

Solution *airIDEAL*[®] 3PTM Traceability

AeroBioCollector
User's Manual

EN



Manufactured par:

 LCB 71260 La Salle France



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Revisions

The list of revisions below summarizes replacements or additional pages in your User's Manual

Version	Date of printing	Modifications	Pages modified
A	2001/01	Bilingual (FR / EN)	All
B	2001/04	Multilingual (FR / EN / ES / IT / DE / PT)	All
C	2005/11	Update of the manual (FR / EN / ES)	All
D	2006/03	Update of the manual (FR / EN / ES / IT / DE / PT)	All
E	2008/03	Environmental conditions (FR / EN / ES / IT / DE / PT)	2-12
F	2010/10	Addition of a remote user interface device (RUID) to ensure sampling traceability.	All
G	2011/01	Regulatory modifications: FCC (USA) and IC (Canada).	Pages 2-7, 2-8, 2-11, 2-13 Pages 3-2 and 5-1

Warning

The content of this manual is based on the Software release **0.9**

This manual is periodically updated. The updates shall be included in the new releases of the Software.

Information supplied in this manual may be subject to modifications before the products described become available.

This manual may contain information or references relating to certain bioMérieux S.A. products, software or services which are not available in the country of release; this shall not mean that bioMérieux S.A. intends to market such products, software or services in such country

To request copies of publications or for any technical request, contact bioMérieux S.A. or your local distributor.

IMPORTANT! *Use of the instrument and manual implies acceptance of the clauses below and the clauses set out in the regulatory booklet. Users are invited to refer to these clauses.*



DANGER! *To ensure user safety, the instrument must be used in accordance with this manual.*

Trademarks

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Note: *Screen captures and figures are given as examples only.*

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1 How to use this manual

IMPORTANT! Please read the "General safety and regulatory information" booklet provided with the instrument.

Finding topics and procedures

This manual is divided into 7 chapters.

Table of contents The table of contents of the manual is located on pages I-1 to I-3. It lists each chapter and the procedures within each chapter.

List of figures The list of figures for the manual is located on page I-4.

Warnings Different types of warnings are used throughout the manual:

- for safety reasons (**DANGER!**),
- to ensure that the instruments are maintained in good working condition (**CAUTION!**),
- for regulatory reasons (**WARNING!**) or,
- for optimum performance of operations, procedures, etc. (**IMPORTANT!**).

Page headers and page footers Apart from the first page of every chapter, each page of the manual includes a page header and a footer.

Each page header includes the chapter title and the title of a procedure or its corresponding description.

The footers contain the title of the manual, the name of the product and the page number.

Notes This manual contains a certain number of notes that are used to emphasize a procedure or certain information.

Glossary

ABS	Acrylonitrile butadiene styrene.
AeroBioCollector or Air sampler	<i>airIDEAL 3P Traceability</i> , instrument used to collect and count viable bacterial and fungal particles in a known and precise volume of air.
CFU	Number of Colony Forming Units read on the agar plate. The number of CFU corresponds to the number of clusters that have grown on the agar.
Delayed start-up	Time between pressing the START button and the motor starting up.
Li-ion	Lithium ion
MPN	Most Probable Number of micro-organisms collected. Statistical correction of the CFU value (FELLER's law).
PVDF	Polyvinylidene fluoride.
Ra coefficient	Roughness factor of a surface. It is the arithmetic mean of all profile deviations, positive or negative, compared to the mean line.
RUID	" Remote User Interface Device " Remote control containing the user interface.
Sampling grid	Perforated and calibrated plastic device. The number of orifices, their diameter and arrangement, guarantee a CFU count (positive clusters) and a flow of air corresponding to the motor setting.
Solution <i>airIDEAL 3P Traceability</i>	<i>airIDEAL 3P Traceability</i> (AeroBioCollector) + RUID (remote control) + <i>airIDEAL 3P Traceability</i> software.
Time-delay	Two seconds required by the software to record a parameter.

Typographic conventions

These conventions are used in the different chapters of the manual.

- Press A bullet point is used to denote an action to be performed.

PROGRAM 1 This typography is used to represent messages which appear on the display.

1

The *airIDEAL 3P Traceability keypad*

There are 5 keys on the instrument keypad. (See page 2-8 of the manual).

In this manual, the keys are referred to by their individual names, enclosed in angle brackets "< >".

2 Functional description

Presentation

“Pharmaceutical manufacturing evolves from an art to a science”.

This sentence alone from the FDA Guideline “Pharmaceutical cGMP for the 21st century – A Risk-Based Approach” summarizes the current revolution in the Pharmaceutical industry.

Conscious of these changes and remaining attentive to its customers, bioMérieux decided to improve its **airIDEAL 3P Traceability** AeroBioCollector in order to best respond to these new needs.

The instrument was thus developed and validated in order to provide a tool to the pharmaceutical industry that would guarantee a scientifically proven method of air sampling.

This instrument evidently remains perfectly suited to the enumeration of airborne micro-organisms in less demanding work environments such as agribusiness.

In addition and in order to continue its universal application, **airIDEAL 3P Traceability** is still available in two versions:

- one for the use of culture media in 90 mm diameter Petri dishes,
- the other designed for use with 65 or 70 mm plates.

The aspiration flow-rate of **airIDEAL 3P Traceability** is calibrated at 100 l/min with an impact velocity of less than 20 m/s.

According to good sterilization practices, sampling grids can be sterilized in an autoclave, see "Sterilization of grids" on page 3-3.

Principle of use

airIDEAL 3P Traceability can operate in 2 modes:

- Slave mode: using **airIDEAL 3P Traceability** with the RUID.
- Manual mode: autonomous operation using the keypad.

The present manual describes how to use the instrument in manual mode; for use of the instrument in slave mode, please refer to the RUID User Manual.

Operating principle

airIDEAL 3P Traceability is an impaction AeroBioCollector used to detect the presence of viable micro-organisms in the environment to be tested, by precise sampling of a given volume of air.

Air is taken up with a turbine through a grid surface. The acceleration of airflow results in the impaction of airborne micro-organisms on the agar. Passage of the air through the grid filters out particles, thereby facilitating the enumeration of CFU (colony forming units) after incubation of the medium.

A reading and statistical correction table is used to convert the number of CFU to the most probable number of micro-organisms collected per m^3 of air.

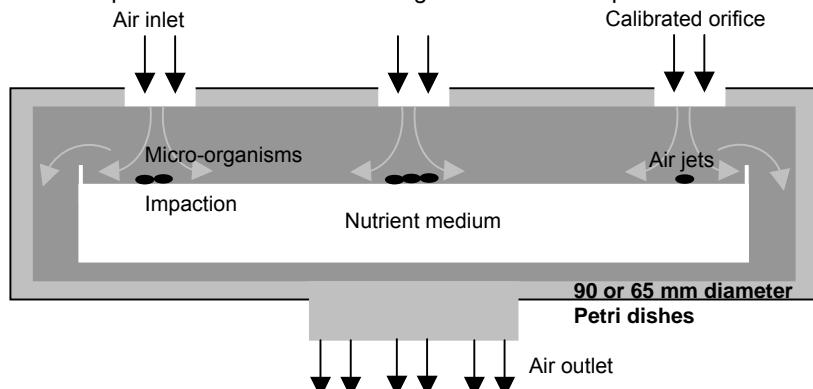


Figure 2-1: Principle of the impaction biocollector

Performance

The performance characteristics of an AeroBioCollector depend on its capacity to collect micro-organisms in the air without compromising their viability during impaction on the agar. This property can be obtained only with a perfect compromise between the high aspiration velocity leading to effective collection, and a sufficiently low impaction velocity to guarantee the revivification of collected micro-organisms.

airIDEAL 3P Traceability was developed in close cooperation with aerdraulics experts in order to optimize this ratio.

Since the industry has increasing needs for scientifically proven methods, bioMérieux commissioned two recognized independent organizations* to validate the physical and biological efficiency of the instrument.

*

CETIAT: Centre Technique des Industries Aérauliques et Thermiques/Technical Center of Aerdraulic and Thermal Industries

Domaine Scientifique de la Doua, 69603 Villeurbanne, France

HPA : Health Protection Agency - Porton Down - Wiltshire SP4 0JG Salisbury - UK

Collection efficiency validated according to the ISO 14698 standard

airIDEAL 3P Traceability was third party validated by the Health Protection Agency (UK) to meet the requirements of ISO 14698-1 for the control of clean rooms. Both the physical and biological efficiencies of the equipment have been validated according to this standard.

Physical efficiency testing approach

The physical efficiency of an air sampler for collecting airborne bacteria is evaluated by comparison with a membrane filter sampler. Uniform particles of different diameters containing bacterial spores of *Bacillus subtilis* var *niger* were generated in a controlled room. The physical efficiency of the instrument was determined by comparison with the membrane filtration standard operating side-by-side.

2

Biological efficiency testing approach

Air sampler inefficiency can either be due to a failure of the sampler to capture particles containing micro-organisms (physical loss), or to inactivation of viable micro-organisms during collection, so that formation of visible colonies on agar will not occur (biological loss).

To address this point, **airIDEAL 3P Traceability** was evaluated for recovery of a mixture of *Bacillus subtilis* (standard indicator for physical loss) and *Staphylococcus epidermidis* (standard indicator for biological loss).

The ratio of *S. epidermidis* / *B. subtilis* for the test samplers was divided by the ratio obtained with the reference standard membrane filter sampler to give a comparative biological efficiency.

Use in glove boxes

In order to be used to test glove boxes, the design and materials of **airIDEAL 3P Traceability** had to be entirely reviewed in order to optimize system air tightness.

In addition and in order to guarantee the optimal operation of the instrument in this application, the system underwent a complete validation in a glove box (SKAN AG, model ARIS glove box).

Applications

airIDEAL 3P Traceability enables precise and reproducible air sampling. The volumes taken can be set in 10 l steps up to a maximum volume of 2000 l.

This sampling range enables the instrument to be used in all types of environments, from sterile zones to more contaminated surroundings and in all applications, e.g. qualification of sterile rooms or daily monitoring.

Description

airIDEAL 3P Traceability is supplied in a carrying case. Inside the case is a rigid lid which can be used as a small work surface [dimensions 22.7 x 13.9 cm (8.9 in. x 5.4 in.)].

The instrument is available in two versions:

- for 90 mm agar plates (product no. 96302)
- for 65/70 mm agar plates Count-Tact® (product no. 96303)

- * For each product no., please refer to the packing list provided with the instrument.



2

Figure 2-2: **airIDEAL 3P Traceability** in its carrying case

* Accessories:

- 65/70 mm Count-Tact diameter additional sampling grid (product No. 96304).
- 90 mm diameter additional sampling grid (product No. 96309).
- Aluminum telescopic tripod with ball joint (product No. 96308).
- Sterile box for transport and incubation of 65/70 mm Count-Tact plates – Kit of 10 (product No. 96301).
- Sterile box for transport and incubation of 90 mm plates – Kit of 10 (product No. 96311*).

* Availability: consult bioMérieux

Consumables

airIDEAL 3P Traceability is adapted to all types of Petri dishes available on the market: 65, 70 and 90 mm.

Moreover, the use of a large range of ready-to-use culture media – irradiated or classic – developed and manufactured by bioMérieux, the reference in this field, enables you to obtain the best possible performance from the instrument.

The media comply with specific industrial and hospital environmental controls.

Culture media for general use

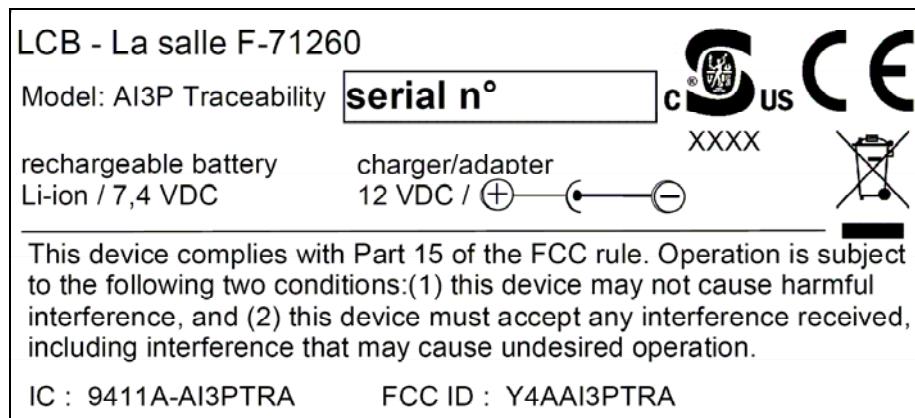
- TSA 20 x 90 mm plates (product No. 43011) / GTS 100 x 90 mm plates (product no. 43018 and product no. 43019)
- PCA agar 20 x 90 mm plates (product no. 43558)
- Sabouraud Dextrose agar 20 x 90 mm plates (product no. 43555)
- Sabouraud Dextrose Chloramphenicol agar 20 x 90 mm plates (product no. 43596)

- Count-Tact[®] agar 20 x 65 mm plates (product no. 43501)
- Count-Tact TSA agar 20 x 65 mm plates (product no. 43582)
- Count-Tact Sabouraud Dextrose Chloramphenicol agar 20 x 65 mm plates (product no. 43580)

Irradiated media

- Irradiated GTS 3P agar 20 x 90 mm plates (product no. 43711)
- Irradiated GTS 3P agar 100 x 90 mm plates (product no. 43169)
- Irradiated GTS 3P agar with neutralizers 20 plates (product no. 43811)
- Irradiated GTS 3P agar with neutralizers 100 plates (product no. 43819)
- Irradiated Count-Tact 3P agar 20 x 65 mm plates (product no. 43691)
- Irradiated Count-Tact 3P agar 100 x 65 mm plates (product no. 43699)
- Irradiated Sabouraud Dextrose agar 20 x 90 mm plates (product no. 43554)
- Irradiated Sabouraud Dextrose 3P agar with neutralizers 20 plates (product no. 43814)
- Irradiated Sabouraud Dextrose Chloramphenicol agar 20 x 90 mm plates (product no. 43595)
- Irradiated Count-Tact Sabouraud Dextrose 3P agar with neutralizers 20 plates (product no. 43812)
- Irradiated Count-Tact Sabouraud Dextrose Chloramphenicol agar with neutralizers 20 x 65 mm plates (product no. 43581)

Identification of the instrument



2

Figure 2-3: Identification of the instrument

Front face of the *airIDEAL 3P* Traceability



Figure 2-4: Front face

Functional description

Description

Rear face of the *airIDEAL 3P Traceability*

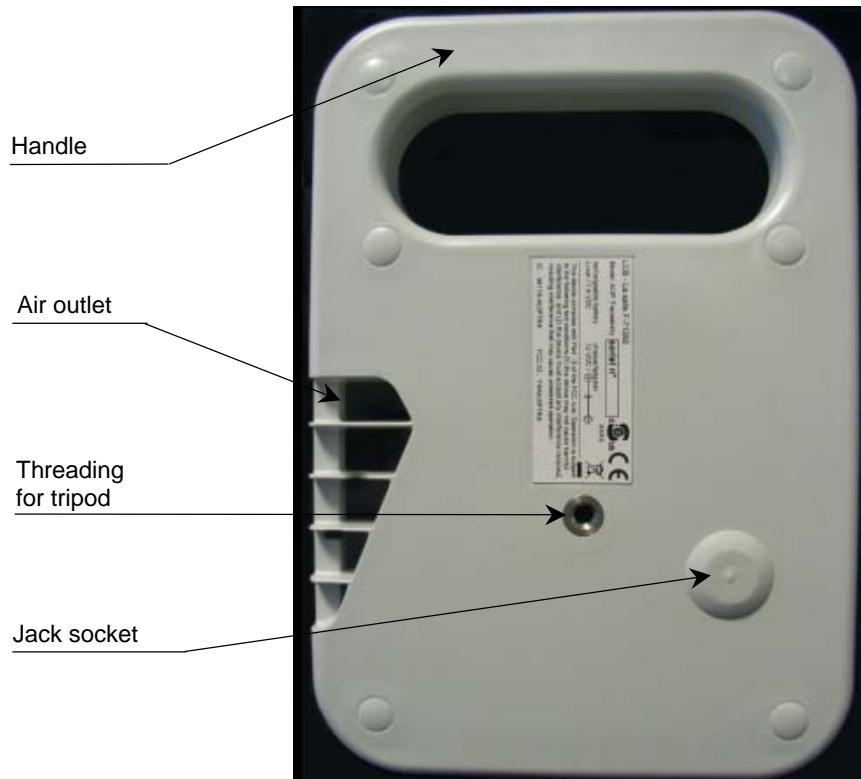


Figure 2-5: Rear face

Keypad



Figure 2-6: Keypad

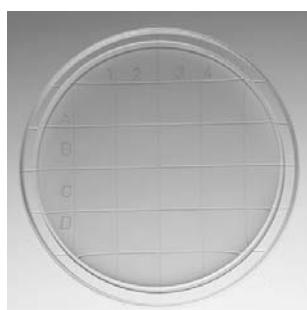
Configuration for 65, 70 or 90 mm Petri dishes



Sampling grid for 65 or 70 mm Petri dishes



Sampling grid for 90 mm Petri dishes



65 or 70 mm (Count-Tact®) Petri dish



90 mm Petri dish

2



Figure 2-7: Sampling head and grid – 65, 70 or 90 mm Petri dishes

Tripod assembly



Figure 2-8: Tripod assembly

General specifications

Environmental conditions

Normal storage condition.....-20° to + 50°C
Inside use in an air class zone, sterile room or glove box.
Normal conditions of use0 to 40 °C (32 °F to 104 °F)
Relative humidity0 to 95%
Maximum installation altitude.....< 2 000 m
Standards applicableSee product certificate
The instrument must be transported in its specific case.

Physical features

2

Dimensions

	<i>Instrument alone</i>	<i>Instrument in its case</i>
<i>Height</i>	128 mm (5.03 in.)	301 mm (11.8 in.)
<i>Width</i>	146 mm (5.75 in.)	250 mm (9.84 in.)
<i>Depth</i>	208 mm (8.18 in.)	400 mm (15.75 in.)

Mass

	<i>Instrument alone</i>	<i>Instrument in its case</i>	<i>Shipping carton</i>
	≈ 1.2 kg	≈ 5.5 kg	≈ 7.1 kg

Materials

- * ABS/Polycarbonate shell
- * Polycarbonate keypad
- * PVDF sampling grid
- * Stainless steel mounting strips and screws
- * Elastomer jack protection caps

Characteristics of materials

- Shock resistance: shell and keypad.
- Chemical resistance: to most standard disinfectants (hydrogen peroxide, concentrated peracetic acid, bleach, 70% ethanol, quaternary ammoniums, etc.).
- Thermal resistance: sampling grid that can be autoclaved using Good Sterilization Practices, see section "Sterilization of grids" on page 3-3.

Note: *With increasing numbers of autoclaving cycles, the grids become increasingly yellow-gray, but this has no effect on grid performance.*

- Surface finish: Ra coefficient of grid = 0.14 micron.
- Fire resistance: ABS/POLYCARBONATE V0 shell (highest grade of fire resistance).

Technical characteristics

Keypad	Key control.
Display	Liquid crystal display (2 x 16 characters).
Sampling grid	1/8-turn screw-on sampling grid. Possibility of sampling on 90 mm 65/70 mm diameter Petri dishes (specific sampling grids and fixing strips).
User interface	airIDEAL 3P Traceability can operate in 2 modes: <ul style="list-style-type: none">• Slave mode: using airIDEAL 3P Traceability with the RUID.• Manual mode: autonomous operation using the keypad. 5 buttons for access to all airIDEAL 3P Traceability functions. An LCD screen is used to program the instrument and follow its operation. Messages are in English. Additional information on instrument operation is given as audible signals. A flashing indicator light indicates, from a distance, the status of the instrument: <ul style="list-style-type: none">– Green flashing indicator light: sampling in progress. The indicator light changes to constant green when sampling is performed successfully. In slave mode the green indicator light continues to flash until sampling is stopped using the RUID.– Slow flashing green indicator light: the battery is charging. The indicator light changes to constant green as soon as the battery has been fully charged.– Constant green indicator light: the instrument is powered on and ready to start sampling in manual or slave mode.– Flashing green/red indicator light: the battery is low.– Flashing or constant red indicator light: a problem has occurred.– Indicator light off: the instrument is powered off. Language used for the software: English
Ergonomics	Ergonomic handle (right hand/left hand). Possibility of stable sampling with the unit in four positions (see page 3-4). Possibility of suspending airIDEAL 3P Traceability with a hook, especially in a glove box. Optionally, the instrument can be mounted on a telescopic tripod equipped with a ball joint enabling the sampling axis to be orientated through an angle of 0° to 90° (from horizontal to vertical), and its height to be adjusted (between 0.7 and 2.50 meters).

Electrical characteristics

Voltage	7.4 VDC nominal
Power supply	1 A max.

airIDEAL 3P Traceability is designed to run on a battery (6 NiMH batteries connected in series, each with a nominal voltage of 3.7 V).

The instrument can also be powered and/or recharged using one of the adapters indicated or an equivalent one.

CAUTION! *The AC-DC power supply adapter must have the following characteristics:*
- Voltage: 12 VDC
- Power: 2 A max.
- Plug mod. Jack 12.0 x 2.1 mm
- AC input voltage corresponding to the characteristics of the power supply in the country where the instrument is installed.

2

Note: *It is recommended to use the adapter provided with the instrument. You will find the details of its characteristics below.*

POWER SUPPLY complying with C E - UL/CSA standards

INPUT	100 – 240 VAC	0.7 A – 0.4A	47 – 63 Hz
UL STD plug or STD European plug			
OUTPUT	12 VDC	2 A max.	
	d = 2.1 mm	JACK plug	

Functional specifications

Flow-rate	100 ± 6.4 liters per minute regardless of the grid used. Flow-rate measured and adjusted according to the bioMérieux quality control protocol reference 96302-protocol.
Autonomy	More than or equal to 4 hours, enabling at least 24 consecutive 1000 liter samples to be collected. Specification valid for a new battery not having undergone a thermal shock or a prolonged period of inactivity.
Charge time	It takes 3 hours to fully charge the battery.
Sound level	< 50 dB
Security	Male plug outlet serves as the power supply sectioning device.

3 Using *airIDEAL 3P Traceability*

Unpacking *airIDEAL 3P Traceability*

The instrument is supplied in a carrying case and box.

- * When opening the box:
 - Make sure you have all the items described in the packing list.
 - Keep the shipping carton in case you need to ship the instrument back to bioMérieux.

CAUTION! *Any damage directly or indirectly resulting from the transport of the instrument without adequate containers will not be covered by the warranty or maintenance contract.*



DANGER! *Do not use the instrument in an explosive atmosphere as sparks could cause an explosion.*

Recommendations for installation and use

- Install the instrument on a flat, perfectly horizontal surface, on its tripod or by its hook.
- Avoid locations directly exposed to sunlight, excessive heat, damp or dust.
- The instrument must not be used near strong sources of electromagnetic interference.
- Do not use the instrument with its original protective cover cap, but with a grid.

IMPORTANT! *When the instrument is used for the first time, it is imperative to perform 1 battery charge-discharge cycle.*

- *Charge the battery for 3 hours.*
- *Discharge the battery by performing successive sampling (see page 3-22 "Battery autonomy test (Menu 6)").*
- *Recharge for 3 hours.*
- *Make sure the grid holes are not blocked.*

WARNING! *The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

WARNING! *Industry Canada requirements:*

RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus, Clause 7.1.2 statement:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus, Clause 7.1.3 statement:

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This device complies with FCC and Industry Canada RF radiation exposure limits set forth for general population (uncontrolled exposure). This device must not be collocated or operating in conjunction with any other antenna or transmitter.

Cleaning and decontamination procedure

Sterilization of grids

airIDEAL 3P Traceability is delivered with a set of 5 grids. They can be sterilized by autoclaving at 134°C for 18 min.

bioMérieux has validated that the grid specifications and performance are not altered after autoclaving up to:

- 40 times at 134°C for 18 minutes
- 200 times at 121°C for 20 minutes

After autoclaving 14 times or more, the grid may begin to turn yellow and may become difficult to screw onto the instrument.

Decontamination of the external part

All the external parts of the instrument can be decontaminated with most of the usual disinfectants at the usual effective concentration (hydrogen peroxide, concentrated peracetic acid, bleach solution, 70% ethanol, quaternary ammonium).

Decontamination of the air circuit

- * Decontamination protocol:
 - Spray twice with 70% isopropyl alcohol with the motor off: one spray at the air inlet, the other at the outlet.
 - Allow to react for 15 minutes before using the instrument.

Decontamination of the instrument according to this protocol with ClearKlens IPA (Johnson Diversey) has been validated.

A summary of this validation is available on request.

3

Decontamination in a glove box

airIDEAL 3P Traceability was specially developed for use in production or control glove boxes. The suitability of this instrument for use in glove boxes was evaluated by the SKAN ag "Center of Competence for Isolator Technology".

- * Two parameters were tested:
 - The capacity of the instrument to withstand standard decontamination cycles in glove boxes.
 - The capacity of a standard decontamination cycle to disinfect the different types of materials that compose the instrument.

A summary of this validation is available on request.

Sampling positions



①



②



③



④

Figure 3-1: Sampling positions

IMPORTANT!

airIDEAL 3P Traceability is delivered with a hook for suspending it in a glove box during decontamination phases. Even though sampling can be done while suspended, it is preferable to position the instrument along the axis of one-way flow at the air outlets. This configuration is the worst case scenario since the air sampled has swept the entire volume of the glove box before emerging.

Do not obstruct the air outlet during use to respect operating parameters.

Screwing on the sampling grid

CAUTION! *Do not insert any foreign objects into the aspiration orifice located under the grid (see pages 2-9).*

- * To screw on the sampling grid easily,
 - Position the grid on the threading of the shell and turn it clockwise by 1/8 of a turn without forcing or pressing it.



3

Figure 3-2: Screwing on the sampling grid

Electrical power supply

airIDEAL 3P Traceability operates self-sufficiently through a Lithium-ion battery pack.

It can also run off the mains using the charger/adapter.

Operation on the battery

The microprocessor manages and displays the available autonomy at all times, on the basis of a theoretical autonomy of 4 hours for sampling cycles of 1000 liters.

As soon as the flashing symbol appears , there are **20 minutes** of autonomous running remaining.

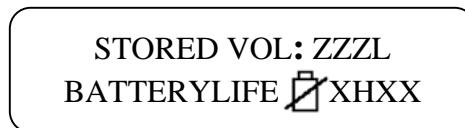
Immediately put the battery on charge; if a sampling cycle is in progress it will be completed just the same.

A sampling cycle cannot start if its duration exceeds the remaining autonomy displayed.

Low battery signals

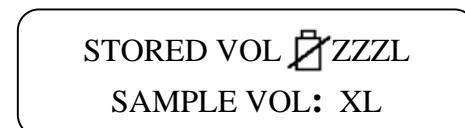
- * When the autonomy has expired, the following low battery signals are output:

Visual signal on the welcome message display:



 Flashing symbol

Visual signal on the sample in progress display:



 Flashing symbol

Audible signal when the instrument is turned on: 2 long beeps emitted each time the instrument is powered on.

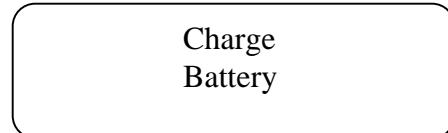
IMPORTANT!

In slave mode, if the battery is low at the beginning of an analysis, the operator is warned by a message displayed on the RUID (please refer to the remote control user manual).

Charging

- * To charge the battery,
 - Use the charger supplied or one with the same specifications.
 - During the charging phase, the instrument can be either switched on or switched off.
 - Connect the charger to the instrument jack connector after removing the protection cap.
 - Connect the charger to the power outlet.

The display indicates:



The normal time required to completely charge a discharged battery pack is 3 hours.

During the charging phase, it is possible to perform sampling with **airIDEAL 3P Traceability** running off the mains. The charging process will be suspended during sampling and will restart automatically when sampling is finished.

3

IMPORTANT! *During sampling with airIDEAL 3P Traceability running off the mains, do not disconnect the instrument from the mains as there is a risk of it switching off and the sampling cycle in progress would be definitively lost.*

- * At the end of the operation,
 - Disconnect the charger from the power outlet.
 - Disconnect the charger from the the instrument jack connector.
 - Install the protection cap.
 - Check that the battery life displayed is again 4 hours.

IMPORTANT! *If airIDEAL 3P Traceability is not used for more than 10 days, the battery must be totally recharged (3 hours).*

Operation using mains power

Connection to the mains is carried out in the same way as for charging the battery.

The display indicates:

Charge
Battery

- Press the **<START>** or **<MENU>** button to return to the welcome message.

Then

- Press the **<START>** button to start (the volume sampled will be the last recorded).

or,

- Select the sample volume by means of MENU 1 or MENU 2, and then start by pressing the **<START>** button.

- * To turn off,

- Disconnect the charger from the Jack socket on the instrument.

IMPORTANT!

During sampling with airIDEAL 3P Traceability running off the mains, do not disconnect the instrument from the mains as there is a risk of it switching off and the sampling cycle in progress would be definitively lost.

Automatic standby

To preserve the battery life, the instrument automatically goes into standby mode after **5 minutes** of inactivity.

Pressing any key will reactivate the instrument.

The RUID can activate the instrument so that it is ready for sampling.

Automatic switch off

In manual or slave mode, the instrument switches off after **1 hour** of inactivity.

While it is switched off, **airIDEAL 3P Traceability** cannot communicate with a RUID.

Operation in slave mode

In slave mode, the **airIDEAL 3P Traceability** is used with a RUID.

Please refer to the RUID User Manual.

Operation in manual mode

In manual mode the **airIDEAL 3P Traceability** operates autonomously.

Programming

airIDEAL 3P Traceability enables sampling to be programmed and monitored.

This section describes how to program the instrument.

Programming characteristics

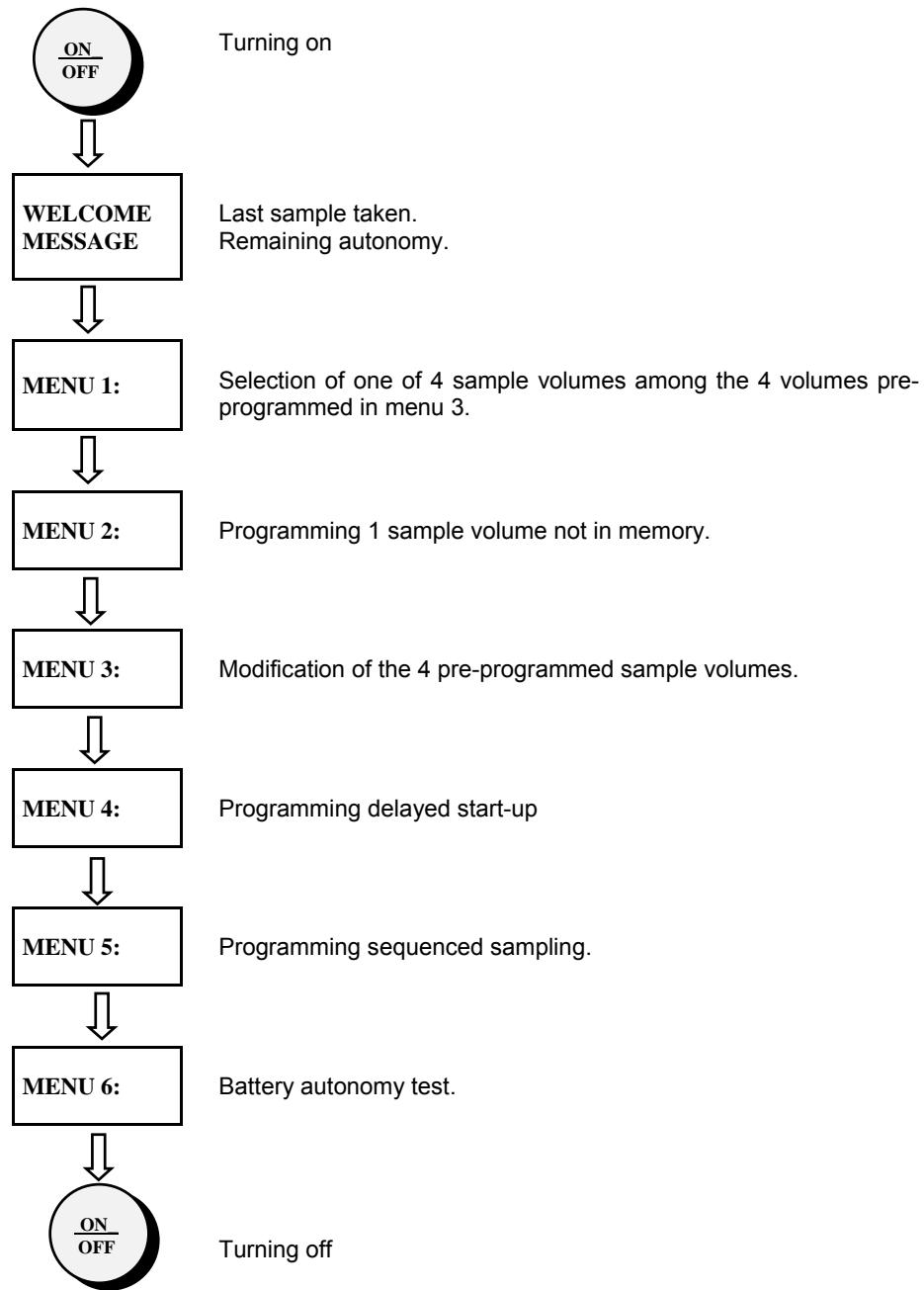
- Sample volumes adjustable from 5 to 10 liters in 1-liter steps.
- Sample volumes adjustable from 10 to 2000 liters in 10-liter steps.
- Automatic selection of last sample volume used.
- Storage of 4 sample volumes in the memory.
- Delayed start-up (maximum 60 minutes).
 - 0 to 60 seconds in 1-second steps
 - 1 minute to 60 minutes in 1-minute steps
- Sequenced sampling.

3

Sampling controls

- Volume counter.
- Volume of air sampled remains on display after sampling is interrupted.
- Sampling status is indicated by an indicator light.
- Possibility of interrupting and resuming a sample in progress (only in manual mode).
- End of sample buzzer (6 short beeps).
- Count-down of time.

airIDEAL 3P Traceability menus



Turning on airIDEAL 3P Traceability



- * To turn on the instrument,
 - Press <ON/OFF>.

The display indicates:

STORED VOL: ZZZL
BATTERYLIFE XHXX

Note: The  symbol is displayed if a delayed start-up is programmed.

- ZZZL corresponds to the last sample volume recorded.
- XHXX corresponds to remaining autonomy.

- * If the symbol  appears:
 - Recharge the instrument.

- * If the last sample did not terminate correctly (sampling stopped before the end, protection cap in place of the grid, motor blocked),
AND

- * If the instrument is then switched off or put on standby,

The following message will appear when the instrument is switched on again or is reactivated:

LAST SAMPLING
NOT COMPLETED

3

In this case, press <MENU> once to display the welcome message.



DANGER!

Do not insert any foreign objects into the motor compartment when the instrument is running.

Standby



- * To put the instrument on standby,
 - Briefly press <ON/OFF>, the indicator light must not go off.
 - or
 - Wait for 5 minutes.
- * To reactivate the instrument,
 - Press any key.

Turning off airIDEAL 3P Traceability



- * To turn off the instrument,
 - Press <ON/OFF> until the indicator light goes off.

Selection of one of the 4 pre-programmed sample volumes (Menu 1)



- * Factory programming memorizes the following 4 volumes in **airIDEAL 3P Traceability**: 100, 500, 1000, 2000 liters.

- * To select menu 1,
 - Press <MENU>.

The display indicates:

MENU 1 : CHOSEN
PRESET VOLUME

- Press the < + > button to select 1 of the 4 volumes memorized.

Example:



- * To select stored volume No. 2 from menu 1,
 - Press < + > twice.

Preset volume 1
XX Liters



PRESET VOLUME 2
YYY LITERS

- **Wait 2 seconds.**

Note: If you did not wait for the end of the first timeout, in other words if you pressed another button before the 2 seconds, the new value selected (YYY) is not recorded. The initial value (ZZZ) remains in memory.

The value YYY selected is recorded.

The display indicates:

RECORDED

3

- * There are 3 possibilities:

- Start sampling immediately by pressing the <START> button.
- Wait: the selected sampling can be started at a later time.
- Press the <ON/OFF> button to turn off the instrument. The volume selected will be displayed the next time it is turned on.

Programming a sample volume not in memory (Menu 2)



- * To select menu 2,
 - Press <MENU> twice.

The display indicates:

MENU 2: CHOSEN
VOLUME XXL

- * To program a new volume,
 - Press < + > or < - > until the desired volume is displayed.

IMPORTANT! *It is imperative to press the < + > or < - > buttons immediately to program a new volume.*

After a 2-second delay, the volume displayed is recorded.

The display indicates:

RECORDED

- * There are 3 possibilities:
 - Start sampling immediately by pressing <START>.
 - Wait: the selected sampling can be started at a later time.
 - Press the <ON/OFF> button to turn off the instrument. The volume selected will be displayed the next time it is turned on.

Modification of the 4 pre-programmed sample volumes (Menu 3)



- * To select menu 3,
 - Press <MENU> 3 times.

The display indicates:

MENU 3:
STORE IN MEMORY

- Wait 2 seconds.

The display indicates:

PROGRAM 1
Volume: XL

3

- * To program a new volume for program 1,
 - Press < + > or < - > until the desired volume is displayed.

IMPORTANT! *It is imperative to press the < + > or < - > buttons immediately to program a new volume.*

After a 2 second delay, the volume displayed is recorded.

The display indicates:

PROGRAM 2
Volume : XL

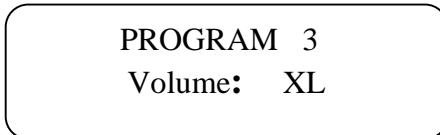
Note: *If the <MENU>, < + > or < - >, buttons are not pressed, each of the 4 pre-programmed volumes is displayed every 2 seconds.*

- * To program a new volume of program 2,
 - Press < + > or < - > until the desired volume is displayed.

IMPORTANT! *It is imperative to press the < + > or < - > buttons immediately to program a new volume.*

After a 2-second delay, the volume displayed is recorded.

The display indicates:



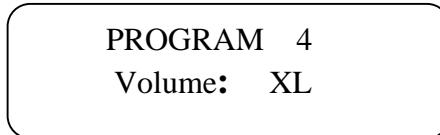
PROGRAM 3
Volume: XL

- * To program a new volume for program 3,
 - Press < + > or < - > until the desired volume is displayed.

IMPORTANT! *It is imperative to press the < + > or < - > buttons immediately to program a new volume.*

After a 2-second delay, the volume displayed is recorded.

The display indicates:



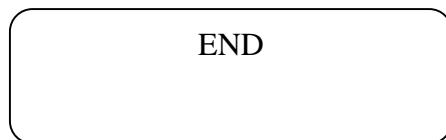
PROGRAM 4
Volume: XL

- * To program a new volume for program 4,
 - Press < + > or < - > until the desired volume is displayed.

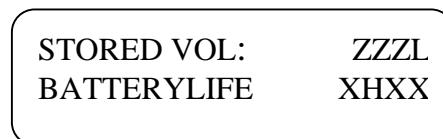
IMPORTANT! *It is imperative to press the < + > or < - > buttons immediately to program a new volume.*

After a 2-second delay, the volume displayed is recorded.

The display indicates:



The screen then returns to the welcome message.



3

Note: *If the < + > or < - > buttons are not pressed, the pre-programmed volumes are sequentially displayed without modification.*

- * Possibility of going directly to "MENU 4", once selected volumes are modified:
When "END" is displayed on the screen,
 - Immediately press <MENU>.
Menu 4 is displayed.

Programming delayed start-up (Menu 4)

- * Delayed start-up can be programmed for up to 60 minutes:
 - 0 to 60 seconds in 1-second steps
 - 1 minute to 60 minutes in 1-minute steps.



- * To select menu 4,
 - Press <MENU> 4 times.

The display indicates:

MENU 4: TIMED
Ømin Øsec

- * To program a delay value,
 - Press < + > or < - > until the desired delay value is displayed.

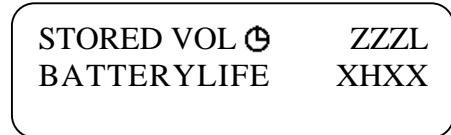
IMPORTANT! *It is imperative to immediately press < + > or < - > to program a new volume.*

After 2-seconds, the delay value is recorded.

The display indicates:

RECORDED

The screen returns to the welcome message.



The delay is recorded: the symbol  appears in the welcome message.

* There are 3 possibilities:

- Start sampling immediately by pressing **<START>**.
- Wait: the selected sampling can be started at a later time.
- Press the **<ON/OFF>** button to turn off the instrument. The volume selected will be displayed the next time it is turned on.

3

Programming sequenced sampling (Menu 5)

Menu 5 is used to sample a selected volume several times.

- * This sequencing is defined with 3 parameters:
 - The unit volume (of each sequence).
This volume is defined with menus 1 or 2 (see pages 3-12 and 3-14).
 - The number of sequences.
This number is included between 2 and 5.
 - The time interval between each sequence.
It is included between 10 minutes and 4 hours, in 10-minute steps.
- * Total sampling time must be less than 5 hours or else an error message appears.



- * To select menu 5,
 - Press <MENU> 5 times.

The following message appears and the 1st line flashes:

MENU 5 : SEQ NB X
VOL ZZZL INTXHXX

The unit volume is shown on the lower left and cannot be modified in this menu.

- * To modify the number of sequences,
 - Press < + > or < - > until the desired number is displayed.
 - Press <MENU> once the number of sequences is selected.

The "INTXHXX" (INTERVAL) field flashes.

- Press < + > or < - > to define the time interval between each sequence.

IMPORTANT! *Check that the remaining battery autonomy is sufficient to carry out complete sampling (base: 10 min/1000 liters).*

- * Once sequenced sampling has been correctly programmed,
 - Press the <START> button to start sampling.

The total duration of sequences and intervals must not exceed 5 hours or else an error message appears:

ERROR
TIME > 5H

Then,
The screen automatically returns to Menu 5.

To return to the welcome message, press <MENU> twice.

IMPORTANT! *A sequenced sampling is run from the specific menu, without returning to the main menu.*

If the last sampling was sequenced, the menu 5 screen is displayed when the instrument is turned on.

3

Battery autonomy test (Menu 6)

This menu is used to verify that the battery is still compliant with specifications of new material (autonomy \geq 4 hours).

The autonomy test can be performed using a volume chosen by the operator. 1000 liters is the reference volume for verifying that specifications have been respected (4 hours of autonomy for 1000-liter samples).

If the volume generally used is, for example, 100 liters, then it is wiser to perform the test on 100 liter volumes.

- * To check battery autonomy:
 - Note the autonomy displayed when the instrument is turned on.
 - Using Menu 1, select a 1000 liter sample volume.
 - Go to Menu 6.
 - Press the <START> button to run the battery discharge cycle.

- * To select menu 6,
 - Press <MENU> 7 times.



The display indicates:

MENU 6: AUT. TEST
BATTERY LIFE: XHXX

- * The battery discharge cycle can be stopped as follows:
 - Press <STOP>.

- * To resume at a later time,
 - Press <START>.

CAUTION! *After stoppage of more than 5 minutes, the instrument goes into standby mode and the sampling program is interrupted. When the instrument is reactivated, the following message is displayed:*

LAST SAMPLING
NOT COMPLETED

- Press <MENU> to return to the welcome message.

Starting sampling

CAUTION! *Before starting, check that airIDEAL 3P Traceability is fitted with a sampling grid and not its protective cover otherwise it could undergo irreversible damage which is not covered by the bioMérieux warranty.*

- * If the protective cover remains on the instrument, the following alarm message is displayed after several seconds and sampling stops automatically:

REMOVE
PROTECTION COVER

The indicator light flashes red.

- Remove the protection cover.
- Install the grid.
- Press <MENU> to return to the welcome message.



- * To start sampling,
 - Turn on the instrument,
 - Press <ON/OFF>.

3

The indicator light is constant green and the following message appears:

STORED VOL: ZZZL
BATTERY LIFE XHXX



- Press <START/STOP>.
- * During sampling, the display indicates:

STORED VOL: ZZZL
SAMPLE VOL: XL

The indicator light changes to flashing green.

The SAMPLE VOL display flashes during the sampling phase and the volume counter is displayed.

- The last sample volume recorded is automatically displayed (shown as ZZZL).

A buzzer indicates the end of sampling (6 short buzzes) and the display returns to the original message with automatic correction of the remaining battery life.

STORED_VOL:_ZZZL
BATTERYLIFE: XHXX

The indicator light changes to constant green. The instrument is free to perform a new sampling cycle.

- * If a delayed start-up has been programmed, the display indicates:

STORED VOL: ZZZL
TIMED : X Min YS

TIMED flashes during the count-down phase.

Note: The motor stops 2 liters before the total volume has been sampled.

- * Last sampling not terminated:

If the instrument was turned off during sampling, the following message appears the next time the instrument is turned on:

LAST SAMPLING
NOT COMPLETED

The indicator light changes to flashing red.

CAUTION! *In this case, the user will take all necessary precautions to deal with this interrupted sampling.*

- Press <MENU> to return to the welcome message.

Stopping the motor



- Press **<START/STOP>**.

Note: *It is always possible to stop a sampling operation under way by pressing <START/STOP>.*

If the motor is stopped during the program, i.e. during the delayed start-up count-down phase or during the sampling phase, the value displayed freezes and the display continues to flash.

STORED VOL: ZZZL
SAMPLE VOL: XL

- * To resume sampling,
 - Press **<START/STOP>**.

If the motor is restarted after being stopped during a program, the program will resume from the point where it was stopped.

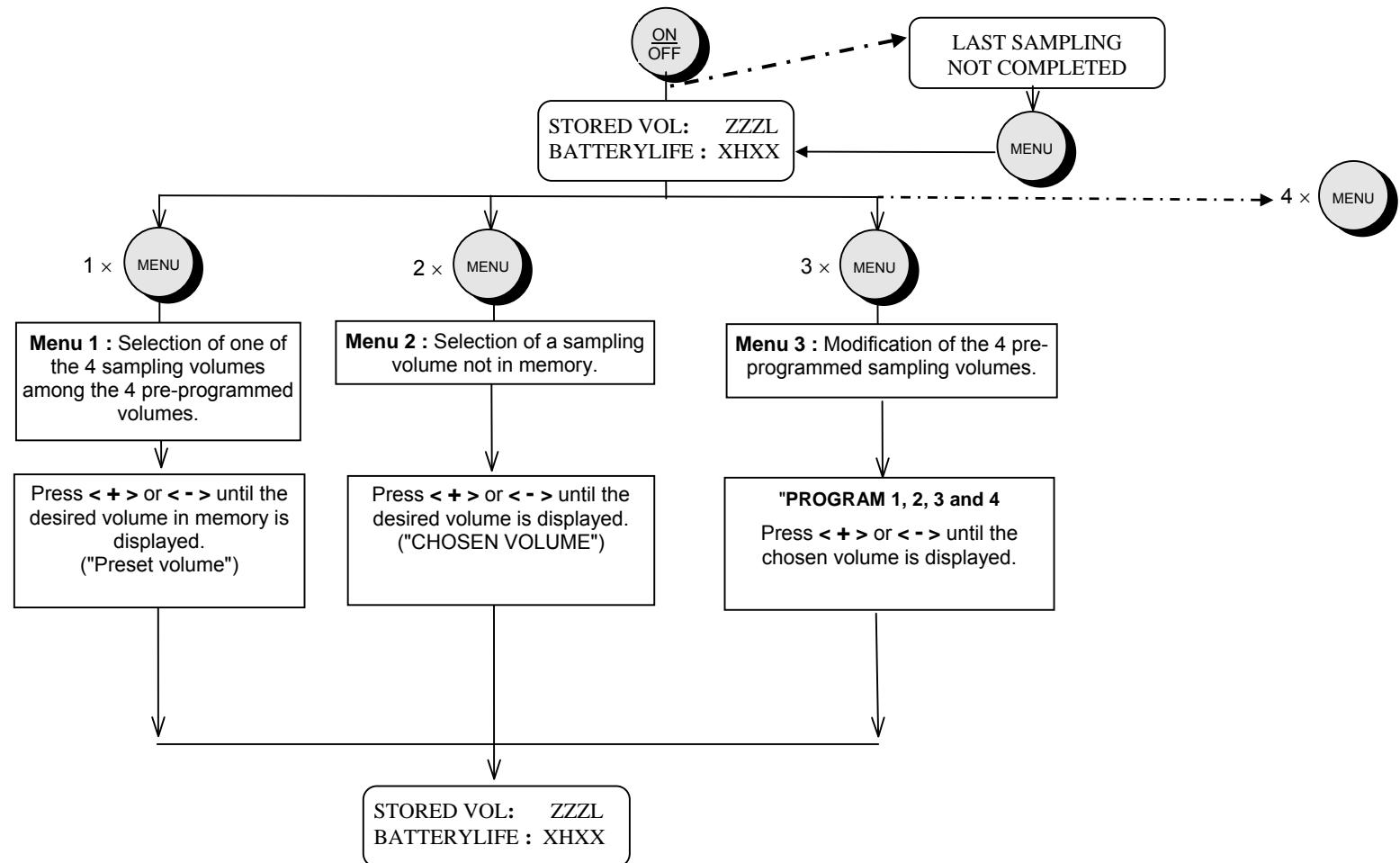
Note: *If stoppage during sampling is more than 5 minutes, the instrument will go into standby mode and the sampling program will not be able to resume.*

3

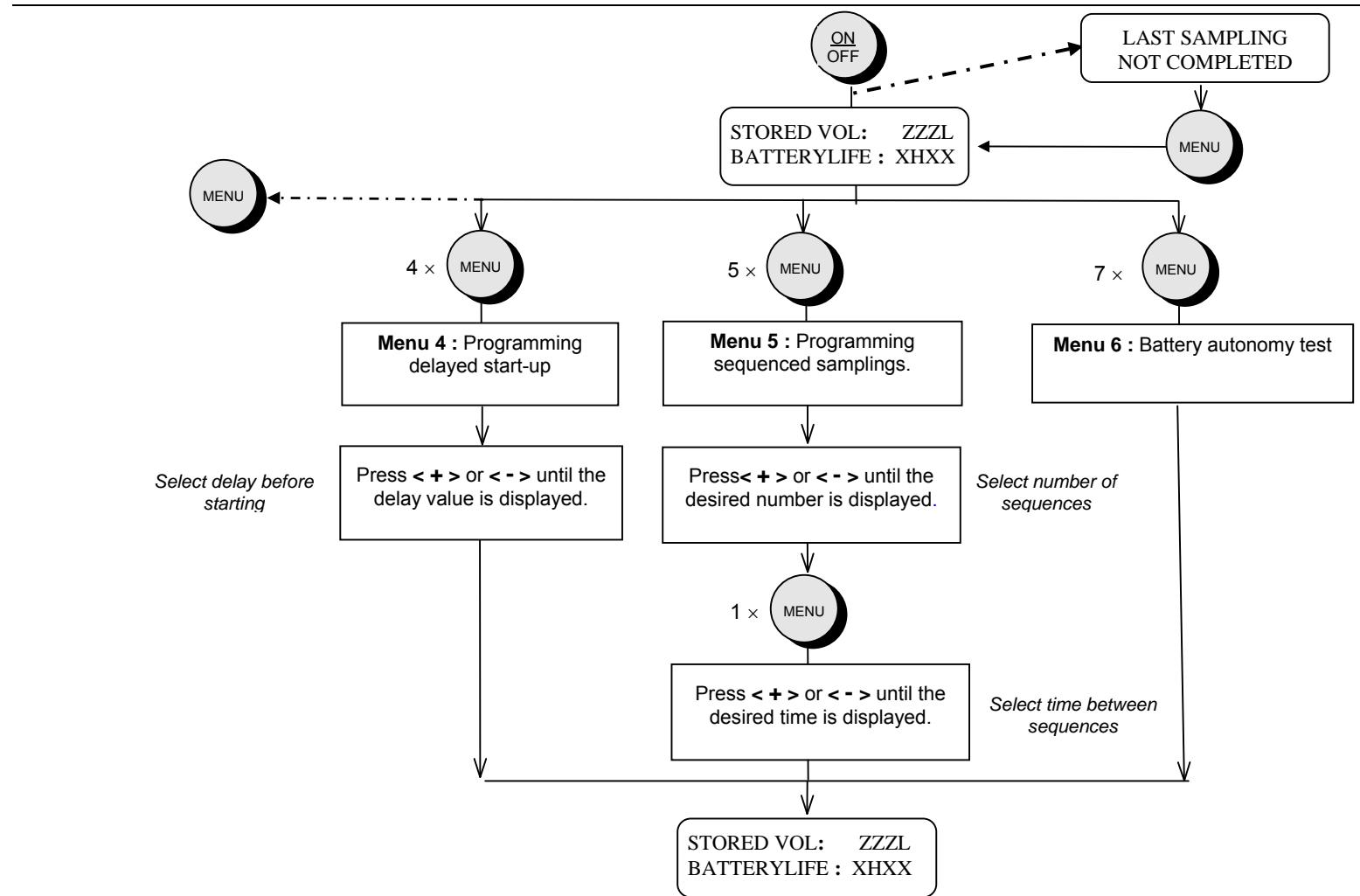
Using airIDEAL 3P Traceability

Setting airIDEAL 3P Traceability parameters (summary diagram)

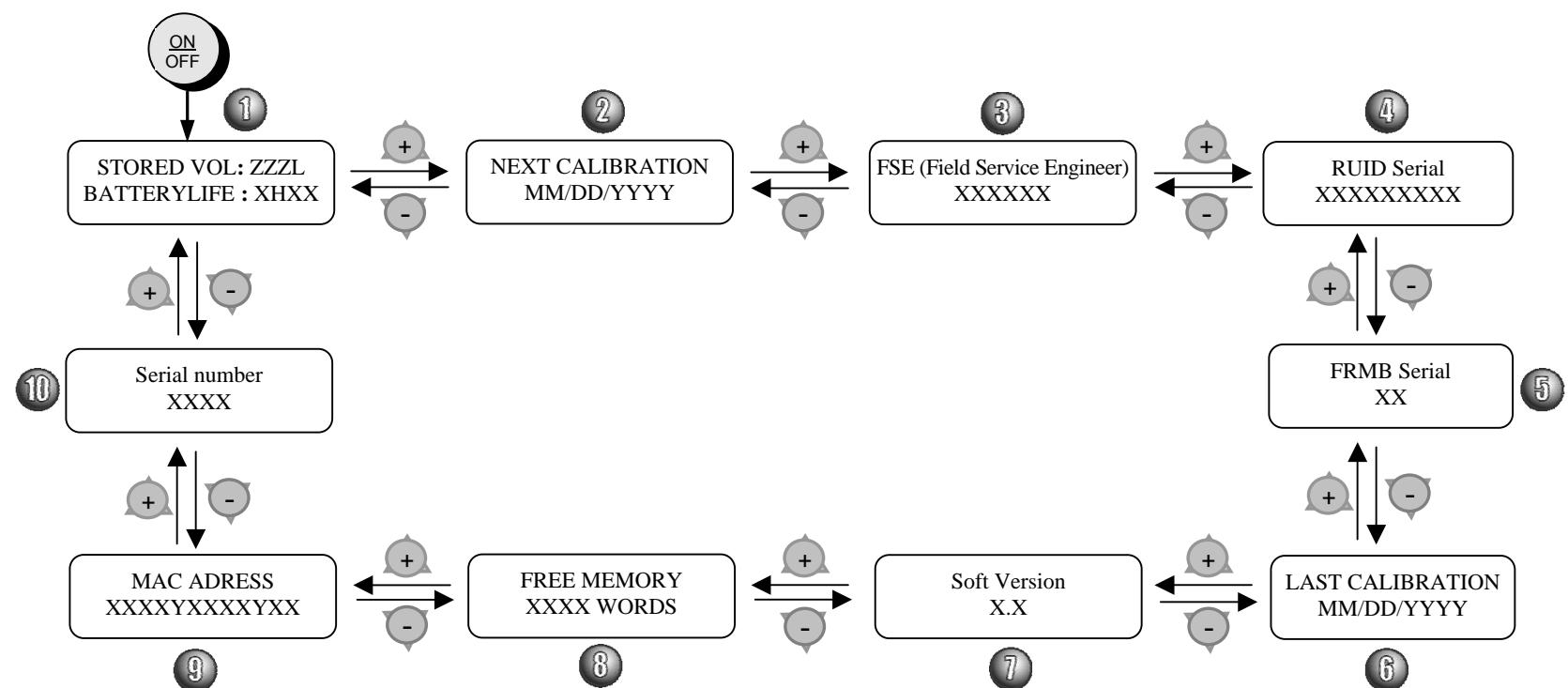
Setting airIDEAL 3P Traceability parameters (summary diagram)



Using airIDEAL 3P Traceability
Setting airIDEAL 3P Traceability parameters (summary diagram)



Navigation using <+> and <-> keys



- 1 Welcome message
- 2 Date of next calibration (Month/Day/Year)
- 3 ID of operator who performed calibration
- 4 Serial number of RUID used for calibration
- 5 Flow Rate Measurement Bench serial number
- 6 Date of last calibration
- 7 **airIDEAL 3P Traceability** firmware version
- 8 **airIDEAL 3P Traceability** available memory size
- 9 MAC address (Media Access Control)
- 10 **airIDEAL 3P Traceability** serial number

4 Procedure

Principle

Implementation and following of a procedure to measure aerobiocontamination corresponds to a process based on prevention, which involves:

- Evaluating the current level and standard of hygiene and controls.
- Selecting the critical areas to be controlled.
- Establishing a reference level and an alert level for each of the critical points.
- Developing a sampling plan.
- In manual mode, preparing a document for recording air sampling results.
- In slave mode, recording of air sampling results using the RUID
- Preparing a plan for corrective action in case of deviation.

The result of sampling should provide information on the level of risk, global hygiene conditions and environment.

Procedure

The procedure must be adapted to the actual conditions in which air sampling will take place (contaminated areas, clean areas, sterile areas, etc.)

When strictly followed, the procedure guarantees good quality sampling and should include:

- Operators' qualifications.
- Names of qualified operators.
- Hygiene of operators (clothes, hands, etc.).
- Protocol for disinfection of the AeroBioCollector.
- Detailed steps of the procedure.

Procedure

How to obtain a good quality sample

How to obtain a good quality sample

Precautions of use

- Check the condition of the instrument and sampling grid.
- When unscrewing and screwing on the sampling grid avoid touching the perforated zone.

The choice of medium depends on the area to be controlled and the type of micro-organism to be isolated.

The agar in 90 mm Petri dishes, must be at least 2.5 mm thick at the center and have a flat surface. It should not present dehydration or humidity droplets.

- During sampling, avoid any unnecessary movement, do not pass in front of the instrument or cough etc.
- Begin by collecting from low contaminated areas.
- Collect several samples in each zone in order to obtain results that can be used for statistical studies.
- Clean the instrument after use and sterilize sampling grids.
- Recharge the battery if necessary.
- Place the instrument in its carrying case and store it in a suitable place.

Sampling in manual mode

Note: For slave mode, please refer to the RUID User Manual.

- Turn on the instrument.
- Check the remaining battery life.
- Place the instrument on a flat surface (work bench, table...) in a vertical or horizontal position, or set it up on its tripod.
- Select the sample volume according to the critical area to be controlled.
- Remove the protective cover or the sampling grid.
- Mark the date, time and sample location on the Petri dish.
- Place the Petri dish with its cover between the attachment clips and make sure it is correctly positioned.
- Remove the Petri dish cover and place it on a clean surface.
- Screw on the sampling grid corresponding to the type of plate used.
- Perform sampling.
- The instrument indicates the end of sampling (6 beeps and a constant green indicator light).
- Unscrew the sampling grid.
- Carefully remove the Petri dish without touching the agar.
- Put the cover back on the Petri dish used.
- Put the protective cover back on.

Incubation and reading

4

The Petri dishes must be placed in the incubator as rapidly as possible.

After incubation, read as follows:

- Count the number of CFU (Colony Forming Units) which have grown and refer to the reading table for the final result (see page 6-1).
- If results are not acceptable, proceed with colony identification to orientate corrective action.

Procedure

Sampling plan

Sampling plan

The sampling plan must be drawn up very carefully and followed strictly. The aim is to guarantee that the values obtained are comparable. Any discrepancy between values should reveal a variation in aerobiocontamination.

A sampling plan must include:

- the critical points to be controlled
- the following must be mentioned for each point controlled:
 - the time and frequency,
 - the micro-organism(s) to be isolated,
 - the media used,
 - the revivification conditions,
 - the sample volume,
 - the number of samples per area controlled,
 - the reference level and the alert level,

In practice, the alert level can be fixed at 3 times the reference level.

- sampling conditions (temperature, hygrometry, staff numbers, activity, etc.).

Recording and evaluating results

The person in charge of controlling the quality of air collects the results recorded.

- Results which give expected values are validated.
- If unacceptable results are obtained, corrective action may be necessary.

The document for recording results must include:

- date and time of sample,
- operator's name,
- critical point controlled,
- the situation of the control in relation to the activity (production cycle, pre or post operative, etc.),
- detailed stages of the procedure,
- level of internal activity (number of people present, number of lines running, etc.),
- thermohygrometric conditions (real or reference),
- micro-organism to be isolated,
- culture medium used,
- incubation conditions (duration, temperature),
- date and time of incubation,
- date and time of reading,
- reference level and alert level,
- result: acceptable/unacceptable,
- decision: validation/ corrective action.

4

5 Maintenance

Preventive maintenance

CAUTION! *No preventive maintenance needs to be performed by the user.*

If an anomaly occurs on your instrument, call bioMérieux or your local distributor. Do not open the shell of the instrument.

Always use a replacement battery of the same type (Li-on 7.4 V – 4.4 to 5Ah) to avoid the risk of explosion.

Used batteries must be returned to bioMérieux or your local distributor.

Routine servicing

The routine servicing operations to be carried out by the user are:

- Battery charging.
- Cleaning and disinfection.
- Sampling grid sterilization.

Cleaning

All parts, including the case (inside and outside), can be cleaned with soapy water, rinsed and dried.

The stainless steel strip for attachment of Petri dishes can be dismantled for cleaning.

IMPORTANT! *Do not use acetone or chlorinated solvents (chloroform, etc.) on the shell or keyboard.*

Decontamination of the external part

All the external parts of **airIDEAL 3P Traceability** can be decontaminated with most usual disinfectants (hydrogen peroxide, concentrated peracetic acid, hypochlorite (bleach) solution, 70% ethanol, quaternary ammonium).

Decontamination of the air circuit

bioMérieux has validated the bacteriological efficacy of air circuit decontamination with ClearKlens IPA (Johnson Diversey).

Decontamination in a glove box

The instrument was specially developed and validated in order to be decontaminated during the disinfection cycle of glove boxes

Sterilization of the sampling grid

The sampling grid can be sterilized in an autoclave:

- at 134°C for 18 minutes for 40 autoclave cycles.
- at 121°C for 20 minutes for 200 autoclave cycles.

IMPORTANT! *Do not sterilize under a flame.*

Airflow control

A yearly airflow control is recommended.

The first control should be performed one year after **airIDEAL 3P Traceability** has been used for the first time.

IMPORTANT! *The airflow control must be done by a qualified person who has all the necessary equipment to perform this task and to enter the data into the airIDEAL 3P Traceability.*

6 Troubleshooting

Indicator light status	Error message	Possible cause	Action in MANUAL mode	Action in SLAVE mode
Flashing red	LAST SAMPLING NOT COMPLETED	Sampling is interrupted in MANUAL mode.	Press <MENU> to return to the welcome message.	Press <MENU> to return to the welcome message.
	LAST SAMPLING NOT COMPLETED	Sampling is interrupted in SLAVE mode.	N/A	Acknowledge the fault on the RUID and stop the sampling cycle with the RUID that was used to start it. ⚠ If this RUID is not available, press <MENU> for 10 seconds on the instrument and then select "Yes" to return to the welcome message.
	ERROR BATTERYLIFE	There is insufficient battery life to perform the sampling program.	Connect the instrument to the mains power so that sampling can start or put the battery on charge.	Acknowledge the fault on the RUID and then connect the instrument to the mains so that sampling can start, or to charge the battery.

Troubleshooting

Indicator light status	Error message	Possible cause	Action in MANUAL mode	Action in SLAVE mode
Flashing red	ERROR TIME > 5H	The total duration of sequenced samplings programmed in MENU 5 has exceeded 5 hours.	Reprogram so that the total duration does not exceed 5 hours.	Not applicable as the fault is detected when the sampling campaign is programmed on the PC application.
	Flashing volume is displayed	Sampling has been accidentally interrupted by the operator.	<p>To continue sampling, press <START>. The volume collected will flash on the display.</p> <p>To stop sampling, press <STOP>.</p>	<p>Acknowledge the fault on the RUID and then close the sampling cycle with the RUID that was used to start it.</p> <p> If this RUID is not available, press <MENU> for 10 seconds on the instrument and then select "Yes" to return to the welcome message.</p> <p> Sampling cannot continue. The volume collected flashes on the instrument.</p>
	Screen is frozen on "MENU 6"	The autonomy test started from MENU 6 has been interrupted using the <STOP> key.	To continue the autonomy test, press <START> .	Not applicable as the autonomy test can only be performed in MANUAL mode.

Indicator light status	Error message	Possible cause	Action in MANUAL mode	Action in SLAVE mode
Flashing red	REMOVE PROTECTION COVER	Sampling has been interrupted as the protective cover has been detected.	Replace the protective cover with the grid and then press <MENU> to return to the welcome message. If the message appears when the protective cover has been removed, please contact your supplier.	Acknowledge the fault to allow another sampling cycle to start. Close the sampling cycle using the RUID. Replace the protective cover with the sampling grid in order to start sampling. If the message appears when the protective cover has been removed, contact your supplier.
	MOTOR JAMMED	Sampling has been interrupted as the motor has jammed.	Inspect the black grid under the Petri dish retaining claws. Press <MENU> to return to the welcome message.	Inspect the black grid under the Petri dish retaining claws. Acknowledge the fault using the RUID.
	CALIBRATION DATE EXPIRED	The calibration date has expired. ⚠ Can only be detected by the RUID in slave mode.	Not applicable as the instrument cannot detect when the calibration date has expired. Sampling can be performed.	Use the RUID to acknowledge the fault and allow another sampling cycle to start. ⚠ Even if the calibration date is not updated, the instrument returns to the welcome message and is able to perform the programmed sampling cycle. However, the calibration date expiry is recorded in the sampling data.

Troubleshooting

Indicator light status	Error message	Possible cause	Action in MANUAL mode	Action in SLAVE mode
Green / Red flashing	Welcome message with battery symbol crossed out and sound signal (2 long beeps).	Battery is low.	Charge the instrument battery. Sampling is allowed, unless the battery life is shorter than the autonomy required to perform the requested sampling cycle.	Charge the instrument battery. Sampling is allowed, unless the battery life is shorter than the autonomy required to perform the requested sampling cycle.
Constant red	SERIAL NUMBER UNKNOWN	The serial number is undefined.	Contact your supplier.	Contact your supplier.
	NO CALIBRATION DATA	No calibration data stored in the instrument memory.	Contact your supplier.	Contact your supplier.
Off	Screen off	Sampling has been interrupted as the instrument was disconnected from the mains power	Reconnect the instrument to the mains and press <ON/OFF> to turn it on. ⚠ Sampling cannot continue.	Reconnect the instrument to the mains and press <ON/OFF> to switch it on. Acknowledge the fault on the RUID to allow another sampling cycle to start and then close the sampling cycle using the RUID. ⚠ Sampling cannot continue.
	Screen off	Battery is low.	Charge the battery.	Charge the battery.

7 Appendix

Using the reading table

The following reading tables indicate the most probable number of micro-organisms collected per plate (MPN collected) with respect to the number of agglomerates of colonies counted on the agar (CFU read).

The **MPN** value is calculated from the **CFU** count, using FELLER's law. This statistical correction corresponds to the random passing of bacteria through the orifices of the grid.

It quantifies for each « visited » orifice, (i.e. for each cluster counted) and as a function of the total number of clusters counted, the most probable number of bacteria which make up the cluster concerned, i.e. the number of bacteria having passed through the same orifice.

The application of the statistical correction assumes that the CFU count on the agar concerns the number of colony clusters, i.e. the number of orifices with a positive impact, without distinguishing, within a given cluster, the number of confluent colonies of which it is made up.

In order to determine the most probable number of micro-organisms collected per cubic meter, the most probable number of micro-organisms collected per plate (MPN collected) must be multiplied by 1000 and divided by the volume sampled in liters.

Example: Volume of air sampled = 50 liters
CFU count: 120
MPN value: 159, 380905
Result expressed as the MPN collected per cubic meter = $159 \times 1000 / 50 = 3180$

Information on FELLER's law

The formula for FELLER's law is the following:

$$MPN = N \cdot (1/N + 1/(N-1) + 1/(N-2) + \dots + 1/(N-CFU+1))$$

where:

MPN = most probable number of bacteria having passed through the orifices of the grid

N= number of orifices on the grid.

CFU = colony forming units, value obtained by the laboratory.

In the case of a sampling grid for which the passage of a particle through a given orifice of the grid is purely random, there is a probability that, during a sampling cycle, **several** particles pass through the **same** orifice and are therefore counted as a **single and unique** CFU, while other orifices are not passed through by any particles.

The closer the CFU count obtained by the laboratory is to N, (total number of orifices on the grid), the higher the probability is.

Moreover, the notion of probability density arises:

Example: for a given CFU value:

- there is a probability p_2 that the same orifice is passed through by 2 particles
- there is a probability p_3 that the same orifice is passed through by 3 particles
- there is a probability p_i that the same orifice is passed through by i particles etc...

The probability p_i decreases as i increases.

It is therefore particularly relevant to apply the statistical correction using FELLER's law when high CFU values are read, i.e. close to N, i.e. in the case of agar plates almost completely saturated with colonies.

IMPORTANT! *In practice, and whenever possible, to minimize statistical correction, it is recommended to adjust the sample volume so that the CFU count does not exceed 100.*

Reading tables

CFU count	Corrected MPN						
1	1	31	32,902158	61	69,177312	91	111,217670
2	2,003788	32	34,034636	62	70,476332	92	112,740659
3	3,011392	33	35,171976	63	71,781750	93	114,272451
4	4,022843	34	36,314217	64	73,093631	94	115,813148
5	5,038168	35	37,461403	65	74,412039	95	117,362856
6	6,057399	36	38,613577	66	75,737039	96	118,921679
7	7,080565	37	39,770782	67	77,068698	97	120,489727
8	8,107697	38	40,933063	68	78,407081	98	122,067108
9	9,138825	39	42,100464	69	79,752259	99	123,653934
10	10,173982	40	43,273030	70	81,104300	100	125,250320
11	11,213197	41	44,450808	71	82,463274	101	126,856380
12	12,256504	42	45,633844	72	83,829254	102	128,472234
13	13,303935	43	46,822184	73	85,202311	103	130,098001
14	14,355523	44	48,015878	74	86,582519	104	131,733803
15	15,411300	45	49,214973	75	87,969954	105	133,379766
16	16,471300	46	50,419519	76	89,364690	106	135,036016
17	17,535557	47	51,629564	77	90,766807	107	136,702683
18	18,604105	48	52,845161	78	92,176381	108	138,379898
19	19,676979	49	54,066359	79	93,593494	109	140,067796
20	20,754215	50	55,293211	80	95,018225	110	141,766514
21	21,835848	51	56,525769	81	96,450657	111	143,476191
22	22,921913	52	57,764087	82	97,890875	112	145,196971
23	24,012448	53	59,008218	83	99,338962	113	146,928997
24	25,107490	54	60,258218	84	100,795006	114	148,672418
25	26,207075	55	61,514142	85	102,259094	115	150,427385
26	27,311241	56	62,776047	86	103,731317	116	152,194051
27	28,420028	57	64,043990	87	105,211764	117	153,972575
28	29,533473	58	65,318028	88	106,700528	118	155,763115
29	30,651617	59	66,598221	89	108,197703	119	157,565836
30	31,774498	60	67,884629	90	109,703385	120	159,380905

CFU count	Corrected MPN	CFU count	Corrected MPN	CFU count	Corrected MPN
121	161,208491	151	222,874919	181	303,387386
122	163,048769	152	225,199481	182	306,542148
123	164,901916	153	227,544613	183	309,734919
124	166,768113	154	229,910685	184	312,966627
125	168,647546	155	232,298072	185	316,238232
126	170,540403	156	234,707163	186	319,550732
127	172,446878	157	237,138356	187	322,905162
128	174,367167	158	239,592059	188	326,302598
129	176,301474	159	242,068695	189	329,744156
130	178,250003	160	244,568695	190	333,230999
131	180,212966	161	247,092504	191	336,764332
132	182,190578	162	249,640581	192	340,345413
133	184,183059	163	252,213397	193	343,975550
134	186,190635	164	254,811436	194	347,656105
135	188,213536	165	257,435198	195	351,388500
136	190,251998	166	260,085198	196	355,174214
137	192,306261	167	262,761966	197	359,014794
138	194,376574	168	265,466048	198	362,911853
139	196,463188	169	268,198007	199	366,867077
140	198,566362	170	270,958423	200	370,882228
141	200,686362	171	273,747897	201	374,959151
142	202,823459	172	276,567046	202	379,099776
143	204,977931	173	279,416508	203	383,306125
144	207,150062	174	282,296943	204	387,580319
145	209,340144	175	285,209031	205	391,924581
146	211,548478	176	288,153475	206	396,341248
147	213,775369	177	291,131003	207	400,832773
148	216,021131	178	294,142367	208	405,401739
149	218,286089	179	297,188344	209	410,050862
150	220,570571	180	300,269739	210	414,783004

CFU count	Corrected MPN	CFU count	Corrected MPN
211	419,601186	239	610,669016
212	424,508594	240	620,861324
213	429,508594	241	631,461324
214	434,604748	242	642,502990
215	439,800826	243	654,024729
216	445,100826	244	666,070184
217	450,508989	245	678,689231
218	456,029823	246	691,939231
219	461,668120	247	705,886600
220	467,428990	248	720,608822
221	473,317879	249	736,197057
222	479,340606	250	752,759557
223	485,503397	251	770,426224
224	491,812921	252	789,354796
225	498,276335	253	809,739411
226	504,901335	254	831,822744
227	511,696207	255	855,913653
228	518,669891	256	882,413653
229	525,832053	257	911,858098
230	533,193165	258	944,983098
231	540,764593	259	982,840241
232	548,558711	260	1027,006907
233	556,589014	261	1080,006907
234	564,870264	262	1146,256907
235	573,418651	263	1234,590241
236	582,251984	264	1367,090241
237	591,389915	265	1632,090241
238	600,854201		

Notes

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