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Biolum Portable ATP Hygiene Monitoring System

User Manual

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Biolum Portable ATP Hygiene Monitoring System User Manual

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Special Declaration

Please read this manual carefully before the usage of Biolum portable ATP hygiene monitoring system.

Symbols Used in This Manual

Symbols used in this manual that directly refers to the safe and proper operations of Biolum portable ATP hygiene monitoring system.

Icon	Description
	**Warning** Warning operation personnel pay attention to a certain operation. Operating the Biolum portable ATP hygiene monitoring system in any manner unspecified in this manual may result in device damage or abnormal function.
	**Reminding** Providing important information that critical to the success of the operation or use of the device, including the information explained in further detail elsewhere in this manual.
	**Prohibit** Prohibiting operation personnel from a certain dangerous operation. Otherwise may result in personal damage or device abnormal function.

Conventions Used in This Manual

Convention	Meaning
Ordered list	Procedure steps must be performed follow the list order.
Click/Double click A	Click or choose **A** on the Biolum PC software.
Press B	Press **B** key on the keyboard of the Biolum detector.
***italic* +Bold**	Refers to the key/button or operation instructions of the Biolum PC software.
<Bold>	Refers to the key/button or options of the Biolum detector.
[ ]	Refers to keys on the computer key board.

Safety and Regulatory Compliance

General Precautions

1. The Biolum portable ATP hygiene monitoring system is safely and reliably designed and manufactured. Personal injury can be avoided if the product is operated properly (as instructed in the manual) and the related precautions are strictly followed.
2. Users shall be aware of the hazards that may be caused by Biolum portable ATP hygiene monitoring system and its accessories.
3. All operators shall be familiar with the safety precautions and warnings described in this section before the usage of Biolum portable ATP hygiene monitoring system.
4. Non-observance of the instruction provided or performing any operations not stated in the manual may affect the safety protection provided by the Biolum portable ATP hygiene monitoring system.

Operation Environmental Precautions

Icon	Description
	**Prohibit** Never run the Biolum portable ATP hygiene monitoring system in places that have or may have flammable and explosive gas.
	**Warning** Do not place the Biolum portable ATP hygiene monitoring system in an extreme temperature environment.

ATP Quickswab Precautions

Icon	Description
	**Warning** Please carefully read the related information and precautions of ATP Quickswab before the usage of Biolum detector.
	**Reminding** Please follow the national and local environment protection regulations and laws for the usage of ATP Quickswab.
	**Warning** Do not insert any other articles into the Biolum detector except the ATP Quickswab, and do not squeeze the ATP Quickswab while inserting.
	**Warning** Please make sure the outside surface of ATP Quickswab is clean and dry before inserting it into the detector.

Keyboard and Keys Precautions

Icon	Description
	**Warning** Do not continuously press the keys on the keyboard of Biolum detector.

Battery Precautions

Icon	Description
	**Warning** Please use the supplied rechargeable lithium-ion battery and adaptor. The recharging voltage is limited to 4.2 V.
	**Warning** Please discard the used battery according to local regulations

USB Interface Precautions

Icon	Description
	**Warning** The computer that connected to the USB interface of the Biolum detector shall comply with BSEN60950/IEC950 standard.

Device Parts Precautions

Icon	Description
	**Warning** The Biolum detector is not provided with spare parts. Do not remove any part from the device without permission.

Use Restrictions

The Biolum detector is designed to following universality, safety and EMC requirements:

Universality

- Low voltage indicator73/23/EEC
- EMC indicator89/336/EEC

Safety

- IEC61010-1:2010
- IEC61326-1:2013
- IEC61326-2-6:2013
- IEC61010-2-081:2015
- IEC61010-2-101:2015

Declaration

The design of Biolum detector conforms to and able by the requirements in section 11 of low voltage specification 73/23/EEC. The design of Biolum detector also accords with the regulation that the design of electronic products should be work under specified voltage regulation and the requirements of BS EN 61010-1: 2010.

Content

1. Overview

The Biolum portable ATP hygiene monitoring system adopts the ATP Bioluminescent theory to realize simple hygiene monitoring in order to help reaching HACCP and food hygienic standard. The Biolum portable ATP hygiene monitoring system is consisted of two parts: ATP Quickswab and Biolum detector. This manual mainly introduces the operation, maintenance and troubleshooting of the Biolum detector in details. For details of ATP Quickswab, please refer to the user's manual of ATP Quickswab.

⚠ **Warning**: The Biolum detector belongs to high-sensitive measuring device that shall be used with due care and protected from damp condition and impact.

1.1 Applications and Features

1.1.1 Scope of Application

The Biolum portable ATP hygiene monitoring system is intended for on-site quick cleanliness (microbial content) test in various industries such as food processing, daily chemicals, sanitation, catering, medical treatment, environmental protection, paper making, water treatment, water administration, entry-exit inspection and quarantine and other law-enforcing departments.

Examples are as follows:

1. **Food processing industry**

- The Biolum portable ATP hygiene monitoring system is capable of testing bacteria, microorganism or food residue in the production environment of food, beverage and catering industry. It is very suitable for HACCP system cleanliness test;

- Cleanliness control during production; and the cleanliness test of food production line;
- Disinfection evaluation of food packages;
- Microorganism contents measurement of finished products and raw materials;
- Hygiene monitoring of the processing environment, capable of detecting organic matter residue and thus prevent growing environment of microorganism.

2. Catering industry

Used by law-enforcing departments for hygienic security screening for catering services.

- Cleanliness control of kitchens, dining tables, work bench and operating tools;
- Disinfection evaluation of tableware as well as the disinfection effect evaluation of one-off disinfection table-wear;
- Disinfection control of tableware used in airline, train and high-speed rail;
- Sanitary control of quality control department;
- Quick cleanliness test of large dining places such as Olympic Games and World Expo.

3. Healthcare Industry

Used by infection control departments to detect hospital hygiene and disinfection & sterilization conditions.

- Object surface cleanliness detection of main department of the hospital, such as disinfection center and ICU;
- Hand cleanliness inspection of medical staff;

- Cleanliness and disinfection detection of medical apparatus and instruments, such as surgical instruments and endoscope;
- Hospital environment cleanliness detection. Ensure the hospital is entirely clean, safe and free of microbial contamination;
- Disinfection effect evaluation of medial disinfection products. Comparison of test result before and after disinfection to ensure disinfection products are high quality and reliable.

4. Environment Protection

- Biological contamination assessment of water or waste water samples.

5. Other Industries

- Daily chemicals manufacturing industry;
- Quality supervision department;
- Sanitary supervision of hotel and lodging industry;
- Port supervision.

1.1.2 Features

Small in size: handheld design, total weight is less than 300g, one-hand operation;

- Low power consumption: lithium battery, duration time is up to 10 hours, standby time is up to 600 hours;
- Auto operating mode: 3.5' color screen, simple keys, and friendly HMI;
- Quick test: 10 seconds per sample. The Biolum detector can be connected to a thermal printer via Bluetooth. The test result can be printed in real time;
- Quantified result: the test result is accurate to 1×10^{-16} mol ATP;

- Test protection: the Biolum detector possesses built-in inclinometer which will stop the test in case the incline angle is out of range to ensure test accuracy;
- Control network: the Biolum detector can smartly check whether the bacterial colony amount is out of limit. It can be connected to electronic terminals such as PC;
- Maximum storage capacity: the Biolum detector is capable of storing 256 Users, 256 Plans, 2000 Programs and 10000 Records;
- Data template: the Biolum detector is integrated with data templates to facilitate user for viewing or calling;
- Intelligent software: test data can be uploaded to the dedicated Biolum PC software after test. Combine with this software, users could track, save the test results and analyze the trend of the tested locations.
- Open reagent: suitable for ATP test reagents from multiple manufacturers. It is strongly recommended to use the supplied consumables to ensure the test result accuracy.

1.2 Technical Specifications

- Dimension: 189mm×70mm×35mm;
- Weight: 280g;
- Display screen: 3.5' color screen, graphic HMI;
- Start-up time: 15s and 60s available;
- Storage capacity: 256 Users, 256 Plans, 2000 Programs and 10000 Results;
- Test time: 10s;
- Battery type: 3.7V rechargeable lithium battery, whose recharging voltage is limited to 4.2 V;

- Battery capacity: 2300mAh (duration time is up to 10 hours, standby time is up to 600 hours);
- Communication mode: the Biolum detector can be connected to your PC via USB cable; and also can be connected to mobile, tablet PC or printer via Bluetooth;
- Real-time print: the Biolum detector can be connected to a printer via Bluetooth, and the test result can be printed in real time;
- Incline angle detection: this feature of Biolum detector ensures the test accuracy. The test will stop processing if the device incline angle is over 30°, and the screen will display  icon as an alert;
- Auto calibration: the Biolum detector possesses light source auto-calibration system and temperature detection system that can automatically be adapted to changes of environment;
- Test range: 0-999999RLUs;
- Test accuracy: 1×10^{-16}mol ATP;
- Test error: ±5% or ±5 RLUs;
- Test repeatability: 8%-20%;
- Correlation coefficient: ≥0.995;
- Operating temperature range: 5℃-40℃;
- Operating humidity range: 20-80%;
- Storage conditions: -10℃-40℃; ≤ 60%RH

1.3 Terms and Abbreviations

- ATP: Adenosine tri-phosphate (energy transfer molecule); RLU: Relative light unit (measuring unit);
- USB: Communication port between the device and PC.

1.4 Accessories and Consumables

Accessories include lithium battery, USB cable, USB charger, hang rope, Biolum PC software CD and blue tooth printer (optional).

For details about other accessories and consumables, please ask local dealer for assistance.

1.5 Working Principle

The Biolum portable ATP hygiene monitoring system adopts the Bio-luminescence technique to convert invisible ATP concentration (ATP content in sample) into visible light output, the basic working principle is as shown in the figure 1.1.

The Biolum portable ATP hygiene monitoring system takes the light energy as reference to out put the test value and displays the test result in quantitative and qualitative form. The test result exhibits the cleanliness of the tested specimen, which should be between 0 and 999999 relative light units (RLU, 1 RLU = 1×10^{-16}mol of ATP).

Fig 1.1 Working principle

According to the user-defined upper & lower limits, the Biolum detector will automatically offer the determination of the test result and displayed as < ***Pass*** >, < ***Fail*** > or < ***Caution*** >.

1.6 Quick Operation Instructions

The ATP Quickswab contains exclusive high-sensitivity liquid stable integrative reagent. It is capable of detecting bacteria or other microorganisms on object surfaces and total ATP activities within food residues in order to quickly provide cleanliness test results.

The ATP Quickswab should be used together with the Biolum-II or Biolum portable ATP hygiene monitoring systems.

1.6.1 ATP Quickswab Structure Diagram

Figure 1.2 Structure diagram of the ATP Quickswab

1.Cap	2. Spring cap(inside)	3. Joint port
4. Unplug point	5.Testtube	6. Swab tip.

1.6.2 ATP Quickswab Operating Procedures

The operating procedures of the ATP Quickswab are shown in the figure 1.3.

1. **Preparing**: Take out the ATP Quickswab from the refrigerator. Wait about 10 to 15 minutes until the internal reagent reaches the room temperature, as shown in figure 1.3a.
2. **Sampling**: Hold the joint port of the ATP Quickswab and unplug the cap at the unplug point. Remove the test tube and pull out the pre-moistened swab tip. Keep 15 to 30 degrees of the swab tip and zigzag swab the sampling area, as shown in figure 1.3b. Please remember to rotate the swab tip while swabbing to ensure the closely contact with the sampling area (The sampling area should be around 10×10 cm^2 and it could be marked within the sampling card).
3. **Installation**: After sampling, please hold the joint port of the ATP Quickswab and insert the swab tip back into the test tube, as shown in figure 1.3c. (The end face of the test tube should be aligned with the lower end face of the blue joint port).

4. **Injection**: Remove the cap of the ATP Quickswab, make sure it is griped in upright position, and forcibly press down the spring cap several times, as shown in figure 1.3d. Let the reagent fully flows into the bottom of the test tube and submerge the swab tip.

5. **Mixing**: Hold the upper spring cap of the ATP Quickswab and swing 30 degrees to the left and right (for five seconds), as shown in figure 1.3e. Ensure the reagent is completely mixed with the sample.

6. **Insertion**: Insert the ATP Quickswab into the test camber of Biolum detector which is on the Pre-test interface, as shown in figure 1.3f. Close the top cover and start the test.

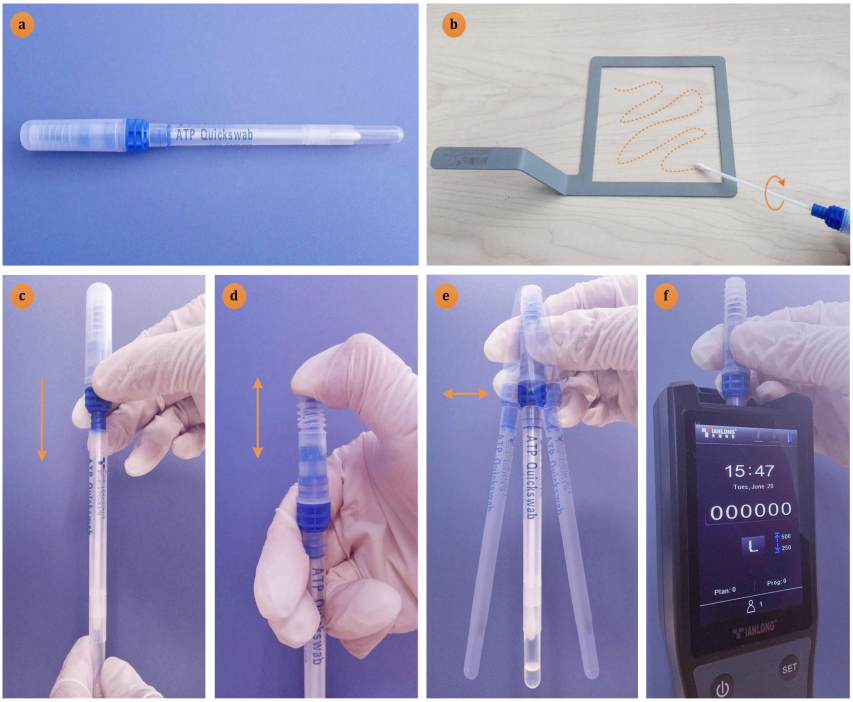

Figure 1.3 Operational demonstration of ATP Quickswab

⚠ **Warning**: The swab tip shall not contact any other object surfaces, in order to avoid the test result from being affected;

⚠ **Warning**: The swab tip shall not contact any other object surfaces, in order to avoid the test result from being affected;

1.6.3 ATP Quickswab Storage

1. The ATP Quickswab test tube shall be stored under 2℃ to8℃, with shelf life of 12months.
2. Direct sunshine shall be avoided. Please maintain the ATP Quick swab with aluminized foil bag for storage. Do not use the reagent beyond the warranty period.

1.6.4 ATP Quickswab Safety

1. The internal reagent of ATP Quickswab is diluted and can be safely used for detection in food processing industry.
2. If standard lab operation procedures are strictly followed, the compositions of ATP Quickswab will not be harmful for human health. The internal reagent contains 0.05% w/v of Sodium azide to exhibit its preservative effect.

☣ **Biohazard:** In case the internal reagent of ATP Quickswab into eyes or onto skin, please flush eyes or skin with plenty of water. The material safety data sheet (MSDS) can be provided in demand.

☣ **Biohazard:** The used ATP Quickswab should be considered as biological contaminated material. User should comply with local or national applicable regulations to dispose the abandoned Quickswab.

2. Basic Operation Instructions

2.1 Structural Diagrams of Biolum Detector

The structural diagrams of Biolum Detector are as shown in figure 2.1.

Fig 2.1 Biolum detector structural diagram

1. Test chamber
2. Screen
3. Keyboard
4. Top cover
5. Hang rope hole
6. USB interface
7. Battery compartment
8. Label
9. Back scaffold

2.2 Function of Keys

The keyboard of Biolum detector is as shown in figure 2.2. The corresponding key functions are listed in table 1.

Fig 2.2 Biolum detector keyboard

Table1.

Key	Icon	Function
Power		Power on/off; Standby mode.
OK		Confirm; Start the test.
Setting		Return; Switch between test and setting interface.
Up		Move the cursor up; Shortcut key for records.
Down		Move the cursor down; Shortcut key for statistics.
Left		Move the cursor left; Shortcut key for plan
Right		Move the cursor right; Shortcut key for program.

2.3 Battery Installation

The Biolum detector battery is installed by opening the cover of battery compartment, inserting the battery and re-installing the cover.

2.4 Power-on Self-test

Press the **< Power >** key to power on the Biolum detector. In non-Silent mode, the device will give the power-on alert (one 'beep' sound) to enter the initial interface, as shown in figure2.3. In case the Biolum detector is charging, please long-press the **< Power >** key (about 2 seconds) on the keyboard to enter the initial interface.

Fig 2.3 Initial Interface

Reminding: In case of low battery power, the Biolum detector may fail to power on or you will be alerted with a low battery alert following with the automatically shuts down. In this condition, please charge the Biolum detector or change its battery.

Reminding: If users are alerted with **< Calibration is halted! >**, it indicates that the power-on self-test of Biolum detector failed. Please eliminate the fault as instructed. For troubleshooting, please refer to **'7. Troubleshooting'**.

2.5 Internal Calibration

2.5.1 Power-on Calibration

After power on and the initial interface is displayed, Biolum detector will enter the calibration interface, as shown in figure2.4.

Fig 2.4 Calibration Interface

Two self-test modes are available, with the calibration time of 60sand 15s (**< Fast boot >** mode) accordingly. The difference is that with 60s calibration time, the Biolum detector will obtain more stable and accurate test result. It is recommended to choose 60s self-test mode when the machine is powered on for the first time of the day.

Reminding:

a. While the calibration time the power-on self-test is counting down, users could press **<** SET **Setting >**key to enter the setting interface.

b. On the setting interface users could select **<** **Settings >** to enter the system setting page, where the **< Fast boot >** is shown, select the **< Fast boot >**, the calibration time will be15s; Unselect the **< Fast boot >**, the calibration time will be60s.

c. Press the **<** SET **Setting >** key again to return to the previous interface and the calibration time counting down restarts. The Biolum detector will start the calibration, after this it will enter the test interface.

Reminding:

a. The calibration pre-conditions of the Biolum detector are: there is no ATP Quickswab within its test chamber and its top cover is properly closed.

b. If the icon and **< Calibration is halted! >**are displayed on the screen of Biolum detector, as shown in figure 2.5-1. Please take out the ATP Quickswab from the Biolum detector to continue the calibration process.

c. If the icon and **< Calibration is halted! >**are displayed on the screen of Biolum detector, as shown in figure 2.5-2. Please close the top cover again to continue the calibration process.

Fig 2.5-1

Take out the ATP Quickswab

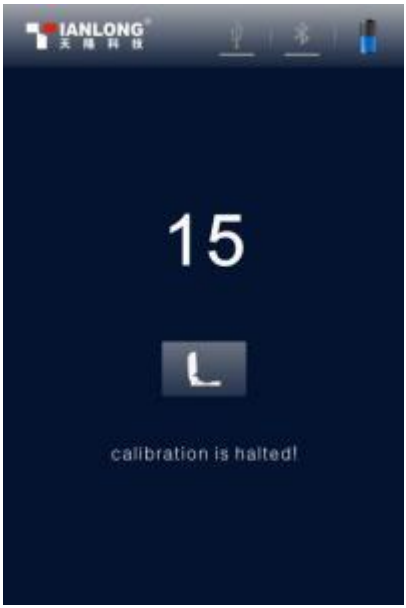

Fig 2.5-2

Close the top cover again

2.5.2 Recalibration

Users could re-calibrate the Biolum detector if it is necessary. Please take out the ATP Quickswab and close the top cover, long press (about 3s) **< OK >** key on the test interface. After sounding a short 'beep', the Biolum detector will enter the calibration interface again for recalibration.

2.5.3 Auto-calibration

1. If the Biolum detector is on the test interface and all the calibration conditions are met, it will automatically perform the calibration.

2. If the Biolum detector is not on the test interface, please press the **< Setting >** key to return to this interface, the Biolum detector will automatically enter the calibration interface.

Reminding: In case the Biolum detector has been continuously working for over 30 minutes, or the temperature change of working environment is over 5℃. The device will automatically perform the calibration process to ensure the accuracy of test result.

2.6 Power-off

Press the **< Power >** key to display the power option menu on the screen of Biolum detector, as shown in figure 2.6. Please select the icon and can press the **< OK >** key to power off the Biolum detector.

Fig 2.6 Power off

2.7 Power Saving Mode On and Resuming

Two kinds of power saving mode are provided with the Biolum detector: Sleep mode and Manual mode.

1. **Sleep mode**: sleep power saving mode can be started automatically according to user-defined sleep time. When the device is on, and no activity happens during the set time, the device will automatically on standby and the screen will turn off. Users could press **< Power >** key for resuming.

2. **Manual mode**: manual power saving mode can be started by pressing **< Power >** key to display the power option menu, where users could select icon as shown in figure 2.7. Press **< OK >** key to let the Biolum detector on standby, press **< Power >** key for resuming.

Fig 2.7 Screen Locker

2.8 Low Battery Alert

The Biolum detector will display icon on the status bar in case the electric quantity is low. Please charge the battery in this condition; when the status bar displays icon, it indicates that the electric quantity is very low and the device will be power off immediately. Users will be alerted with three 'beep' sounds before the automatically low battery power off.

Reminding: If battery low battery alert displays, please charge the Biolum detector as soon as possible. In case the device will be unused for a long time, please remove the battery and place it at cool and dry place.

2.9 Icons and Meanings

Table 2.

Icon	Description
	The top cover is not properly closed, close it again.
	Please insert the ATP Quickswab.
	Please take out the ATP Quickswab.
	The incline angle of device is too large. (The incline angle of device should be less than 30°)
	Ready, press the **<** **OK >** key to start the test.
	**Pass**, test result is lower than the lower limit.
	**Caution**, test result is between the upper and lower limit.
	**Fail**, test result is high than the upper limit.
	USB cable is not connected
	USB cable is connected.
	Bluetooth is not connected.
	Bluetooth is connected.
	Charging.
	Electric quantity is low.
	Electric quantity is very low, charge or power off.

3.Setting and Operation

3.1 Setting Interface

On the test interface, press **<** SET **Setting >** key to enter the setting interface, as shown in figure 3.1.

Fig 3.1 Setting Interface

Users could also enter the setting interface by pressing **<** SET **Setting >** key while the power-on self-test. Press **<** SET **Setting >** key again to restart the self-test and start counting down the calibration time. After the calibration, users will be directed to the test interface.

3.2 User

Select <  **User >** on the setting interface, and press < **OK >** key to access the user select option, as shown in the figure 3.2.

Fig 3.2 User Select

- Press < **Up >** or < **Down>** key to view the existing users for selection;
- Press < **OK >** key to confirm the selection;
- Press < **Setting >**key, users could return to the previous interface.

Reminding: The device configures **<User 0>**by default. Users could also execute the same related operations via Biolum PC software. For details, please refer to '**Biolum Portable ATP Hygiene Monitoring System Software Specification**'.

3.3 Program

Select **< Program >**on the setting interface, and press **< OK >** key to access the **< Set Program >** option, as shown in the figure 3.3.

Fig 3.3 Set Program

- Press **< Up >** or **< Down >** key to select the desired program;
- Press **< Left >** or **< Right >** key to view the **< Location >** and **< Surface >** of the selected program.

Reminding: The Biolum detector offers two kinds of program:

a. One kind of program is written by computer and marked with icon before program number, and its upper and lower limits cannot be changed on the device;

b. The other kind of program is modified on the device and without the icon before the program number, and its upper and lower limits can be user customized;

c. For a program not marked with the icon, user could press **< Up >** or **< Down >** key to select the procedure (as shown in Figure 3.4) and press **< OK >** key for confirmation;

d. Move the cursor to the upper limit setting box (as shown in Figure 3.5), using **< Up >** or **< Down >** key to set the value (range: 1~9999) and press **< OK >** key for confirmation;

e. Move the cursor to the lower limit setting box (as shown in Figure 3.6), using **< Up >** or **< Down >** key to set the value (range: 1~9999) and press **< OK >** key for confirmation and return to the setting interface;

f. Press **< Setting >** key to quit setting and return to the previous interface.

Fig 3.4 Program Select

Fig 3.5 Upper Limit Setting

Fig 3.6 Lower Limit Setting

Reminding: If the Biolum detector is stored with programs. User could press **< Right>** key on the test interface to access the set program option.

3.4 Plan

Select < **Plan** > on the setting interface, and press < **OK** > key to access the < **Plan Select** >option, as shown in the figure 3.7.

- Press < **Up** > or < **Down** >key to select the desired plan;
- Press < **OK** >key to confirm the selection;
- Press < **Setting** >key to return to the previous interface.

Fig 3.7 Plan Select

Reminding: If the Biolum detector is stored with plans. Users could press < **Left** >key on the test interface to access the set program option.

3.5 Records

Select < **Records** >on the setting interface, press < **OK** > key to enter the test records interface, as shown in figure 3.8.

Fig 3.8 Test Records Interface

- Press < **Left** > or < **Right** > key to page up or down;
- Press < **Up** > or < **Down** > to move the cursor and select test record.
- Press < **OK** >key to confirm the selection and enter the test record detail interface, as shown in figure 3.9.
- Press < **Setting** > key to return to the previous interface.

Fig 3.9 Test Records Detail Interface

On the test record detail interface,  and  options are available. Press **< Down >** key to move the cursor and select option as shown in Figure 3.10.

Fig 3.10 Test Record Deletion

Fig 3.11 Test Record Print

- Press < **Left** > or < **Right** > key to select and options for test record deletion or print;
- Press < Up > key to cancel the selection, press < OK > key to confirm and execute the selection;
- Press < Setting >key to return to the previous interface.

Reminding:If the Biolum detector is stored with test records. Users could press < **Up** > key on the test interface to access the test records interface.

Reminding: Before print the test records, please check if the matched Bluetooth printer is connected and power on.

3.6 Statistics

Select < **Statistics** > on the setting interface, and press < **OK** > key to access the< **Statistics** > option, where the statistical information about < **Pass** >, < **Caution** > and < **Fail** > are displayed as shown in figure 3.12.

Fig 3.12Statistics

- Press < **Right** >key to check the storage capacity of the Biolum detector, as shown in Figure3.13;
- Press < **Left** >key return to the < **Statistics** >option;
- Press < **Down**>key to move the cursor and select for storage deletion, as shown in Figure 3.14.

Fig 3.13 Storage Capacity

Fig 3.14 Storage Deletion

- Press **< Up >** key to cancel the selection;
- Press **< OK >** key to confirm the selection and display the secondary confirmation for all test records deletion, as shown in figure 3.15.

Fig 3-15 All Test Records Deletion

- Press **< Left >** or **< Right >** key to select **< Yes >** or **< No >** (**< No >** is selected by default);
- Press **< OK >** key to confirm the selection;
- Press **< Setting >**to return to the previous interface.

Reminding:If the Biolum detector is stored with test records. Users could press **< Down >** key on the test interface to access the **< Statistics >** option, with other operations same as the above mentioned method.

3.7 System Settings

Select **< Settings >** on the setting interface, and press **< OK >** key to enter the system setting interface. The options on this interface and their corresponding functions are listed in table 3 as follow.

Table 3. The options on system setting interface.

Option	Function
Date &Time	Set the date and time and its format
Sleep time	Set the auto-standby duration
Save test	Save test results or not
Fast boot	15s and 60s calibration time selection
Silent Mode	Buzzer On /Off
Language	Select the display language
Factory reset	Clear all user information
Bluetooth	Bluetooth On /Off
Brightness	Adjust the screen brightness

3.8 Template

Select **< Template >** on the setting interface, and press **< OK >** key to enter the reference template interface where the commonly-used templates are provided. Users could select a certain reference template and press **< OK >**to confirm the selection and access the reference template for this industry. The template itself provides the test **< Sites>, < Upper >** and **< Lower >** limits.

- Press < Left > or < Right >key to page up or down;
- Press **< Up >** or **< Down >** key for linefeed;
- Press **< OK >** key to confirm the selection;
- Press **< Setting >** to return to the test interface and the selected template will be automatically set as the test program.

3.9 Help

Select **< Help >**on the setting interface, and press **< OK >** key to enter the help interface where the **< Company >** name and **< Website >** information of the manufacture are provided.

3.10 About

Select **< About >** on the setting interface, and press **< OK >** key to enter the about interface where the information of **< Battery level >**, **< Temperature >**, **< Device name >**, **< Hardware version >**, **< Software version >** and **< Serial number >** are provided.

4. Test and Test Result

4.1 Pre-test Interface

After power-on self-test and calibration, the Biolum detector will enter the Pre-test interface, as shown in figure4.1.

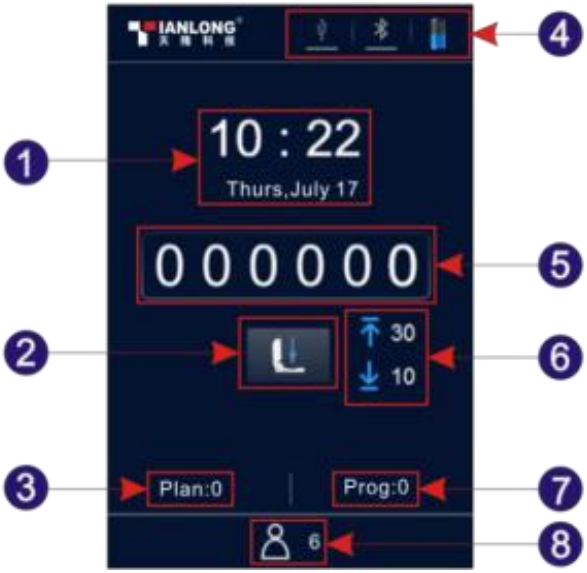

Fig 4.1 Pre-test Interface

1. Date& Time
2.Conditionprompt
3. Plan No.
4. Status bar
5. Test result
6. Upper & lower limits
7. Program No.
8. User No.

4.2 Program Selection and Setting

There are three program selection methods, including calling of plan program; calling of template program and user-defined program.

4.2.1 Selection and Setting of User-defined Program

1. User-defined programs are those not marked with the icon before program number.

- Press **< Right >** key on the test interface to access the **< Set Program >** option;
- Press **< Up >** or **< Down >** key to select a program and press **< OK >** key to confirm the selection;
- Move the cursor to the upper limit setting box, press **< Up >**or **< Down >** key to set its value and press **< OK >** key to confirm the setting;
- Move the cursor to the lower limit setting box, and press **< Up >**or **< Down >** key to set its value;
- Press **< OK >** key tree times to confirm the setting and return to the test interface, whose current test program will be the one has been just modified.

2. User could also select **< Program >** on the setting interface, and press **< OK >** key to access the **< Set Program >** option;

- Press **< Up >**or **< Down >** key to select a program and press **< OK >** key to confirm the selection;
- Move the cursor to the upper limit setting box, press **< Up >**or **< Down >** key to set its value and press **< OK >** key to confirm the setting;
- Move the cursor to the lower limit setting box, press **< Up >**or **< Down >** key to set its value, and press **< OK >** key to confirm the setting;
- Press **< OK >** key tree times to confirm the setting and return to the test interface, whose current test program will be the one has been just modified.

Reminding:The Biolum detector is stored with 1999programs that not marked with the icon by default ranging 1~1999 (0 is the default procedure and cannot be modified);

Reminding: In case a program is written by users from Biolum PC software, such program will increase progressively from1 and replace the original program with the same number on the Biolum detector. The information about the upper &lower limits, sites of the program can be freely set on Biolum PC software according to users' requirements.

Reminding: The programs written on the Biolum PC software whose program number is marked with icon cannot be edited again on the Biolum detector. For details, please refer to '**9. Biolum Portable ATP Hygiene Monitoring System Software Specification**'.

4.2.2 Plan Setting and Program Selection

Plan is written on Biolum PC software and imported into the Biolum detector via USB cable. One plan can contain several programs. For details, please refer to **'9. Biolum Portable ATP Hygiene Monitoring System Software Specification'**.

1. Select **< Plan >**on the setting interface, and press **< OK >** key to access the **< Plan Select >**option.

- Press**< Up >**or **< Down >** key to select the desired plan;
- Press **< OK >** key to lock the selected plan;
- Press **< Up >** or **< Down >** key to select the desired program;
- Press **< Right >** key to view the **< Location >** and**< Surface >**of the selected program;

- Press **< Left >** key to return to the previous step;
- Press **<OK >**key to confirm the selection and return to the setting interface;
- Press **<Setting >**key to return to the test interface and the selected program will be automatically set as the current test program.

2. Users could also press **<OK >**key to access the **< Plan Select >** option for the plans contained.

- Press < Up >or < Down > key to select the desired program within the selected plan;
- Press < Right > key to view the < Location > and < Surface > of the selected program.
- Press < Left > key to return to the previous step
- Press < OK > key to return to the test interface and the selected program will be automatically set as the current test program.

4.2.3 Calling of Template Program

1. Select **< Template >** on the setting interface, and press **< OK >** key to enter the reference template interface where the commonly-used templates are provided.

2. User could select a certain reference template and press **< OK >** to confirm the selection and access the reference template for this industry. The template itself provides **< Sites >**, **< Upper >**and **< Lower >** limits.

- Press **< Left >** or **< Right >**key to page up or down;
- Press **< Up >** or **< Down >** key for linefeed;

- Press **< OK >** key to confirm the selection;
- Press **< Setting >** key to return to the test interface and the selected template will be automatically set as the test program.

Reminding:After selecting and confirming a certain template program, please press **< Setting >** key to return to the test interface, the selected template program will be set as the current test program.

4.3 Start Test

1. After completing the program setting, users could open the top cover of the Biolum detector, insert the test ATP Quickswab, and properly close the top cover.
2. Keep the Biolum detector upright and ensure its incline angle is less than 30° during the test. The Biolum detector will display the test interface, as shown in figure4.2.

- Press **< OK>** key to start the test and counting down the test time(10s). After this, the Biolum detector will display the test result.
- The Biolum detector will automatically analyze the test result according to the program upper and lower limits and offer the determination of the test result, displayed as **< Pass >**, **< Caution >** or **< Fail >.**
- In non-silent mode, one beep will sound before the Biolum detector automatically return back to test interface, where users could press **< OK >** key again for second or more tests.

Fig 4.2 Test Interface

4.4 Records Regarding Operations

4.4.1 View Records

1. Select < **Records** > on the setting interface, and press < **OK** > key to enter the test records interface.

- Press < **Left** > or < **Right** >key to page up or down;
- Press < **Up** > or < **Down** > key to move the cursor line feed.
- Press < **OK** > key to confirm the selection and enter the test record detail interface to view the test result.
- Press < **Setting** > key to return to the previous.

2. User could also press < **Up** > key on the test interface to directly enter the test records interface.

- Press < **Left** > or < **Right** >key to page up or down;
- Press < **Up** > or < **Down** > key to move the cursor linefeed.
- Press < **OK** > key to confirm the selection and enter the test record detail interface to view the test result.
- Press < **Setting** > key to return to the previous.

4.4.2 Print Records

On the test record detail interface, and options are available.

- Press < **Down** > key to move the cursor to option.
- Press < **Right** >key to select the option.
- Press < **OK** > key to confirm the selection and print the current record.

Reminding:Before printing the test records, please check whether the matched Bluetooth printer is connected and power on.

4.4.3 Delete Records

On the test record detail interface, and options are available.

- Press < **Down** > key to move the cursor and select option.
- Press < **OK** > key to confirm the selection and delete the current record.

5. Connect to PC or Other Terminals

5.1 Setup Biolum PC Software on PC

Install the supplied Biolum PC software CD into the control computer with Windows operation system as instructed.

5.2 Connect Biolum Detector to PC

1. Open the Biolum PC software on the computer and use the provided USB cable to connect this computer with the Biolum detector while it is power on;
2. The **< USB >** icon on the status bar of Biolum detector will be lighted in blue and a prompt < Connected > will pop up on the screen of Biolum detector, reminding users that the device is successfully connected to the control computer;
3. Click the ***Connect*** icon in the toolbar of the Biolum PC software. The screen of Biolum detector will display a prompt**< Communicating**...**>**, reminding users that the device is communicating with the control computer to realize data exchange and other operations.

5.3 Disconnect Biolum Detector from PC

After the Biolum detector is successfully connected to the control computer.

- Users could press **<** OK **OK >** key on the Biolum detector to disconnect the device from the connected computer;

- Users could also click  ***Disconnect*** icon in the toolbar of the Biolum PC software to disconnect the device from the connected computer.

5.4 Connect Biolum Detector to Bluetooth Printer

1. Select **<**  **Settings >** on the setting interface, and press **<**  **OK >** key to enter the system setting interface.
2. Open the **<**  **Bluetooth >** option on this interface and the **<**  **Bluetooth >** icon on the status bar of Biolum detector will be lighted in blue (The device is named is Biolum and its password is 0000);
3. After the Bluetooth is enabled, the device can be matched with the Bluetooth printer;
4. After matching, the test result can be printed on paper.

6. Operation and Maintenance

6.1 Daily Precautions

- Please carefully read this manual before using the Biolum detector;
- Please power off the Biolum detector after test; In case the device will be unused for a long time, please remove the battery and place it at cool and dry place;
- The Biolum detector belongs to high-precision optical device which shall be stored and used against damp as well as water and rain;
- The Biolum detector shall not be operated in dusty environment to ensure the test result accuracy;
- If the Biolum detector automatically powers off due to the low battery. Please charge it as soon as possible and do not forcibly start it again and again;
- The Biolum detector shall not be operated in environment with strong magnetic field interference;
- No person other than the qualified maintenance staff assigned by our company shall disassemble the Biolum detector.

6.2 Battery Charge or Replacement

- In case the low battery alert displayed in the status bar of the Biolum detector, please charge the battery and be sure to use the supplied power adaptor.
- In case the discharge time of the provided battery is short or the battery fails to recharge or discharge, please contact our service support or local distributor for battery replacement.

6.3 Test Chamber Clean or Replacement

The test chamber of Biolum detector can be removed for cleaning or replacement.

1. Users could open the top cover of Biolum detector, insert one finger into the test chamber, and use the friction force between the finger and test chamber to pull out the test chamber.
2. As the acquisition channel for optical signal, the bottom structure of the test chamber is designed as a special transparent cap. In order to ensure the optical performance, thus the performance of Biolum detector, the test chamber cap shall be well protected during disassembly. If any part of it is damaged, please contact our service support or local distributor for test chamber replacement.
3. Users could clean the test chamber interior with warm water or mild detergent. Let the test chamber natural air drying, after this please insert it back in to the Biolum detector till it reaches the bottom and is locked. Please pay attention to ensure the right insertion direction.

⚠ **Warning**: Please power off the Biolum detector and remove the battery before cleaning or replacing the test chamber.

🚫 **Prohibit**: It is prohibited to clean the test chamber with strong detergent.

7. Troubleshooting

Table 4. The main possible errors during the self-test process of Biolum detector and their possible causes.

No.	Description	Possible causes
1	Storage unit error	Memory storage fails
2	File system error	Initialization of the file system fails.
3	Temperature test error	The temperature test module fails.
4	Temperature error	The environment temperature is not within 5~40°C.
5	Incline angle test error	The incline angle sensor is invalid.
6	Battery error	The battery voltage is very low.
7	Background error	The background value of test environment is out of specification
8	Test module error	The test module fails.

Corrective instruction: for errors during self-test process, the Biolum detector can be restarted on the condition that the battery has sufficient voltage and the working environment meets the pre-mentioned requirements.

Reminding: If the error persists, please contact our service support or local distributor.

Table 5. Other possible errors and their corrective instructions.

No.	Error Description	Possible Cause	Corrective Instructions
1	Press the <**Power**>key, but the Biolum detector cannot be powered on.	a. Low battery; b. Battery is loosened; c. Device or keyboard is damaged.	a. Connect to an external power supply. If the device starts normally, charge the battery or re-install the battery; b. Otherwise please contact us.
2	Press the <**Power**>key, but the Biolum detector cannot be powered off.	a. Improper operation b. Device or keyboard is damaged.	a. Replace the keyboard; b. Restart or power-down restart.
3	Abnormal shutdown	a. Low battery; b. Battery is loosened; c. The device has been damaged or strongly vibrated; d. The device is automatically powered off within the standby time; e. The device is damaged or malfunctioned.	a. Re-install the battery; b. Check the integrity of the device; c. Restart the device.

4	The screen has no display or partial display.	a. The screen is damaged; b. Auto power saving mode; c. The device is automatically powered off due to low battery.	a. Wake up power saving mode; b. Charge the battery.
5	The test records cannot be stored.	a. The system has been set not to store the test records; b. A certain part of the device is loosened or damaged	a. Check if the system is enabled to store the test records; b. Check the integrity of the device.
6	The test result always reads0 or a value lower or higher than the set limits.	a. The ATP Quickswab is not properly used; b. The ATP Quickswab is expired; c. The test is performed in an unstable environment; d. The device is contaminated.	a. Properly use ATP Quickswab; b. Recalibrate the instrument; c. Operate the device in a compliant environment; d. Clean the test chamber

Reminding: If the error persists, please contact our service.

Warning: in case of any following condition occurs, please immediately power off the device, and contact our service support or local distributor to ask for qualified maintenance staff for assistance:

1. Any liquid has entered into the device;
2. Any abnormal sound or smell appear inside the device;
3. Device is soaked with water or rain;
4. Any housing damage caused by accidently drop of the device;
5. Obvious functional changes of the device.

8. System Software Specification

8.1 Overview

Biolum data management system is mainly used to realize functions such as data exchange between PC and Biolum, test record analyzing and processing and unidirectional command control.

Biolum data management software has following main features and advantages:

- Compatible with current mainstream Windows OS versions such asWin8/Win7/Vista/XP;
- Fully independent from any third-party software;
- Its communication employs the standard Windows driver, requiring no third-party driver;
- Chinese and English are fully supported;
- Capable of directly uploading test data from one or more Biolum devices;
- Editable templates such as User, Program and Plan, which can be downloaded to the Biolum device for usage;
- Uploaded data and edited templates can be directly exported as Excel-compatible format;
- Test data can be output as statistical graph based on specified conditions (histogram, sector diagram, line chart and so on) and can be printed;
- Uploaded test data is encrypted.

8.2 Setup

Open the included CD and locate ‘setup.exe’ to run the executable file. You will be automatically directed to the ‘Installation Confirmation’ interface, as shown in figure 8.1.

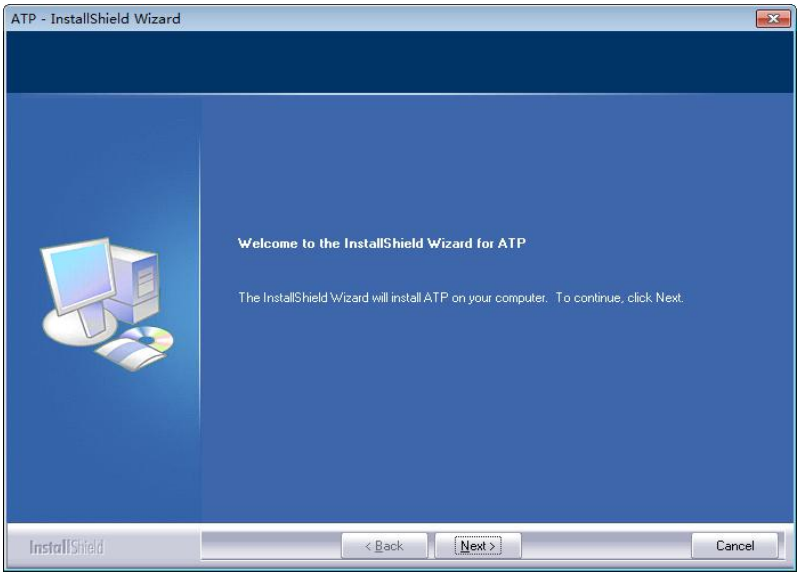

Fig 8.1 Installation Confirmation

Click the ***Next*** button to enter the ‘Installation Directory Selection' interface, as shown in figure8.2. Users could click the ***Change*** button to change the Installation directory. Click the ***Next*** button to enter the ‘Software Installation’ interface, as shown in figure 8.3

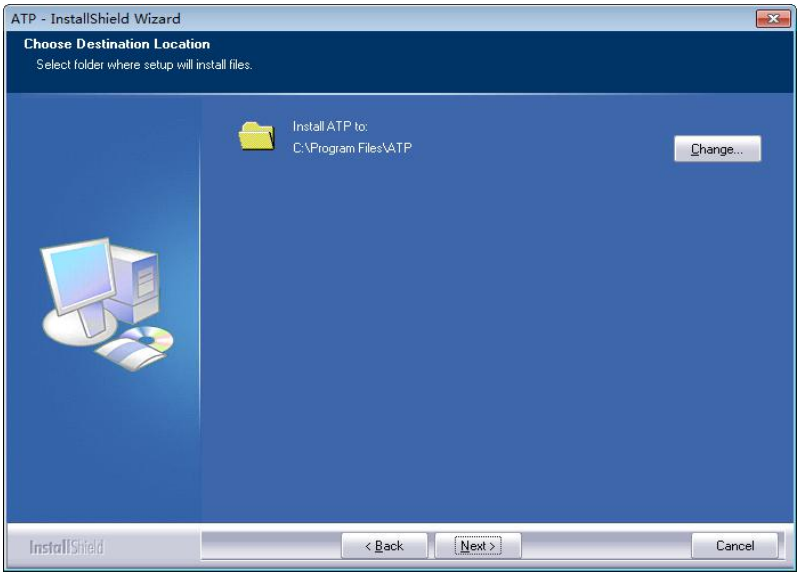

Fig 8.2 Installation Directory Selection

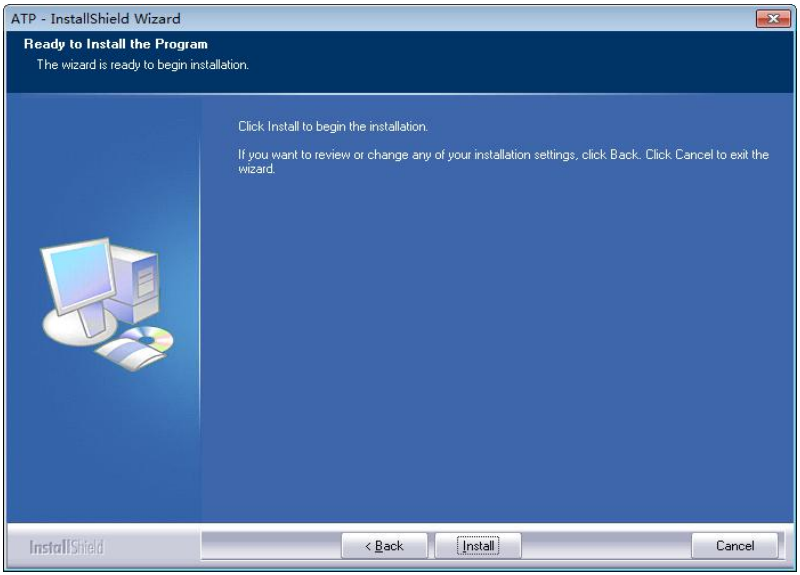

Fig 8.3 Setup

Click the ***Install*** button to enter the '***Installation Status***' interface; After the installation, you will be directed to the ***'Installation Complete'*** interface, as shown in figure 8.4. Please click ***Finish*** to confirm.

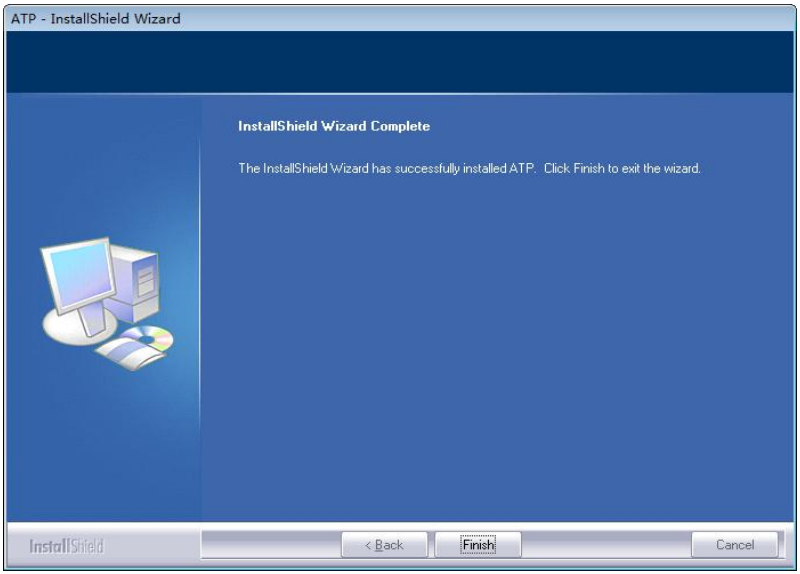

Fig 8.4 Software Installation

The software will run automatically upon completion of installation, and generate a shortcut icon ' Biolum' on the desktop for easy operation. Software Installation

8.3 Remove

Users could find the ‘  uninstall’ icon in the Start menu of Windows operation system, click it and a uninstall dialog box will pop up, according to whose prompt, the uninstall operation can be done. Users could also uninstall the software from the ‘Control panel- Program and function’ menu of the computer.

9. Software Interfaces and Features

9.1 Software Interfaces

The initial interface is as shown in figure9.1.

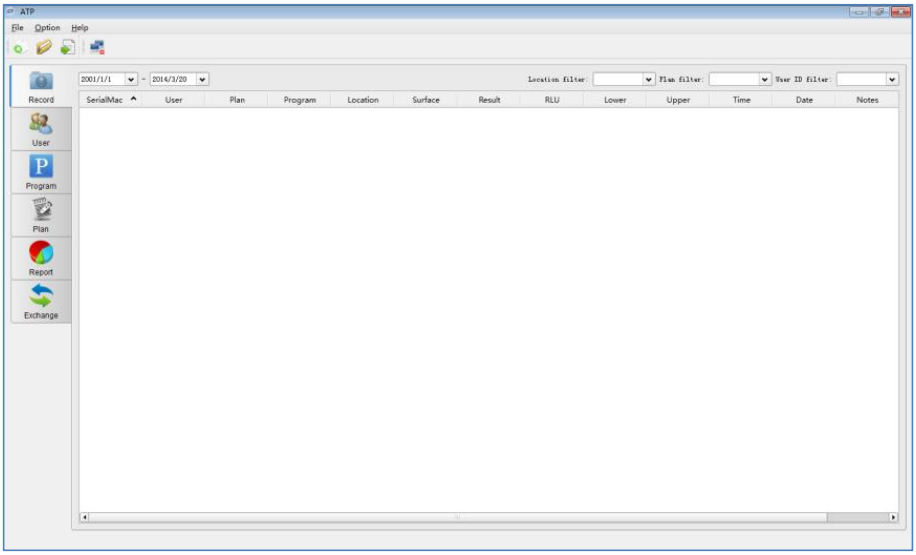

Fig 9.1 Initial Interface

9.2 Overview of Features

9.2.1 Menu Bar

File Pull-down Menu

File	Icon	Feature
New...		Generate a statistical graph report according to test data;

Open...		Open a statistical graph report from the disc;
Export...		Export list contents such as test records and templates to the disc;
Exit	/	Exit the software.

Option Pull-down Menu

Option	Icon	Feature
Login...		Login as administrator
Switch to Chinese	/	Switch interface language
Connect...		Connect the device
Exit	/	Exit the software.

Help Pull-down Menu

Help	Icon	Feature
Contents F1	/	Display help document information
About	/	Software Version Information

9.2.2 Function Options

File	Icon	Feature
Record		View, sort, search, delete and edit of uploaded test records
User		Edit, add or delete user templates
Program		Edit, add or delete procedure templates
Plan		Edit, add or delete plan templates
Report		View, print or delete statistical graphs
Exchange		Data sync with device, firmware update and issue of control command
Help		View help documents

10. Operating Guidance

10.1 Connect Biolum Device to PC

Start up the device and use the data cable to connect the device to the USB port of your PC.

10.2 Connect Biolum Device to Software

Open the software, select the connect icon from the pull-down menu of the 'Option', or directly click the icon on the tool bar. After the Biolum device is successfully connected to the software, the device interface is as shown in Figure 10.1, and the connect icon also changes to icon.

Figure 10.1Connecting

10.3 Record

10.3.1 Description

Click the **<** **Record >** from the function options on the main interface, the software will directly enter the record interface as shown in figure 10.2.

	SerialMac	User	Plan	Program	Location	Surface	Result	RLU	Lower	Upper	Time	Date	Notes
1	3		0	0	Hotel	Cushion	Pass	0	450	450	13:39:52	2014-07-18	
2	3		0	0	Hotel	Cushion	Pass	0	450	450	13:40:58	2014-07-18	
3	3		0	0	Hotel	Cushion	Pass	112	450	450	09:09:12	2014-07-19	
4	3		0	0	Hotel	Cushion	Pass	111	450	450	09:09:30	2014-07-19	
5	3		0	0	Hotel	Cushion	Pass	112	450	450	09:12:30	2014-07-19	
6	3		0	3	P3	Plate	Pass	2	7	20	11:45:43	2014-07-19	
7	3		0	3	P3	Plate	Pass	1	7	20	11:46:07	2014-07-19	
8	3		0	2	P2	Faucet	Caution	113	100	250	11:46:40	2014-07-19	
9	3		0	3	P3	Plate	Fail	112	7	20	11:47:17	2014-07-19	

Fig 10.2 Record

After the Biolum device is successfully connected to the software, and data synchronization is completed, the test record will be displayed in the record management section to display detailed record information.

Users could edit, delete, export and generate the statistical report based on the test records, and also analyze these data by time, location, user or schedule.

Users could select the records within a certain period of time.

Displays the record of a certain location

Displays the record of a certain schedule

Displays the records of a certain user

10.3.2 Records Editing

Administrator privilege is required for management of the test records. Under the administrator model. The **<User>**, **<Plan>**, **< Program >**, **< Location >** and **< Surface >**information of these test records can be edited.

10.3.3 Login as Administrator

From the pull-down menu of 'Option' on the menu bar, click the icon ***Login…*** to display the 'Input administrator password' dialogue box, as shown in figure10.3.

Fig 10.3 Input administrator password

In the 'Input administrator password' dialogue box, you can input the password '0000' to get the administrator privilege, and click OK to log in, as shown in figure 10.4. You can double click the cell to be edited to edit the related records.

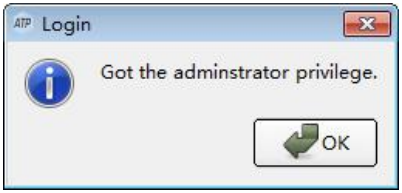

Fig 10.4 Login Successfully

10.3.4 Logoff

From the pull-down menu of 'Option' on the menu bar, click the icon ***Logoff*** to exit from the system.

10.3.5 Records Deletion

After login as administrator, users could select a certain record and right click to delete the selected test records.

10.3.6 Records Export

Click the icon ***Export*** from the pull-down menu of 'File' on the menu bar, or directly click the icon ( ) on the shortcut on the tool bar to display the Export dialogue box. Select the save position, and enter the file name. Click ***OK*** to save the file in 'CSV' format that can be opened by Excel or in txt format which facilitates data entry of users.

10.4 User

10.4.1 New User

When the button ***Add*** in the work area is enabled, click it to add a new user. Input user name and press the **[Enter]** key to confirm it, as shown in figure 10.5.

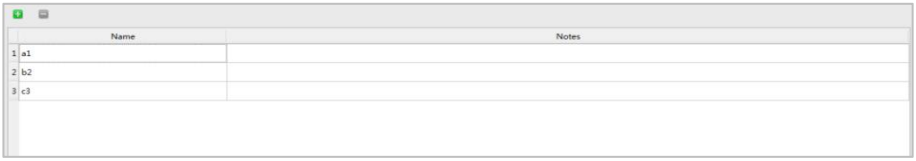

Fig 10.5 Add New User

Reminding: When the user name is empty, already exists or exceeds 10 characters, the software will remind that the user name is invalid, please re-set the user name again.

10.4.2 Edit User

Double click the user entries to be edited to enter the Edit mode, after editing the user name please press the **[Enter]** key to confirm the modification.

10.4.3 Delete User

After selecting the user entries to be deleted, the button ***Delete*** in the work area will be enabled. Press the button and click ***Yes*** in the displayed Confirm Delete dialogue box to delete the selected user entries.

10.5 Program

This module provides the feature to customize test program which essentially consist of test 'Location', 'Surface', 'Upper' reference limit and 'Lower' reference limit.

Among them, the test 'Location' and 'Surface', have the maximum character length of 30 characters and the range of 'Upper' and 'Lower' reference limit is 1~9999, while the upper limit is not less than the lower limit. Up to 1999 programs can be added, as shown in figure 10.6.

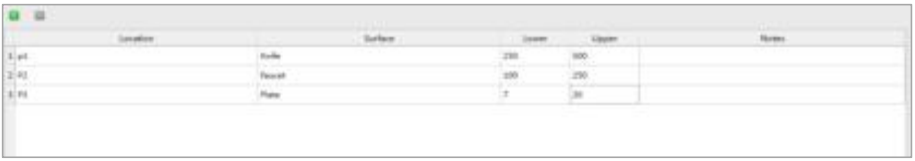

Fig 10.6 Program

10.5.1 New Program

When the button ***Add*** in the work area is enabled, click it to add a new program. Input all the corresponding information of the new program and press the [Enter] key to confirm it.

10.5.2 Edit Program

Double click the cell to be modified to enter Edit mode, edit the corresponding content and press the **[Enter]** key to confirm the modification.

10.5.3 Delete Program

After selecting the program entries to be deleted, the ***Delete*** button in the work area will been abled. Press the button and click ***Yes*** in the displayed Confirm Delete dialogue box to delete the selected program entries.

Reminding: Delete the program in the 'Program' module, the corresponding program in the 'Plan' module will be also deleted.

10.6 Plan

This module provides the feature to customize test plan that consist of several test programs. As shown in the above figure, the left section displays the t test plan, while the right section displays test programs contained in the selected test plan. Up to 255 test plans can be added, each of which contains up to 255 test programs, as shown in figure 10.7.

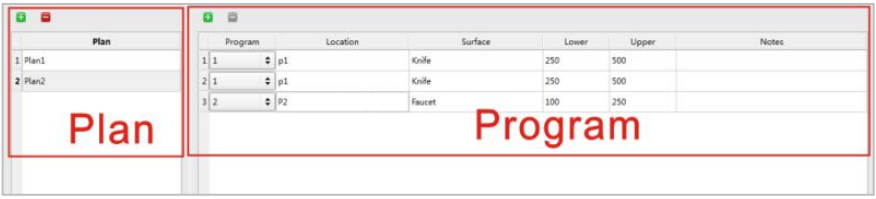

Fig 10.7 Plan

10.6.1 New Plan

When the button ***Add*** on the schedule column in the work area is enabled, please press the Add button to add a new plan. Users could use the system automatically generated plan name or manually customize the new plan name. After adding a new plan, the right program column will add the first test record of the current program template by default. Users are allowed to add or change program contents and sequence in the right program column.

Reminding: A plan can be added only when the test program is not null.

10.6.2 Edit Plan

Plan editing is to modify the program information of the selected plan. You can select the desired program from the pull down list in the program column.

10.6.3 Delete Plan

After selecting the plan entries to be deleted, the button ***Delete*** in the work area will been abled. Press the button and click 'Yes' in the displayed Confirm Delete dialogue box to delete the selected plan entries.

10.7 Report

The contents displayed are statistical graphs report generated and saved by New Wizard under the current 'Report' directory, as shown in figure 10.8.

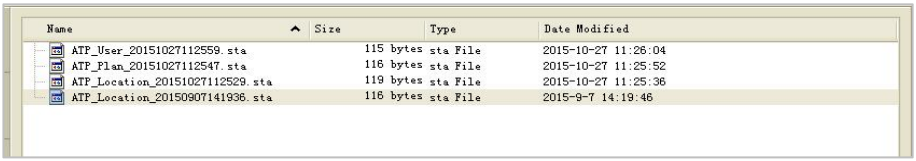

Fig 10.8 Report

Double click a certain report to open it, the statistical graph is as shown in figure 10.9. User could also right click it to display the Delete option.

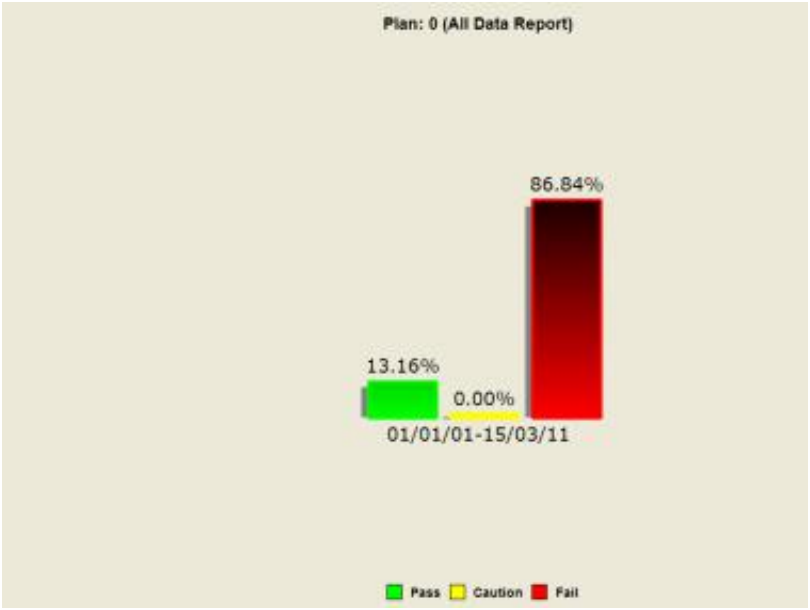

Fig 10.9 Statistical Graph

Right click on the statistical graph to display options menu, as shown in figure 10.10.

Fig 10.10 Options Menu

Functional description

Options	Description
Close	Close the current statistical graph
Print...	Print the current page
Print Preview	Preview the current page printing effect
Histogram	Display the histogram for statistical report
Pie chart	Display the statistical report in form of pie chart
Line chart	Display the change trend of statistical results in form of line chart
Hide/show Label	Hide/show the percent comment of charts

10.8 Exchange

This module is not enabled when the software starts.

10.8.1 Activation Method

1. Check that the Biolum device is properly connected to your PC through the data cable;
2. Click the button  ***Connect*** on the toolbar. This button will change to  after connection succeeds.

Reminding: If it is not properly connected, check if the Biolum device is reliably connected to your PC.

After successfully connected the device with PC, the 'Device Firmware Upgrade', 'Synchronization' and 'Control Command' buttons will be enabled for data exchange between your PC and device, as shown in figure10.11.

Fig 10.11 Exchange Interface

10.8.2 Device Firmware Upgrade

This module is used to update the Biolum device firmware program. Please make sure the Biolum unit is successfully connected to computer via the provided USB cable update.

Reminding: Do not shutdown the computer or the Biolum device during the update process.

10.8.3 Synchronization

This module is used to synchronize the data between the Biolum device and PC. After successfully connecting the Biolum unit to the computer, please click ***Synchronization*** to upload the test results from the Biolum unit to the computer. After the completion of the upload, the software will automatically remind the users 'Whether to clean all the data in Biolum device?' Click ***No*** the data Biolum device will not be deleted; Click ***YES*** the test data in the device and downloaded template will be cleared, and the **< User>**, **< Program >**and **< Plan>**templates created on the computer will be downloaded into the Biolum device in turn to complete data synchronization.

10.8.4 Command Send

This module is used to send control commands to the Biolum device, in order to realize the remote control of PC software on the Biolum device. There are two control commands: 'Single Test' and 'Shutdown'.

Single Test: place the swab and close the top cover to ensure the swab is being tested. Press the ***Single Test*** key to start test.

Shutdown: Shot down the Biolum device.

10.9 Help

The help document of the host computer.

11.Contact Information

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