capillary – C55	55 µL	100	170	21
Capillary – C35 Met	35 µL	80	145	25
Capillary – C35 Oxi	35 µL	80	145	25

Continued on next page

Sample handling, *Continued***ABL830/20/10/
10 BG only**

Mode	Sample volume	Measuring time (sec)*	Cycle time (sec)	Samples per hour
Syringe – S85 Other fluids – S85	85 µL	80	145	25
Capillary – FLEXMODE Other fluids – FLEXMODE (no message)	85 µL	80	145	25
Capillary – FLEXMODE Other fluids – FLEXMODE (message 869 or 870)	30-40 µL or 40-55 µL	100	170	21
Capillary – FLEXMODE Other fluids – FLEXMODE (message 871 or 872)	50-70 µL	100	170	21
Capillary – C55	55 µL	100	170	21
Capillary – C35 Oxi (not active on the ABL810 BG only)	35 µL	80	145	25

ABL805

Mode	Sample volume	Measuring time (sec)*	Cycle time (sec)	Samples per hour
Syringe – S165 Other fluids – S165	165 µL	80	150	25
Capillary – FLEXMODE Other fluids – FLEXMODE (no message)	16 5 µL	80	150	24
Capillary – FLEXMODE Other fluids – FLEXMODE (message 869 or 870)	30-40 µL or 40-55 µL	80	145	25
Capillary – FLEXMODE Other fluids – FLEXMODE (message 871 or 872)	50-70 µL	80	145	25
Capillary – FLEXMODE Other fluids – FLEXMODE (message 873)	65-100 µL	80	170	21

Continued on next page

Sample handling, *Continued*

ABL805 (continued)

Mode	Sample volume	Measuring time (sec)*	Cycle time (sec)	Samples per hour
Capillary – FLEXMODE Other fluids – FLEXMODE (message 874)	> 90 µL	100	170	21
Syringe – S95 Capillary – C95	95 µL	100	170	19
Syringe – S85	85 µL	80	145	25
Capillary – C55	55 µL	80	145	25
Capillary – C35 Met	35 µL	80	145	25

All ABL800 FLEX analyzers

Mode	Sample volume	Measuring time (sec)*	Cycle time (sec)	Samples per hour
Expired air	15 mL	65	170	21
QC		80	145	25

* From the moment the inlet flap is lifted until the results are displayed.

Calibration and maintenance programs

Calibrations

Calibration type	Adjustable frequency (hours)	Duration, min		
		ABL835/ 25/15	ABL830/20 /10	ABL805
Cal 1	½, 1, 2, 4	4¾	3¾	4¾
Cal 2	1, 2, 4, 8	9½	8	9½
1-point gas cal (for the USA only)	½, 1, 2	2	2	2
tHb	Manual	2¼	2¼	-

Auxiliary programs

Program	Started...	Duration, min		
		ABL835/25/15	ABL830/ 20/10	ABL805
Cleaning	Every 8 or 24 hours, or called by operator	4¼	4¼	4¼
Tubing Refill	After changing all solution bottles or called by operator	4	4	4¼
Decontamination	Called by operator	2¾	2¾	2¾
Protein Remover	Called by operator	2½	2½	2½
Liquid Sensor Adjustment	Called by operator	3	3	3
Pump Calibration	Called by operator	4	3½	4
Rinse	After each measurement, calibration or called by operator	80 sec	80 sec	80 sec
Flush	Automatically	50 sec	50 sec	50 sec
Draining	Automatically	21 sec	21 sec	21 sec

System alignment

ABL830: approximately 1300 sec

ABL835/05: approximately 1450 sec

Analyzer requirements

Analyzer requirements	Power	Rated voltage: 100-240 V; 50/60 Hz; 270 VA. Maximum voltage fluctuations: $\pm 10\%$. Leakage current measured at 230 V and 50 Hz: Normal condition (ground connected): < 0.005 mA Single fault condition (ground disconnected): < 0.5 mA
	Relative humidity	20 to 80 %
	Fuses	Printer unit has 1 protective fuse: 5 × 20 mm, 4 Amp, Slow blow (T4AL). Main fuse includes 2 protective fuses: 5 × 20 mm, 4 Amp, High break (T4AH). Type Shurter No. 0001.2510. WARNING/CAUTION: Fire hazard. Replace fuse as marked.
	Operating temperature	15 °C to 32 °C (59 °F to 90 °F)
	Storage temperature	-20 °C to 60 °C (-4 °F to 140 °F).
	Altitude correction	Up to 3000 meters over sea level at standard barometric pressure of 760 mmHg.
	Baro	450-800 mmHg 60.0-106.7 kPa 0.600-1.067 bar 450-800 torr
	Start up	Cold start: typically 25 minutes Warm start: 5 minutes
	Gas pressure	Operating pressure: 1.0-38 bar Maximum pressure: 38 bar

Analyzer specifications

Specifications	Thermostating	Solid state, 37.0 ± 0.15 °C (~ 99 °F)
	Spectrophometer	Wavelength range: 478-672 nm 
	Hemolyzer	Hemolyzation: at approximately 30 kHz cuvette light path: approximately 0.01 cm
	External serial ports	1 x RS-232 (9-pin) connector. Baud rate: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 115200
	USB ports	Pin header for two USB (Universal Serial Bus) ports
	Ethernet	1 x RJ45 connector, 32-bit PCI bus interface, Novell NE 2000 compatible, onboard 10-Base T, fully compliant with IEEE 802.3 10 Mbps CSMA/CD standards.
	External printer port	Bi-directional parallel (ECP/EPP/SPP) port (25-pin) connector
	Keyboard/Mouse	Keyboard/PS/2 mouse interface
	External VGA Screen	Connector for VGA screen
	Printer	Built-in thermal; paper 11 cm wide
	Barcode reader	Built-in. Reading distance: contact – 70 mm. Barcode length: max. 65 mm Bar width: ≥127 µm (5 mil) Number of characters: <62 Code types: 128, 39, I 2 of 5
	Dimensions (basic module, without accessories)	Height: 548 mm(21.95 in.) with the vertical screen Width: 700 mm (27.6 in.) Depth: 476 mm(18.5 in.)
	Weight (kg) (with AutoCheck)	ABL800: 31.8 ABL805: 32.9 ABL830/20/10: 32.9 ABL835/25/15: 33.9
	AutoCheck module specifications	Number of ampoules in the carousel
Positioning of ampoules in the carousel		Random
Lot change		2 Lots of the same level at the same time possible
Ampoule volume, liquid		0.7 mL
Expiration of ampoules		24 months at 25 °C (including 15 days at up to 32 °C)

Continued on next page

Analyzer specifications, *Continued*

AutoCheck module specifications (continued)	Conditioning time (from room temperature)	< 15 min. with filled carousel
	Scanning time	< 60 sec with filled carousel
	Manual quality control measurement possible	Yes
	Remote control	Remote monitoring and start of measurement via RADIANCE

FLEXQ module specifications	The specifications for the FLEXQ module are as follows:	
	Number of samplers in the sampler tray	up to 3
	Sampler type	<i>safe</i> PICO with <i>safe</i> TIPCAP
	Positioning of samplers in the sampler tray	Random
	Sample mixing time	7 sec
	Scanning time per sample	Typically <1 sec
	Warning signal for missing sampler ID	< 5 sec
Barcode scanner reads	Code 128 between 5-10 mil.	

Approvals and patents

Approvals	UL, CSA. In compliance with IEC 61010-1. Installation category II.
CE-mark	Indicates compliance with the In Vitro Diagnostic Directive 98/79/EC.
EMC emission	The equipment complies with the emission requirements for Class B equipment in EN 61326-1: Electrical equipment for measurement, control and laboratory use - EMC requirements part 1: General requirements.
EMC immunity	The equipment complies with the immunity requirements in EN 61326-1: Electrical equipment for measurement, control and laboratory use - EMC requirements part 1: General requirements.
Patents	<p>One or several of the following patents and patent applications may apply:</p> <p>US Patent Nos.: US4780192, US4874501, US4997769, US6051389, US6099804, US6551480, US6689318, US6880384</p> <p>European Patent Nos.: EP210417, EP212126, EP889951</p> <p>Japanese Patent Nos.: JP2070313, JP2972351, JP3285879, JP3369547</p> <p>German Patent Nos.: DE3673910, DE3686855, DE69729185</p> <p>Austrian Patent Nos.: AT56271</p> <p>Danish Patent Nos.: DK151394, DK155764</p> <p>European Patent Application Nos.: EP944731, EP1084398, EP1086366, EP1273920</p> <p>International Patent Application Nos.: WO2004/057304</p> <p>US and other patents pending.</p>

14. Ordering information

Overview

Introduction This chapter lists accessories used for the analyzer.

Contents This chapter contains the following topics.

Analyzer accessories	14-2
Quality control	14-5
Sampling devices	14-8
Symbols overview	14-10

Analyzer accessories

Introduction The following accessories are available on order for the ABL800 FLEX analyzer depending on analyzer configuration.

Electrodes	Item	Code No.	Type
	Reference Electrode	945-603	E1001
	pH Electrode	945-614	E777
	pO_2 Electrode	945-613	E799
	pCO_2 Electrode	945-612	E788
	K Electrode	945-615	E722
	Na Electrode	945-618	E755
	Cl Electrode	945-617	E744
	Ca Electrode	945-616	E733
	Glucose Electrode	945-620	E7066
	Lactate Electrode	945-619	E7077
	Dummy Electrode	945-626	-

Membrane boxes	Item	Code No.	Type
	Reference Membrane Box (4 units)	942-058	D711
	pO_2 Membrane Box (4 units)	942-064	D799
	pCO_2 Membrane Box (4 units)	942-063	D788
	K Membrane Box (4 units)	942-059	D722
	Na Membrane Box (4 units)	942-062	D755
	Cl Membrane Box (4 units)	942-061	D744
	Ca Membrane Box (4 units)	942-060	D733
	Glucose Membrane Box (4 units)	942-065	D7066
	Lactate Membrane Box (4 units)	942-066	D7077

Continued on next page

Analyzer accessories, *Continued*

Solutions	Item	Code No.	Type
	Waste Container 600 mL	905-802	D513
	ctHb Calibration Solution (4 ampoules)	944-021	S7770
	Cleaning Solution 200 mL	944-125	S8370
	Calibration Solution 1 200 mL	944-128	S1820
	Calibration Solution 2 200 mL	944-129	S1830
	Rinse Solution 600 mL	944-132	S4980

Gas accessories	Item	Code No.	Type
	Gas Cal 1 (10 bar) Onboard gas bottle	962-169	-
	Gas Cal 2 (10 bar) Onboard gas bottle	962-170	-
	Gas Cal 1 (34 bar) Onboard gas bottle for non-EU countries	962-183	-
	Gas Cal 2 (34 bar) Onboard gas bottle for non-EU countries	962-184	-
	Gas Cal 1 (34 bar), Onboard gas bottle for the USA and Canada	962-174	-
	Gas Cal 2 (10 bar), Onboard gas bottle for the USA and Canada	962-175	-
	Gas Cal 1 (26 bar), Onboard gas bottle for Japan	962-176	-
	Gas Cal 2 (10 bar), Onboard gas bottle for Japan	962-177	-
	Valve Key	922-509	-

Power cords	Item	Code No.	Type
	Line Cord 120 V, USA and Japan	615-403	-
	Line Cord 230 V, UK	615-312	-
	Line Cord 230 V, ITA	615-313	-
	Line Cord 230 V, DK	615-314	-
	Line Cord 230 V, ISR	615-315	-
	Line Cord 230 V, CHE	615-316	-
	Line Cord 230 V, other 230 V countries	615-303	-
	Line Cord 230 V, AUS and NZA	615-317	-
	Line Cord 230 V, ZAF and IND	615-318	-

Continued on next page

Analyzer accessories, *Continued***Other accessories**

Item	Code No.	Type
Thermal Paper (8 rolls)	984-070	-
Hypochlorite Solution	943-906	S5362
Inlet Gasket	902-668	-
Inlet Probe	902-797	-
Inlet Syringe Handle	902-669	-
Inlet Capillary Handle	902-670	
Pump Tube for electrode modules	842-328	-
Waste Pump Tube, yellow (2 pcs.)	842-326	-
Pump Tube for solutions	842-327	-
Fan Filter	924-073	-
Clot Catcher for the ABL800 FLEX, 250 units	906-020	-
Cleaning Additive for S8370 Cleaning Solution	944-108	S5370

Documentation

Item	Code No.	Type
Communication Protocol Specifications, English	989-329	-
Operator's manual, ABL800 FLEX, English	989-942	-
ABL800 FLEX Operator's manual on CD-ROM, English	990-325	-
Reference manual, ABL800 FLEX, English	989-963	-
ABL800 FLEX Reference manual on CD-ROM, English	990-449	-

Quality control

Quality control accessories

Item	Code No.	Type
Ampoule Opener	920-712	-
QC Adaptor	924-036	H700

Automatic quality control accessories

Item	Code No.	Type
Carousel	887-865	-
Ampoule Holder	924-185	H705

QUALICHECK1+ The QUALICHECK1+ quality control system contains the following solutions:

Type	Description	Code
S7130	Level 1 – RED	944-041
S7140	Level 2 – YELLOW	944-042
S7150	Level 3 – BLUE	944-043
S7160	Level 4 – GREEN	944-044

QUALICHECK3+ The QUALICHECK3+ quality control system contains the following solutions:

Type	Description	Code
S7330	Level 1 – RED	944-049
S7340	Level 2 – YELLOW	944-050
S7350	Level 3 – BLUE	944-051
S7360	Level 4 – GREEN	944-052

QUALICHECK4+ The QUALICHECK4+ quality control system contains the following solutions:

Type	Description	Code
S7430	Level 1 – RED	944-053
S7440	Level 2 – YELLOW	944-054
S7450	Level 3 – BLUE	944-055
S7460	Level 4 – GREEN	944-056

Continued on next page

Quality control, *Continued*

QUALICHECK5+ The QUALICHECK5+ quality control system contains the following solutions:

Type	Description	Code
S7730	Level 1 – RED	944-017
S7740	Level 2 – YELLOW	944-018
S7750	Level 3 – BLUE	944-019
S7760	Level 4 – GREEN	944-020

AutoCheck3+ The AutoCheck3+ quality control system contains the following solutions:

Type	Description	Code
S7335	Level 1 – RED	944-082
S7345	Level 2 – YELLOW	944-083
S7355	Level 3 – BLUE	944-084
S7365	Level 4 – GREEN	944-085

AutoCheck5+ The AutoCheck5+ quality control system contains the following solutions:

Type	Description	Code
S7735	Level 1 – RED	944-074
S7745	Level 2 – YELLOW	944-075
S7755	Level 3 – BLUE	944-076
S7765	Level 4 – GREEN	944-077

Range+ QUALICHECK The Range+ QUALICHECK quality control system contains the following items:

Type	Description	Code
S7930	Level 1, box of 30 ampoules	944-151
S7940	Level 2, box of 30 ampoules	944-152
S7950	Level 3, box of 30 ampoules	944-153
H700	ABL700 QC Adaptor	924-036
	Ampoule opener	920-712

Continued on next page

Quality control, *Continued***Quality Control
Documentation**

Type	Description	Code
	Quality Control Systems Reference Manual	989-046
	QUALICHECK Short-form Instructions	983-313
	Logbook Control Binder, QUALICHECK+	984-129
	Logbook Control Charts, Blood Gas	989-417
	Logbook Control Charts, Electrolytes and Metabolites	989-418
	Control Charts – Oximetry	989-419

Sampling devices

The following sampling devices are available:

Arterial blood gas samplers

Item	Code no.	Type
PICO50, 2 mL aspirator (100 units)	956-552	PICO50
PICO70 w/o needle (100 units)	956-518	PICO70
PICO70 w/o needle (w/o needle cube) (100 units)	956-519	PICO70
PICO70 22G × 1" (100 units)	956-522	PICO70
PICO70 22G × 1 1/4" (100 units)	956-525	PICO70
PICO70 23G × 5/8" (100 units)	956-529	PICO70
PICO70 23G × 1" (100 units)	956-533	PICO70
PICO70 23G × 1 1/4" (100 units)	956-534	PICO70
PICO70 23G × 5/8" (w/o needle cube) (100 units)	956-546	PICO70
PICO70 25G × 5/8" (100 units)	956-547	PICO70
PICO70 22G × 1" (w/o needle cube) (100 units)	956-563	PICO70
<i>safe</i> PICO70 22G × 1 1/4" with needle shield device (100 units)	956-608	PICO70
<i>safe</i> PICO70 23G × 5/8" with needle shield device (100 units)	956-609	PICO70
<i>safe</i> PICO70 22G × 1" with needle shield device (100 units)	956-624	PICO70

Capillary samplers, glass

Item	Code no.	Type
CLINITUBES with balanced heparin, 210 µL including mixing wire and capillary caps (5 × 50 units)	942-884	D957G-70-210x5
CLINITUBES with balanced heparin, 100 µL including mixing wire and capillary caps (5×75 units)	942-878	D957G-70-100x5
CLINITUBES with sodium heparin, 85 µL excluding mixing wire and capillary caps (10×75 units)	942-876	D941G-NA-240-85x10
CLINITUBES with sodium heparin, 85 µL including mixing wire and capillary caps (5×75 units)	942-875	D941G-240-85x5
CLINITUBES with sodium heparin, 55 µL excluding mixing wire and capillary caps (10×75 units)	942-873	D941G-NA-240-55x10
CLINITUBES with sodium heparin, 55 µL including mixing wire and capillary caps (5×75 units)	942-885	D941G-240-55x5

Continued on next page

Sampling devices, *Continued*

Capillary samplers, glass (*continued*)

Item	Code no.	Type
CLINITUBES with balanced heparin, 35 µL including mixing wire and capillary caps (5×75 units)	942-869	D957G-70-35x5

Capillary samplers, plastic

Item	Code no.	Type
CLINITUBES with balanced heparin, 100 µL including mixing wire and capillary caps (1 × 250 units)	942-892	D957P-70-100x1
CLINITUBES with sodium heparin, 85 µL excluding mixing wire and capillary caps (3 × 250 units)	942-891	D941P-NA-240-85x3
CLINITUBES with sodium heparin, 85 µL including mixing wire and capillary caps (1 × 250 units)	942-890	D941P-NA-240-85x1
CLINITUBES with sodium heparin, 55 µL excluding mixing wire and capillary caps (3×250 units)	942-889	D941P-NA-240-55x3

Sampling devices for FLEXQ

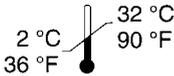
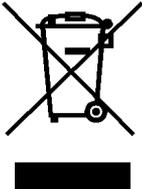
The following sampling devices are available on order for the ABL800 FLEX analyzers with FLEXQ module:

Item	Code No.
* <i>safe</i> PICO Self-fill without needle with <i>safe</i> TIPCAP, 0.7-1.5 mL (100 units)	956-610
<i>safe</i> PICO Self-fill with <i>safe</i> TIPCAP, without needle shield device, 22G x 32 mm, 0.7-1.5 mL (100 units)	956-611
<i>safe</i> PICO Self-fill with <i>safe</i> TIPCAP, without needle shield device, 23G x 16 mm, 0.7-1.5 mL (100 units)	956-612
<i>safe</i> PICO Self-fill with <i>safe</i> TIPCAP, without needle shield device, 22G x 25 mm, 0.7-1.5 mL (100 units)	956-613
* <i>safe</i> PICO Self-fill with needle shield device and <i>safe</i> TIPCAP, 22G x 32 mm, 0.7-1.5 mL (100 units)	956-614
* <i>safe</i> PICO Self-fill with needle shield device and <i>safe</i> TIPCAP, 23G x 16 mm, 0.7-1.5 mL (100 units)	956-615
* <i>safe</i> PICO Self-fill with needle shield device and <i>safe</i> TIPCAP, 23G x 25 mm, 0.7-1.5 mL (100 units)	956-616
* <i>safe</i> PICO Self-fill with needle shield device and <i>safe</i> TIPCAP, 22G x 25 mm, 0.7-1.5 mL (100 units)	956-620
* <i>safe</i> PICO Self-fill with needle shield device and <i>safe</i> TIPCAP, 25G x 16 mm, 0.7-1.5 mL (100 units)	956-623

* Without a needle cube.

Symbols overview

List of symbols The symbols below are used by Radiometer.

Symbol	Explanation
	Biohazard
	Expiry date
	See instructions for use
	For In Vitro Diagnostic Use
	Lot number
	Sensitive to light. Store in a dark place.
REF	Code number
	For single use only
	Sterilized by ethylene oxide
	Storage temperature from 2 °C to 32 °C (36 °F to 90 °F)
	<p>Waste of Electrical and Electronic Equipment (WEEE)</p> <p>The symbol indicates that:</p> <ul style="list-style-type: none"> • Radiometer Medical ApS and its distributors within the European Union (EU) and associated states have taken the necessary steps to comply with the directive, 2002/96/EC on waste electrical and electronic equipment (WEEE). • The instrument, when reaching its end of life, must be collected and recycled separately from other waste according to national requirements. Please contact your local Radiometer distributor for instructions. <p>Environmental implications: WEEE contains materials that are potentially hazardous to the environment and to human health.</p>

15. Radiometer settings

Overview

Introduction This chapter describes Radiometer settings, contents of various Ini files, troubleshooting messages, and calibration verification procedure,

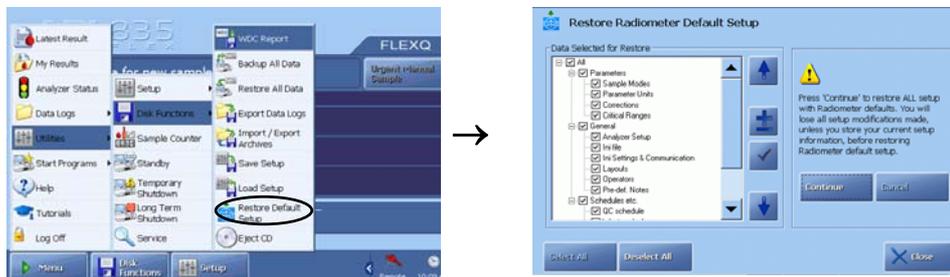
Contents This chapter contains the following topics.

Radiometer default settings.....	15-2
Contents of setup settings.....	15-14
Calibration verification	15-17
Interfacing facilities	15-19

Radiometer default settings

Radiometer default setup screen

Press *Menu - Utilities - Disk Functions - Radiometer Default Setup*:



You can select the parts of the Setup to be set back to Radiometer defaults.

Operators and Passwords defaults

Default settings for **Access Profiles** are as follows:

	A	B	C	D	E	F	G	H	I	J
User	X	X	X		(X)	X			X	
Supervisor	X	X	X	X	X	X	X		X	X
Manager	X	X	X	X	X	X	X		X	X
Service techn.	X	X	X	X	X	X	X	X	X	X
Guest	X				(X)					
Custom 1					(X)					
Custom 2					(X)					
Custom 3					(X)					
Remote operator	X	X	X	X	X	X	X	X	X	

A = Perform measurement

B = Perform calibration

C = Perform replacements

D = Perform Disk Functions

E = View Data Logs

F = Edit data in logs

G = Enter Setup Programs

H = Enter Service Programs

I = Start AutoCheck

J = Approve results

Columns D, E, G and H are controlled via the **Menu and Button Configuration** screen settings, not via the check buttons on the **Access Profiles** screen.

(X) means restricted access to data logs:

- User can view the logs, but there is no access to the archived data logs.
- Guest and Custom can view Patient Results log and Quality Control log.

Continued on next page

Radiometer default settings, *Continued*

Analysis Setup defaults The following default measuring modes are available:

Analyzer	Modes	Default button
ABL835/25 /15	Syringe: Capillary:	Syringe – S195 µL; Syringe – S95 µL; Ampoule-QC Capillary – FLEXMODE; Capillary – C95 µL; Capillary – C55 µL pH+BG+OXI; Capillary – C35 µL MET Capillary – C35 µL OXI
ABL830/20 /10/10 BG only	Syringe: Capillary:	Syringe – S85 µL; Ampoule-QC Capillary – FLEXMODE; Capillary – C55 µL Capillary – C35 µL OXI
ABL805	Syringe: Capillary:	Syringe – S165 µL; Syringe – S95 µL; Ampoule-QC Capillary – FLEXMODE; Capillary – C95 µL; Capillary – C55 µL pH+BG; Capillary – C35 µL MET
ABL800*	N/A	N/A

* Not available at the time of the release.

- All user-defined modes and Other Fluids mode are deleted. All modes are set to Radiometer default layout.
- Reference ranges and critical limits are deleted.
- **Parameter profile:** All parameters are selected.
- Dynamic Parameters: Off.
- **Sample Pre-registration** settings:
 - Interpret barcode input as: Sampler ID
 - Confirm pre-registered data : On.
 - Included fields: All fields On.
- **Sample Logistics Setup** settings:
 - Batch mode: Off
 - Sample age: On (30 min for all parameters)
 - Primary patient ID field in "FLEXQ" box: Patient Last Name.
- Available **layouts:** -R- Default (Default)
- **Patient ID layout** settings included in the -R- Default Layout:
 - Patient ID
 - Patient Last Name
 - Patient First Name
 - Sample type
 - Temp. °C

Continued on next page

Radiometer default settings, *Continued*

- Analysis Setup defaults** (continued)
- **Patient Result** settings included in the -R- Default Layout (bold text = a new title; [xxx – xxx] = the reference range for a parameter):

Blood Gas Values	
pH	[xxx – xxx]
pCO ₂	[xxx – xxx]
pO ₂	[xxx – xxx]
< New Line >	
Oximetry Values	
ctHb	[xxx – xxx]
sO ₂	[xxx – xxx]
FO ₂ Hb	[xxx – xxx]
FCOHb	[xxx – xxx]
FHHb	[xxx – xxx]
FMetHb	[xxx – xxx]
FHbF	[xxx – xxx]
< New Line >	
Electrolyte Values	
cK ⁺	[xxx – xxx]
cNa ⁺	[xxx – xxx]
cCa ²⁺	[xxx – xxx]
cCl ⁻	[xxx – xxx]
< New Line >	
Metabolite Values	
cGlu	[xxx – xxx]
cLac	[xxx – xxx]
ctBil	[xxx – xxx]
< New Page >	

Continued on next page

Radiometer default settings, *Continued*

Analysis Setup defaults (*continued*)

Temperature-corrected values
pH(<i>T</i>)
<i>p</i> CO ₂ (<i>T</i>)
<i>p</i> O ₂ (<i>T</i>)
< New Group >
Oxygen Status
<i>ct</i> O ₂
<i>p</i> 50
< New Line >
Acid-base Status
<i>c</i> Base(Ecf)
<i>c</i> HCO ₃ ⁻ (P, st)

Calibration Setup defaults

Default settings for **Drift tolerances** are as follows:

Parameter	Drift 1	Drift 2	Units
pH	0.020	0.020	
<i>p</i> CO ₂	2.5	5	mmHg
<i>p</i> O ₂	6	6	mmHg
<i>ct</i> Hb	10	N/A	pA
<i>c</i> K ⁺	0.2	1.5	mmol/L
<i>c</i> Na ⁺	3	1	mmol/L
<i>c</i> Ca ²⁺	0.05	0.2	mmol/L
<i>c</i> Cl ⁻	2	3	mmol/L
<i>c</i> Glu	0.5	N/A	mmol/L
<i>c</i> Lac	0.2	N/A	mmol/L

Continued on next page

Radiometer default settings, *Continued*

Calibration Setup defaults (*continued*)

Default settings for **Calibration Schedule** are as follows:

Activity	Default setting
2-point calibration	8 hours
1-point calibration	4 hours
1-point gas calibration (for the USA only)	2 hours
tHb Cal	3 months
Automatic Cleaning	24 hours
Start Time	00:00
Activity after measurement	None

Quality Control Setup defaults

Default settings for **Quality Control Statistics** are as follows:

Item	Default setting
Statistics factor	1.5
Remind to print statistics each month	No
Remind to export WDC data each month	No

Default settings for **Quality Control Mandatory Input** are as follows:

Item	Default Setting
Mandatory temperature	No
Default temperature	25 °C

- **QC Schedule** settings are deleted.
- **AutoCheck Setup**: replacement warning before carousel empty: No.
- **Westgard Rules**: all rules are 'Off'.

Continued on next page

Radiometer default settings, *Continued*

Replacement Setup defaults

The default settings for **Replacements** are as follows:

Item	Default setting
pCO ₂ Electrode Membrane	Never
pO ₂ Electrode Membrane	Never
K Electrode Membrane	Never
Na Electrode Membrane	Never
Ca Electrode Membrane	Never
Cl Electrode Membrane	Never
Glucose Electrode Membrane	Never
Lactate Electrode Membrane	Never
Reference Electrode Membrane	Never
K Electrode	Never
Na Electrode	Never
Ca Electrode	Never
Cl Electrode	Never
Glucose Electrode	Never
Lactate Electrode	Never
Reference Electrode	Never
pH Electrode	Never
pCO ₂ Electrode	Never
pO ₂ Electrode	Never
Inlet Gasket	Never
Rubber Tube for Inlet	Never
Pump Tube, Electrode Modules	Never
Pump Tube, Waste	Never
Pump Tube, Solutions	Never
Fan Filter	Never

Solution warning settings are 25 %.

User Activities settings are blank.

AutoCheck Warning: No.

Continued on next page

Radiometer default settings, *Continued*

General Setup defaults The default settings for **Parameter Setup** are as follows:

Parameter	Enabled/ Locked	Repression	Offset	Slope	Units	Out of Range Suppression
pH	Not altered	No	0.000	1.000		
pCO ₂	Not altered	No	0.0	1.000	mmHg	
pO ₂	Not altered	No	0.0	1.000	mmHg	
ctHb	Not altered	No	N/A	1.000	g/dL	
FHHb	Not altered	No	N/A	N/A	%	No
FO ₂ Hb	Not altered	No	N/A	N/A	%	No
FHbF	Not altered	No	0	1.000	%	Yes
sO ₂	Not altered	No	0.0	1.000	%	No
FCOHb	Not altered	No	0.0	N/A	%	No
FMetHb	Not altered	No	0.0	N/A	%	No
ctBil	Not altered	No	0	1.000	μmol/L	Yes
cK ⁺	Not altered	No	0.0	1.000	mmol/L	
cNa ⁺	Not altered	No	0	1.000	mmol/L	
cCa ²⁺	Not altered	No	0.00	1.000	mmol/L	
cCl ⁻	Not altered	No	0	1.000	mmol/L	
cGlu	Not altered	No	0.0	1.000	mmol/L	
cLac	Not altered	No	0.0	1.000	mmol/L	

Continued on next page

Radiometer default settings, *Continued*

General Setup defaults (*continued*)

Default settings for **Units** are as follows:

Parameter	Unit
Pressures	mmHg
ctBil	μmol/L
ctHb	g/dL
Oximetry fractions	%
Saturation	%
Gas fractions	%
FO ₂ (I)	%
Sensitivity pH/cK ⁺ /cNa ⁺ /cCa ²⁺ /cCl ⁻	%
Hct	%
pO ₂ (a/A)	%
FShunt	%
RI	%
cK ⁺ /cNa ⁺ /cCa ²⁺ /cCl ⁻	mmol/L
cGlu/cLac	mmol/L
Temperatures	°C
ctO ₂ /ctCO ₂	Vol %
ĐO ₂	mL/min
ṂO ₂	mL/min
Age	years
Weight	kg
Height	m
Altitude	m
Birth weight	g
pO ₂ sensitivity	pA/mmHg

Continued on next page

Radiometer default settings, *Continued*

General Setup defaults (continued) Default settings for **User-defined Patient Data Items** are as follows:

Name	Type	Unit	Decimals
Spontaneous RR	Numerical	b/min	1
Set RR	Numerical	b/min	1
Vt	Numerical	L	2
Ve	Numerical	L	2
Peak Flow	Numerical	L/min	1
Liter Flow	Numerical	L/min	1
Ti	Numerical	seconds	1
PEEP	Numerical	cmH ₂ O	1
Pressure Support	Numerical	cmH ₂ O	1
CPAP	Numerical	cmH ₂ O	1
CMV	Numerical	Rate	1
SIMV	Numerical	Rate	1
Flow-by	Numerical	L/min	1
HFV	Numerical	Rate	1
I:E Ratio	Numerical		2
Wave	Numerical		None
ICD9 Code	Numerical		None
Oxygen Device 1	Numerical		None
Oxygen Device 2	Numerical		None
Diagnostic Code	Numerical		None

Default settings for **User-defined Notes**: No notes defined.

Default settings for **Language**: English.

Default settings for **Acoustic Signals** are as follows:

Event	Default setting
Value exceeds critical limits	No
Close inlet	Yes
Result is ready	Yes
Beep before AutoCheck module opens	Yes

Continued on next page

Radiometer default settings, *Continued*

General Setup defaults (*continued*)

Default settings for **Corrective Actions** are as follows:

Event	Default setting	Traffic light
Calibration error(s) present	"?" on specific parameters"	N/A
Calibration schedule reminder(s)	No setting	Yellow
QC error(s) present	No setting	Green
QC schedule reminders	No setting	Yellow
Replacement schedule reminders	No setting	Yellow
System message(s) present	No setting	Yellow
User Activity Reminder(s)	No setting	Yellow
AutoCheck QC error(s) present	No setting	N/A
AutoCheck scheduled level missing	No setting	Green

Default settings for **Miscellaneous Setup** are as follows:

Event	Default setting
Analyzer locked	Not set
Use <i>safe</i> TIPCAP	??
Enable Estimated Derived Parameters	No
Fixed pO_2/pCO_2 decimals	No
Enable General Barcode Support	Yes
Enable Patient Result Approval	No
Apply Parameter Corrections to QC	Yes
Log All Measurement Activities	No
Show Parameter Bar	Yes
HbF correction	"Enabled for levels > 20 %"
Analyzer Message	(Blank)
Screen saver	

Default settings for **Automatic Printing** are as follows:

Item	Default setting
Patient Results	On
QC Results	Off
Calibration Results	Off
Activity Log Message	Off
Registration receipts	Off
Message Level	User
Number of copies	1

Continued on next page

Radiometer default settings, *Continued*

General Setup defaults (*continued*)

Default settings for **Printer Setup** are as follows:

Item	Default setting
Installed printers	Internal Printer (added printers are not deleted)
Select printer dialogue	Off

Default settings for **Automatic Backup** are as follows:

Item	Default setting
Auto Backup	Off

Default settings for **Automatic Archiving** are as follows:

Item	Default setting
Archive Pt Report Log	On
Archive Cal Log	On
Archive QC Log	On
Archive Activity Log	On
Store archives on analyzer	On

Default settings for **Operators and Passwords** are as follows:

Item	Default setting
User password	123456
Logoff Time	3 min

Default settings for **Communication Setup** are as follows:

Item	Default setting
RADIANCE	Off
LIS/HIS	None
Automatic Data Request	"When entering sampler ID" – on
Automatic Data Transmission	Patient results, Calibration results, QC results, Activity log messages
Patient Lookup	Local database
Remote Control	Enable remote access

Continued on next page

Radiometer default settings, *Continued*

- Setups without Radiometer settings** The following setups have no Radiometer settings:
- barometer setup
 - time and date setup
 - analyzer identification setup

Contents of setup settings

Groups of Setup settings The setup is divided in the following groups of settings:

- Parameters
- General
- Schedules, etc.



You can restore the Radiometer Default Setup or a setup you have customized (Customer Setup) and saved.

Selecting or deselecting items in the setup – see *Loading/restoring Setup* in *chapter 8*.

Each setup group of settings is described in this section.

Parameters

The following settings (i.e. screens and their data) will be restored in the Parameters group:

Item	Setup (screens)
Sample Modes	<ul style="list-style-type: none"> • Syringe Mode • Capillary mode • Parameter Setup (Offset and slope only)
Parameter Units	Units Setup
Corrections	Parameter Setup (Repression and Out-of-range suppression only)
Critical Ranges	<ul style="list-style-type: none"> • Reference ranges, Critical limits • Age groups

Continued on next page

Contents of setup settings, *Continued*

General

The following settings (i.e. screens and their data) will be restored in the General group:

Item	Setup (screens)
Analyzer Setup	<ul style="list-style-type: none"> • Corrective Actions • Acoustic Signals • Low Level Warning
Ini File	<ul style="list-style-type: none"> • Selected Language • Printer path
Ini Settings and Communications	<ul style="list-style-type: none"> • RADIANCE Connection • LIS/HIS Connection • Automatic Data Transmission • Automatic Data Request • Patient Lookup Setup • Operators and Passwords (Logon Protection Level and Logoff Time only) • Miscellaneous Setup (All, except Analyzer Locked) • Automatic Printing • Automatic Archiving • Automatic Backup • Save Setup (Destination) • Load Setup (Source) • Backup All Data (Destination) • Export Data Logs (Destination) • Function: External keyboard enabling • Function: Enable remote access when operator is logged on • QC Statistics Setup • QC Input Setup • AutoCheck Setup • Westgard Rules (enable Westgard Rules) • Printer Setup (Show list of printers)

Continued on next page

Contents of setup settings, *Continued*

General (continued)

Item	Setup (screens)
Layouts	<ul style="list-style-type: none"> • Patient Report Setup • Patined ID Layout • Patient Result Layout • User-defined Data Items • The width of the following column setups: Patient Results Log; Patient Lookup; Patient Profiles Log; QC Log; Calibration Log; System Messages; Replacement Schedule
Operators	<ul style="list-style-type: none"> • Operators and Passwords • Access Profiles
Pre-def. Notes	<ul style="list-style-type: none"> • User-defined Notes

Schedules, etc. The following ini files (i.e. screens and their data) will be restored in the Schedules, etc. group:

Item	Setup (screens)
QC Schedule	QC Schedule (QC schedule is restored for the slots with the control solutions installed in them. The schedule follows the slots, not the QC levels).
Wetsection Setup	<ul style="list-style-type: none"> • Calibration Schedule (minus tHb Cal and the start time) • Calibration Drift Tolerances
Replacement Schedule	Replacement Schedule
User Activities Schedule	<ul style="list-style-type: none"> • User Activities • Edit User Activities

NOTE: The default settings – see section *Radiometer default settings* in this chapter.

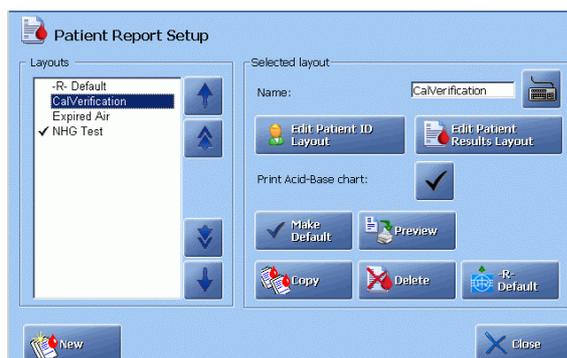
Calibration verification

Purpose Regulations in some countries require verification of the reportable ranges selected for the measured parameters, and a special feature described below is provided to assist in the collection of this data.

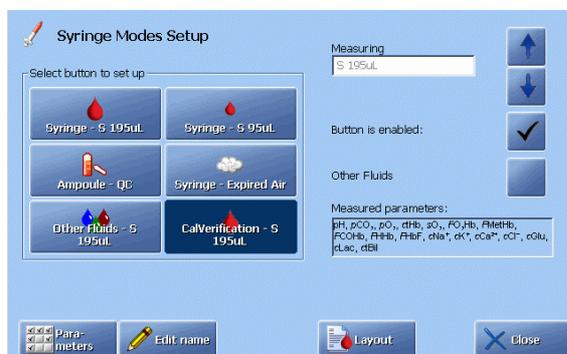
Once the reportable ranges for the measured parameters are established, the limits may be entered in the Reportable Ranges program described in *Analysis Setup*, chapter 3.

Preparatory steps The procedure given below is only a suggestion to easily identify your specific layout and measuring mode.

- | Step | Action |
|------|---|
| 1. | Make a new report layout called, e.g. "Cal. Verification", based on the Radiometer default layout – see <i>Patient Report Setup</i> in chapter 3. |
| 2. | Press <i>Patient ID layout</i> and deselect all items except for the Patient ID and Sample type. Set default sample type to Cal. Verification. |



- Press *Edit Patient Results Layout* and deselect all parameters except for the measured parameters. Deselect range checks for all parameters.
- In the *Analysis Setup - Syringe Mode Setup* dedicate one unoccupied button to this specific mode (call it, e.g. Cal. Verification) using *Edit name*.



Select desired parameters (press *Parameters*) and layout (press *Layout*) that you have made in step 1 above.

Continued on next page

Calibration verification, *Continued*

Preparatory steps (*continued*)

- | Step | Action |
|------|--|
| 5. | Condition Radiometer quality control solutions – see <i>Preparing a control solution</i> in <i>chapter 5</i> of this manual. |
| 6. | Place the ampoule in the ampoule opener and break off the ampoule neck. Place the ampoule fully into the H700 Adapter. |

Verification procedure

To perform a verification measurement, do the following:

- | Step | Action |
|------|---|
| 1. | Check that the analyzer is in the Ready mode. |
| 2. | Open the syringe inlet flap and place the adapter tip into the syringe inlet. |
| 3. | Select the Cal. verification mode on the screen and press Start . |
| 4. | Press Aspirate to start sample aspiration. |
| 5. | When prompted by the analyzer, remove the sampling device and close the inlet flap. |
| 6. | Enter the information on the Patient Identification screen. |



- Use a dedicated identifier for each solution (e.g. Level 1) as Patient ID.
- | | |
|----|---|
| 7. | After all measurements on the calibration verification solutions have been completed, review the data by filtering it in the Patient Results log or transfer the data to a data analysis program – see <i>Exporting Data Logs</i> in <i>chapter 8: Disk Functions</i> . |
| 8. | After the new reportable ranges have been determined, enter any changes in Setup program: Reportable Ranges. |

Once the first measurement in this mode has been performed, the mode is available for the next seven days. During this time you can verify your reportable ranges according to the procedure used in your institution. After seven days the mode will not be available for the next 14 days.

Interfacing facilities

Connecting a mouse

A mouse connected to the analyzer may be used to activate all the analyzer's screen functions instead of the operator touching the screen.

A standard PS/2 port mouse is the sole item that is required for connection to the analyzer.

To connect the mouse to the analyzer, do the following:

Step	Action
1.	Switch off the analyzer.
2.	Connect the mouse to the mouse port at the rear of the analyzer.
3.	Switch on the analyzer.

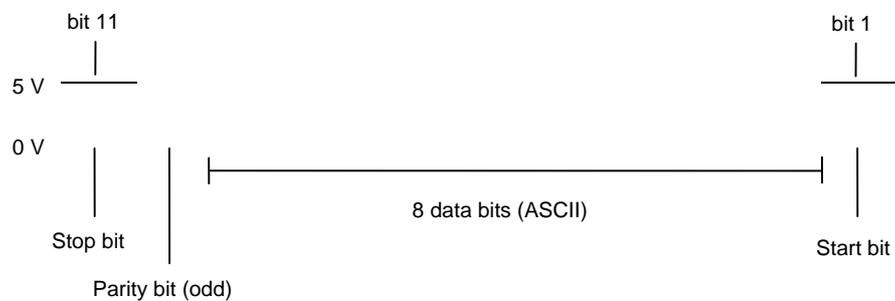
Connecting an alphanumeric keyboard

An external alphanumeric keyboard may be used instead of the on-screen keyboard to enter data. However, to select individual buttons on the analyzer's screen, a mouse must be used or the operator must touch the screen.

An IBM enhanced personal computer keyboard is the sole item that is required for connection to the analyzer.

NOTE: The keyboard layout must correspond to the language version used by the analyzer.

The transmission format for an alphanumeric keyboard is as follows:



Pin designation on the cable connector are as follows:

Pin 1 – Clock in/out

Pin 2 – Data in/out

Pin 3 – Not connected

Pin 4 – Ground

Pin 5 – +5 V

Pin 6 – Not connected

Continued on next page

Interfacing facilities, *Continued*

Connecting an alphanumeric keyboard (*continued*)

To connect the keyboard to the analyzer, do the following:

Step	Action
1.	Switch off the analyzer.
2.	Connect the keyboard to the keyboard port at the rear of the analyzer.
3.	Switch on the analyzer.

Connecting to a network

Many hospitals utilize a computer-controlled information system such as the Hospital Information System (HIS) or the Laboratory Information System (LIS). Connecting the analyzer to such an information system via a network enables the user to exercise greater control over the amount of patient data circulating within the hospital.

The types of information that can be communicated via a network between the central computer controlling the information system and the analyzer are:

- Patient results
- Quality control results
- Calibration data
- System messages

Recommendations:

1. Use a shielded data cable with an RJ45 connector to connect the analyzer to a network.
2. The analyzer is first connected to the computer controlling the information system via one of the following two interfaces:
 - A serial line (RS232 Interface)
 - An Ethernet interface (TCP/IP)
3. Once the analyzer has been physically connected to the network, one of two of the protocols stated below is used for communication with the central computer.
 - ASTM
 - HL7

For further information refer to the *Communication Protocol Specifications for Radiometer Products* (code 989-329).

Radiometer recommends that a qualified service technician carries out connection of the analyzer to a network.

External barcode reader

An external barcode reader can be connected and used side by side with the built-in barcode reader – contact your Radiometer service representative.

Index

I

1- or 2-point calibration results 6-8

A

Access to analyzer menu 2-27

Access to Data Logs 9-2

Accessing Setup programs 3-3

Acid-Base Chart 4-20

Acoustic Signal 3-60

Activity Log 9-18

 Adding a Message 9-18

 Filter function 9-19

Adding a new patient profile 9-9

Adding a user activity 3-46

Adding an operator 3-7

Adjusting low level warning 3-48

Allowed actions at analyzer startup 2-24

Analysis Setup 3-12

Analysis Setup Defaults 15-3

Analyzer - Front 2-2

Analyzer - Rear 2-4

Analyzer ID 3-58

Analyzer Message 3-81

Analyzer messages 11-7

Analyzer Requirements 13-12

Analyzer Settings Setup 3-58

Analyzer Specifications 13-13

Analyzer Status 2-28

Analyzer status at a glance 2-28

Approvals and Patents 13-15

Archived Data Logs 9-3, 9-21

Arterial blood samplers 12-8

AutoCheck Measurement 5-7

AutoCheck Module 2-14

AutoCheck Module Specifications 13-13

AutoCheck Status 2-33, 5-14

AutoCheck Warning program 3-50

Automatic Archiving Setup 3-74

Automatic Auxiliary Programs 7-18

Automatic Backup Setup 3-73

Automatic Data Request 3-67

Automatic Data Transmission Setup 3-68

Automatic Printing 3-70

Auxiliary programs

 Interrupting a program 7-18

 Starting a program 7-18

Available Calibration Schedule Options 3-32

Available modes and parameters 4-2

B

Backing up All Data 8-6

Barcode Reader 2-13

Barometer Setup 3-59

Batch measurement.....	4-8
Batch mode (automatic sample handling).....	3-21
Before measurement on AutoCheck control solution	5-5
Before measurement on QUALICHECK+ control solution	5-4
Before using the FLEXQ	4-5
C	
Calculation of F_{Shunt} and $ctO_2(a-\bar{v})$	4-22
Calibration	
Filter function	9-16
Trend function	9-17
Calibration Drift Tolerances	3-30
Calibration Log	9-15
Calibration programs	6-2
Calibration Result	6-8
Calibration Result Messages.....	6-10
Calibration Schedule.....	3-31
Calibration Setup	3-30
Calibration Setup Defaults.....	15-5
Calibration Status.....	2-29
Calibrations during 24 hours after Restart	6-4
Calling an unscheduled calibration	6-4
Capillary samples.....	4-11
Causes of errors in preanalytical phase.....	12-2
CE-mark.....	13-15
Cleaning	
the analyzer exterior	7-22
the analyzer touch screen.....	7-23
the inlet flaps and inlet gasket	7-22
the measuring chambers	7-22
Cleaning Additive	7-21
Cleaning the Analyzer	7-22
Cleaning the FLEXQ sampler tray cover.....	7-23
CLINITUBES	12-8
Communication Ports	2-11
Communications Setup	3-62
Complete menu	2-26
Conditions and correction actions.....	3-76
Connecting a mouse.....	15-19
Connecting an alphanumeric keyboard.....	15-19
Connecting to a network	15-20
Converting an Archive into .csv Format	9-22
Corrective Actions program.....	3-76
Creating a backup of all data	8-6
Creating a layout.....	3-24
Creating a WDC Report.....	8-4
D	
Data storage options.....	8-3
Decontamination program	7-19
Default list of operators	3-6
Definition	
NOTE	1-7
WARNING/CAUTION.....	1-7
Deleting a Patient Profile.....	9-9
Deleting a user activity	3-47
Deleting an archive	8-12
Description of the Fluidic Module.....	11-62
Diagram of fluid transport system	11-61
Diagram of the Fluidic Module.....	11-61

Disabled Versus Deselected Parameter.....	3-14
Disk Functions menu	8-3
Disk Functions programs	8-2
Disk Functions Setup.....	3-73
Disk handling rules	8-3
E	
Editing a layout.....	3-25
Editing a Patient Profile	9-8
Editing a user activity	3-47
Editing patient ID layout.....	3-26
Editing patient result layout	3-28
Editing sample registration	4-9
Electrode Troubleshooting Procedures	11-58
Electrode Updatings.....	4-16, 5-9
Electrodes and Other Status	2-32
Entering Corrections for Other Fluids Mode	3-15
Entering default values	3-27
Entering Fluid Replacements Mode.....	7-4
Entering Information Manually	4-14
Entering Information with Bar Code Reader	4-14
Entering Information with Barcode Reader	5-8
Entering password.....	3-5
Entering standard password	2-25
Entering Standby.....	10-3
Entering the Hold Mode.....	7-2
Evaluating the Rinse	11-63
Executing the Temporary Shutdown program	10-6
Exiting Standby.....	10-3
Expired air sampling.....	12-13
Expired calibrations	6-5
Explanation of Corrective Actions.....	3-77
Exporting an Archive.....	8-11
Exporting Data Logs.....	8-9
External barcode reader	15-20
F	
Finding a Patient Profile	9-10
FLEXMODE.....	1-3, 4-4
FLEXQ module	2-8
FLEXQ module specifications.....	13-14
Fluid Transport System Description	11-61
Fluid Transport Troubleshooting Procedure	11-54
Forced Hold Causes	11-5
Forced Standby	10-5
Full Waste Container	10-5
G	
General Setup Defaults	15-8
Glucose and Lactate troubleshooting procedure.....	11-59
Guidelines for handling capillary blood samples.....	4-7
H	
Help	2-35
I	
Importing an Archive.....	8-12
Importing/Exporting Archives	8-11
Indication of obstructions in the inlet	11-56
Inlet Calibration Error.....	11-5

Inlet Module.....	2-7
Inlet Probe Troubleshooting Procedure	11-55
Inlet Troubleshooting Procedure.....	11-56
Installation	3-2
Intended use	1-2
Interfacing Facilities	15-19
Interrupted calibrations	6-5
Interrupting a measurement	4-5
Introducing a Blood Sample	4-10
Introducing an Expired Air Sample	4-13
K	
Known interfering substances.....	1-4
L	
Leak Detected Error.....	11-6
Leak Troubleshooting Procedure.....	11-57
Limitations of use	1-4
LIS/HIS Connection Setup	3-63
Loading/Restoring Setup	8-14
Long-term Shutdown	10-8
M	
Manual Quality Control Measurement	5-6
Measurements on animal blood	1-3
Measurements with FLEXQ	4-8
Measuring modes with FLEXQ.....	4-2
Measuring Section	2-5
Menu at analyzer startup.....	2-24
Menu Structure	2-24
Messages after refilling AutoCheck carousel	7-17
Miscellaneous Setup	3-79
List of options.....	3-79
Mixing a blood sample	
in a capillary	4-7
in a syringe	4-7
in a test tube.....	4-7
Moving Archive.....	9-22
N	
Names	1-2
O	
Online Aid Facilities.....	2-35
Operators and Passwords	3-6
Other fluids	<u>3-13</u>
Other fluids mode	1-3
P	
Parameter Setup	3-51
Parameter status	4-18
Parameters and Input Setup	3-51
Patents.....	13-15
Patient Filter Friteria.....	9-5
Patient identification on the Ready screen.....	3-22
Patient Lookup.....	3-68, 4-15
Patient Profile Log.....	9-7
Patient Report Layout	3-28
Patient Reports Setup.....	3-24
Patient Result	4-18

Patient result approval 4-19
 Patient result audit trail 4-21
 Patient Result Messages..... 4-23
 Patient Results Log 9-4
 Patient Trend Function..... 9-6
 $p\text{CO}_2$ and $p\text{O}_2$ troubleshooting procedure..... 11-58
 Pending calibrations..... 6-5
 Performing a tHb Calibration..... 6-6
 pH, K, Na, Ca, and Cl troubleshooting procedure 11-58
 Preparation prior to arterial/venous sampling 12-5
 Preparation prior to capillary sampling..... 12-7
 Preparing a Control Solution 5-4
 Print Setup 3-5
 Printer Setup 3-71
 Printing Monthly QC Statistics 9-14
 Printing QC statistics 9-14
 Protein Removal Program..... 7-19
 Pump Troubleshooting Procedure..... 11-60

Q

QC Input Setup program..... 3-37
 QC Ranges program..... 3-35
 QC Shedule program 3-38
 QC Solutions program 3-33
 QC Statistics program..... 3-40
 Quality Control
 Entering Information Manually 5-8
 filter criteria..... 9-12
 General information..... 5-2
 Glossary of Terms 5-3
 Quality Control Frequency 5-2
 Quality Control Log..... 9-11
 Quality Control Plot..... 5-12
 Quality Control Result
 status markings 5-10
 Quality Control Result Messages..... 5-14
 Quality Control Setup 3-33
 Quality Control Setup Defaults..... 15-6
 Quality Control Status 2-31

R

RADIANCE Browser (optional)..... 9-23
 RADIANCE Communication Setup 3-62
 Reading In A Barcode..... 2-13
 Ready screen..... 2-15
 Reagents Status 2-32
 Recalling patient ID 4-21
 Recalling Quality Control Identification..... 5-11
 Recommended Replacement Intervals..... 3-45
 Recording Replacements in Hold Mode 7-3
 Recording replacements in the Fluid Replacements mode 7-4
 Reference electrode troubleshooting procedure..... 11-58
 Refilling the AutoCheck Carousel 7-17
 Remebraning an Electrode..... 7-6
 Remote Support 3-69
 Removing an operator..... 3-7
 Replacement Setup 3-44
 Replacement Setup Defaults 15-7
 Replacing an Electrode 7-7
 Replacing gas cylinders 7-15

Replacing Pump Tubes	7-8
Replacing solutions	7-15
Replacing the electrode pump tubes	7-8
Replacing the Fan Filter	7-13
Replacing the inlet gasket unit	7-11
Replacing the Inlet Probe	7-11
Replacing the Printer Paper	7-13
Replacing the Solutions Pump Tube	7-9
Replacing the Waste Container	7-13
Replacing the Waste Pump Tubes	7-10
Requirement to the operator	1-3
Restart after replacements	7-5
Restarting the Analyzer	10-6
Restoring All Data	8-8
Retrieving patient result	4-18
Rinse Process	11-62
S	
Sample age	3-22
Sample Counter	2-38
Sample Logistics Setup	3-21
Sample Pre-registration	3-20
Samples	
Preparation Prior to Analysis	12-10
Sampling devices	12-8, 14-8
Sampling devices for FLEXQ	14-9
Sampling with a standard syringe	12-12
Sampling with a test tube	12-13
Saving Setup	8-13
Scheduled AutoCheck measurement	5-7
Screen elements	
buttons	2-22
center section	2-17
check buttons	2-20
information bar and icons	2-22
parameter bar	2-16
screen keyboard	2-21
screen keypad	2-20
status bar	2-15
text boxes	2-19
time bar	2-16
top section	2-15
Screen saver	3-81
Selecting Sex	3-17
Selecting a Report Layout	3-16, 4-16
Selecting access profile	3-8
Selecting access to menus	3-9
Selecting Archive Stored on the Analyzer	9-21
Selecting button configuration	3-11
Selecting HbF Correction	3-14
Selecting HbF Correction option	3-80
Selecting Options	3-80
Selecting Parameter Profile	3-13
Selecting parameters after a measurement	4-17
Selecting Sample Type	3-17
Selection of Anticoagulant	12-3
Set Language	3-61
Setting logoff time	3-11
Setting Reference and Critical Limits	3-18
Setup Menu Structure	3-3

Shutdown programs	10-2
Single measurement from the FLEXQ sampler tray	4-8
Solution Level Forecast program.....	3-48
Solution Warning program	3-48
Specifications	
Derived Parameters	13-6
Input Parameters.....	13-5
Measured Parameters.....	13-2
Standby Mode.....	10-3
Storage and preparation prior to analysis.....	12-9
Storing a WDC Report.....	8-4
Storing the analyzer	10-9
Storing the setup	8-13
Syringe Mode Setup.....	3-12
Syringe samples	4-10
T	
Temperature Corrections (QC)	5-11
Temporary Shutdown	10-6
Test tube samples.....	4-12
tHb Calibration	
check.....	6-7
tHb calibration result	6-9
The shutdown procedure.....	10-8
Thermal Printer	2-10
Time/Date Setup	3-60
Transporting the analyzer	10-9
Tutorials.....	2-36
U	
Units Setup.....	3-53
Unknown quality control solutions.....	5-11
Unscheduled AutoCheck Measurement.....	5-7
Unscheduled Calibrations	6-4
User Activities	3-46
User-defined Data Items	3-54
User-defined Notes	3-57
Using Cleaning Additive.....	7-21
V	
Viewing a calibration result	6-8, 9-16
Viewing quality control statistics.....	9-13
Viewing the Reference Ranges and Critical Limits	3-17
W	
Westgard Rules program.....	3-41

Date of issue

Manufacturer:



Radiometer Representative:

**ABL800 FLEX Operator's manual
from software identification version 5.24**

Publication: March 2006

Edition: 200603F

Code Number: 989-942

