MR-96A

Microplate Reader

Operator’s Manual

CE

For this Operator's Manual, the issue date is 2012-10.

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WARNING:

It is important for the hospital or organization that employs this equipment to carry out a reasonable service/maintenance plan. Neglect of this may result in machine breakdown or personal injury.

NOTE:

This equipment must be operated by skilled/trained clinical professionals.

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- Malfunction of the instrument or part whose serial number is not legible enough.
- Others not caused by instrument or part itself.

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Preface

Before using the MR-96A, please read this operation manual thoroughly for relevant operation instructions.

Please keep this manual properly for convenient use.

What Can You Find in This Manual

The MR-96A Microplate Reader should be operated and maintained strictly as instructed by this manual. This operation manual covers principles, operations, daily maintenance and troubleshooting of the equipment. Please operate and service the equipment strictly as instructed by this manual.

Conventions

Safety Symbols

Safety symbols alert you to potentially dangerous conditions and information that requires your attention. These safety symbols, together with related text, apply to specific procedures and appear as needed throughout this manual.

When you see…		Then…
	**WARNING**	Read the statement following the symbol. The statement is alerting you to an operating hazard that can cause personal injury.
	**BIOHAZARD**	Read the statement following the symbol. The statement is alerting you to a potentially biohazardous condition.
	**CAUTION**	Read the statement following the symbol. The statement is alerting you to a possibility of system damage or unreliable results.
	**NOTE**	Read the statement following the symbol. The statement is alerting you to information that requires your attention.

Labels

The labels attached to the surface of the instrument use symbols to clarify the meaning of the text. If any of the labels peels off, contact Mindray customer service department or your local distributor for replacement. The chart below explains the symbols on the labels.

SN	Serial number
	Manufacture date
	Manufacturer
	The device is fully in conformance with the Council Directive Concerning In Vitro Diagnostic Medical Devices 98/79/EC.
EC REP	Authorized Representative in the European Community
	The following definition of the WEEE label applies to EU member states only: The use of this symbol indicates that this product should not be treated as household waste. By ensuring that this product is disposed of correctly, you will help prevent bringing potential negative consequences to the environment and human health. For more detailed information with regard to returning and recycling this product, please consult the distributor from whom you purchased the product.
IVD	In Vitro diagnostic equipment
	Biohazard Warning: Risk of potentially biohazardous infection
	Warning: Risk of personal injury or equipment damage
	Warning: Risk of burn
	Protective ground terminal
	Risk of electric shock
100-240V~	AC 100-240V~
50/60Hz 120VA	50/60Hz; power consumption: 120VA
	Power ON
	Power OFF
	Serial port to connect the equipment to PC
	USB port, which complies with the USB 2.0 protocol.

Graphics

All graphics, including screens, are for illustration purpose only and must not be used for any other purposes.

Safety Precautions

Observe theses safety precautions when using the MR-96A Microplate Reader. Ignoring any of the precautions may lead to personal injury or equipment damage.

WARNING

If the instrument is used in a manner not specified by Mindray, the protection provided by the system may be impaired.

Preventing Electric Shock

Please observe the following instructions to prevent electric shock.

WARNING

When the instrument is turned on, users must not open the cover.

Spillage of reagent or sample on the analyzer may cause equipment failure and even electric shock. Do not place sample and reagent on the analyzer. In case of spillage, switch off the power immediately, remove the spillage and contact Mindray customer service department or your local distributor.

This instrument is supplied with a slow-blow fuse (250V, 3.15A), which must not be replaced by the user.

Power supply: AC100-240V~, 50/60Hz.

The instrument is supplied with a three-wire power cord and should be properly grounded during application.

Preventing Personal Injury Caused by Moving Parts

Please observe the following instructions to prevent personal injury caused by moving parts.

WARNING

Do not touch such moving parts as plate carrier, etc. when the system is in operation.

Do not put your finger or hand into any open part when the system is in operation.

Preventing Infection

Please observe the following instructions to protect against the biohazardous infection.

BIOHAZARD

Inappropriately handling samples may lead to biohazardous infection. Do not touch the sample, mixture or waste with your hands. Wear gloves and lab coat and, if necessary, goggles.

In case your skin contacts the sample, follow standard laboratory safety procedures and consult a doctor.

Treating Waste Microplates

Please observe the following instructions to dispose of the waste microplates to prevent from environmental pollution or harm to human body.

BIOHAZARD

Substances in reagent and microplates are subject to contamination regulations. Dispose of the reagent and microplate in accordance with your local or national guidelines for waste disposal and contact the reagent manufacturer or distributor for details.

Treating Waste

Please observe the following instructions to prevent environmental pollution and personal injury caused by waste.

BIOHAZARD

Materials of the waste components and microplate reader are subject to contamination regulations. Dispose of them in accordance with your local or national guidelines for waste disposal. Wear gloves and lab coat and, if necessary, goggles.

Preventing Fire or Explosion

Please observe the following instructions to prevent fire and explosion.

WARNING

Do not use flammable substance around this instrument. Ethanol is flammable substance. Please exercise caution while cleaning the instrument with ethanol.

Precautions on Use

To use the MR-96A Microplate Reader safely and efficiently, please pay much attention to the following operation notes.

Intended Use

WARNING

The MR-96A Microplate Reader is a chemical instrument that is designed for photometric measurements in ELISA or other experiments and to perform qualitative or quantitative determination of blood, etc. Please consult Mindray first if you want to use the instrument for other purposes.

Operator

WARNING

The MR-96A Microplate Reader is to be operated only by clinical professionals, doctors or laboratory experimenters trained by Mindray or Mindray-authorized distributors.

Environment

CAUTION

Please install the instrument in an environment specified by this manual. Installation in other environment may lead to unreliable results and even equipment damage.

To relocate the system, please contact Mindray customer service department or your local distributor.

Preventing Interference by Electromagnetic Noise

CAUTION

Electromagnetic noise may interfere with operations of the system. Do not install devices generating excessive electromagnetic noise around the system.

Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g. mobile phones or radio transmitters), as these may interfere with the proper operation.

The electromagnetic environment should be evaluated prior to operation of the device.

This device has been designed and tested to CISPR 11 Class A, and in a domestic environment may cause radio interference, in which case，you may need to take measures to mitigate the interference.

NOTE:

It is the manufacturer's responsibility to provide equipment electromagnetic compatibility information to the customer or user.

It is the user's responsibility to ensure that a compatible electromagnetic environment for the equipment can be maintained in order that the device will perform as intended.

Communication interface

CAUTION

The MR-96A is provided with a USB port and a serial port, which are respectively used to connect an external printer or a U disk for upgrading the system, and to connect a PC to transfer data.

User must not perform other operations via these two interfaces. Otherwise the system may be damaged.

Contents

1 The Basics

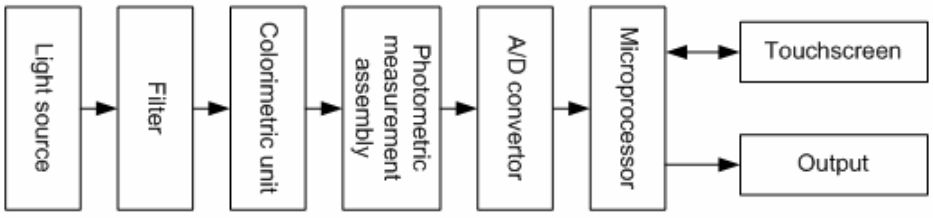
1.1 System Description

The MR-96A Microplate Reader consists of the hardware, built-in operating software and recorder.

1.1.1 Principles

The MR-96A Microplate Reader is used to perform qualitative or quantitative determination of samples in accordance with the Lamber-Beer Law. In photometric measurement, the enzyme reacts with the substrate and different substances have distinct absorption spectrum. The following figure shows the measurement principles of the microplate reader.

Figure 1-1 Measurement Principles of Microplate Reader



As shown in Figure 1-1, the light beam from the lamp passes through the filter and forms a monochromatic light bundle, which then goes through the sample in the well and reaches the photo detector with partial light absorbed by the sample. The photo detector converts the received light signals into electric signals, which are then

converted by the A/D converter and sent to the microprocessor for processing and calculation. Finally the output unit outputs the measurement results.

1.1.2 Appearance

Figure 1-2 shows the front view of the MR-96A. The printing device is optional.

Figure 1-2 Front View

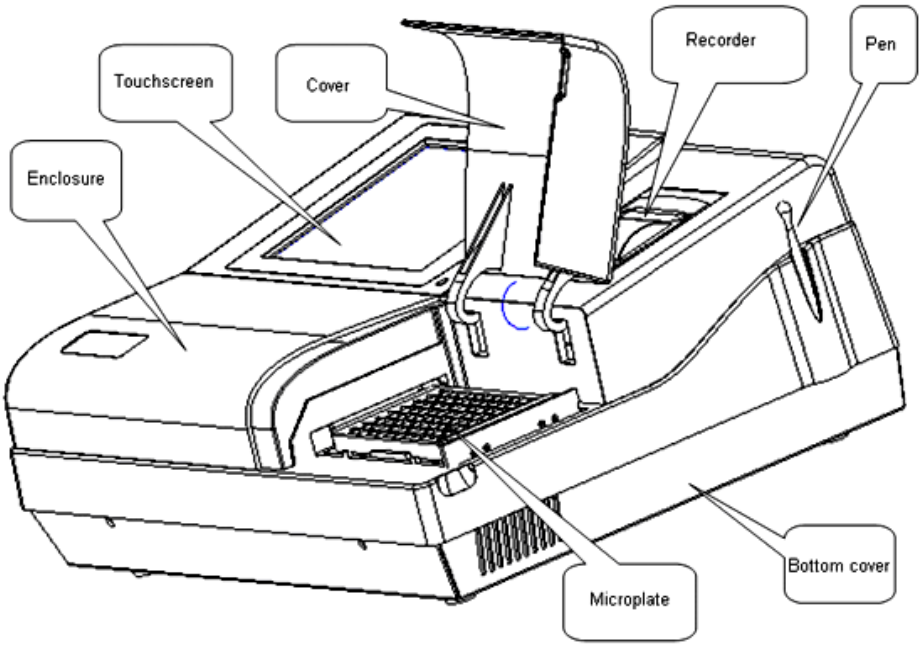
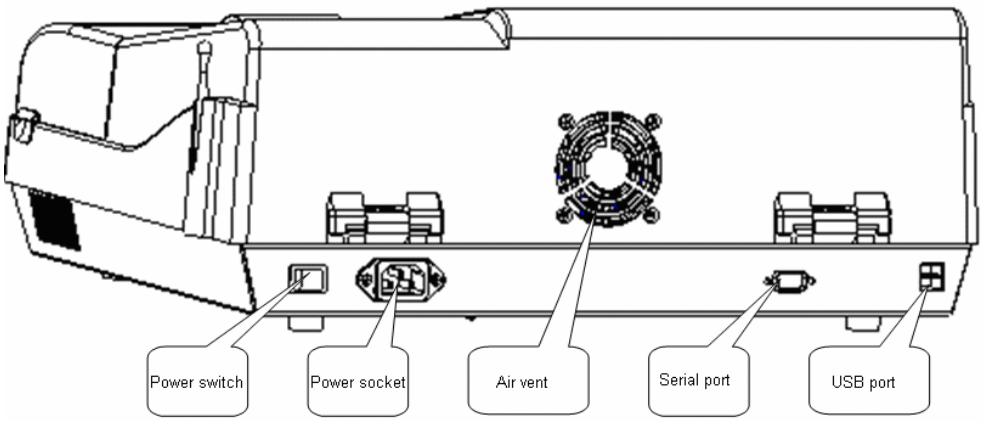


Figure 1-3 shows the rear view of the MR-96A.

Figure 1-3 Rear View



The USB port is used to connect a USB mouse and the serial port to connect the PC for data transferring. The air vent is for ventilation of the instrument.

1.2 Operating Conditions and System Features

1.2.1 Operating Conditions

- Ambient temperature: 5℃-35℃
- Relative humidity: 15%-85%, without condensation
- Power supply: AC 100-240V~±10%, 50/60Hz
- Power consumption: 120VA
- Atmospheric pressure: 70 kPa-106kPa
- The installation site should be far from strong electromagnetic fields
- The instrument should be shielded from direct sunlight
- The instrument should be installed on a stable platform free of vibration.
- The instrument should be connected to a properly grounded power socket.

1.2.2 Dimensions and Weight

- Dimensions: 437mm×332mm×174mm (L×W×H)
- Weight: 8.5kg

1.2.3 Technical Specifications

Light source	Tungsten-halogen lamp. Automated control
Optical system	8-channel fiber measurement system
Filter	Interference filters of 405nm, 450nm, 492nm and 630nm. User can also configure another four if needed.
Photosensor	Silicon photocell
Plate type	96-/48-well plates
Spectral range	400-700nm
Measurement range	0-2.5A
Readout range	0-3.5A
Precision	0.001A
Operation speed	Step mode: 12s/plate for single wave and 26s/plate for dual wave; Continuous mode: 5s/plate for single wave and 12s/plate for dual wave;
Shaking mode	Adjustable among High, Medium and Low
Shaking time	Adjustable from 0-60 sec
Sample combination	Single-/dual- sample
Calibration method	One-point, Point to Point, Multi-point%ABS, Linear, Exponential, Logarithm, Power and Factor
Result storage	Up to 20,000 results can be stored on the instrument.
Number of tests that can be stored	Up to 100 tests

1.3 Control Mode

The MR-96A is supplied with a touchpen, which is used to operate on the touchscreen.

CAUTION

Be sure to use the supplied pen to operate the touchscreen of MR-96A. Do not touch the screen with sharp-edged tools. Otherwise the screen may be damaged.

1.4 General Operating Procedure

The power indicator is located on the lower-right corner of the touchscreen and indicates different status when on or off:

- On – The instrument is powered on.
- Off – The instrument cannot work normally.

When powered on, the instrument starts the initialization process, which includes:

- Loading operating system;
- Loading application;
- System initialization;
- Self-check.

After self-check, the main screen is displayed.

NOTE

The initialization process takes about 1.5 minutes.

You should not start measurement until 5 minutes after the system is started up and gets steady.

Follow this procedure to operate the MR-96A (See detailed instructions in chapter 4):

1 Switch on the power supply and set up hospital information, system date and time, etc on the System Setup screen.

2 Add a new test on the Test Setup screen and configure the parameters.

3 Set up plate placement mode on the Run screen.

4 Place the microplate on the plate carrier and then start the analysis.

5 Review the test data and store it if needed.

6 Edit patient information on the Reports screen and print out the patient reports.

7 Select Shutdown to exit the operating software with test information saved.

8 Switch off the power supply.

CAUTION

Ingression of dust or foreign matters may influence the instrument performance. Be sure to lay down the cover when the instrument is not in use.

1.5 Storage Requirements

The instrument and its packaging materials should be stored in the following environment:

- Temperature: 0℃-40℃;
- Relative humidity: 15%-85%, without condensation;
- Free of corrosive gas;
- Well ventilated.

1.6 Printing Device

1.6.1 Internal Thermal Recorder

The internal thermal recorder is optional. If you want to purchase a recorder, please contact Mindray customer service department or your local distributor.

While feeding printing paper, please pay much attention to the following notes.

- Before feeding printing paper, please ensure the instrument has been powered off.
- After feeding printing paper, be sure to cover the record.

CAUTION

Do not use any tools like sandpaper that may damage the thermal components. Do not squeeze the thermal print head.

NOTE

The paper used for the thermal recorder should be 50mm × 20m.

1.6.2 External Printer

The external printer is optional. If you want to purchase a printer, please contact Mindray customer service department or your local distributor.

The printer is shown in the figure below, connecting to the power supply and USB port.

WARNING

The printer must be connected to properly-grounded power socket.

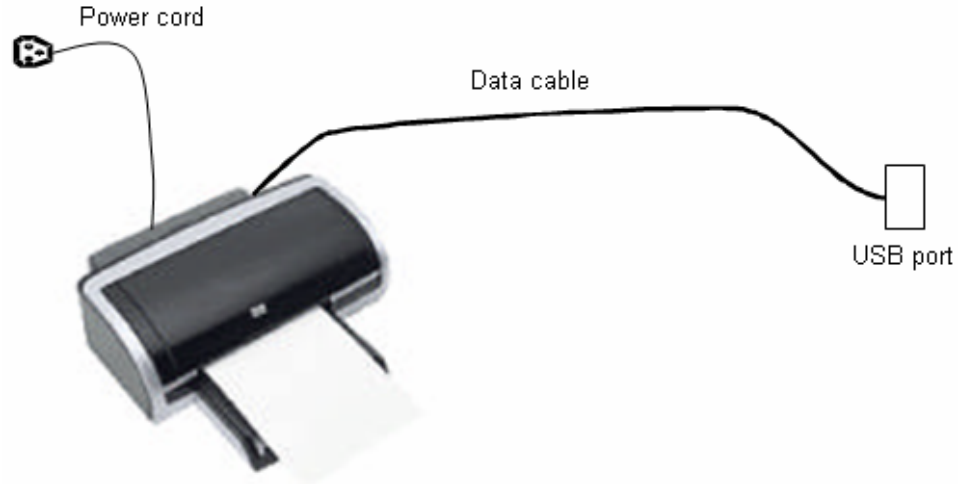
NOTE

You are recommended to use printers that are compatible with the MR-96A and listed in (not limited to) Appendix C. If you have any questions about the printers, please contact Mindray customer service department or your local distributor.

The printers connected to the MR-96A must comply with the requirements of IEC 60950 or EN 60950.

For the detailed instructions about the printer, please refer to its operation manual.

Figure 1-4 Connection of External Printer



Perform the following steps to install the printer:

1 Plug the data cable to the USB port on the back of the instrument.

2 Plug the power cord to a properly-grounded power socket.

3 Turn on the MR-96A and the printer.

2 Installation

2.1 Unpacking

When you receive the instrument, carefully inspect the package. If you see any signs of mishandling or damage, file a claim immediately with Mindray Customer Service Department or your local distributor.

After opening the package, check the delivered goods against the packing list as well as the appearance of the instrument. If you find anything missing or damaged, alert Mindray customer service department or your local distributor immediately.

2.2 Installation Requirements

CAUTION

Make sure the instrument is installed in a place meeting the requirements. Otherwise, it will not perform as promised.

2.2.1 Environmental Requirements

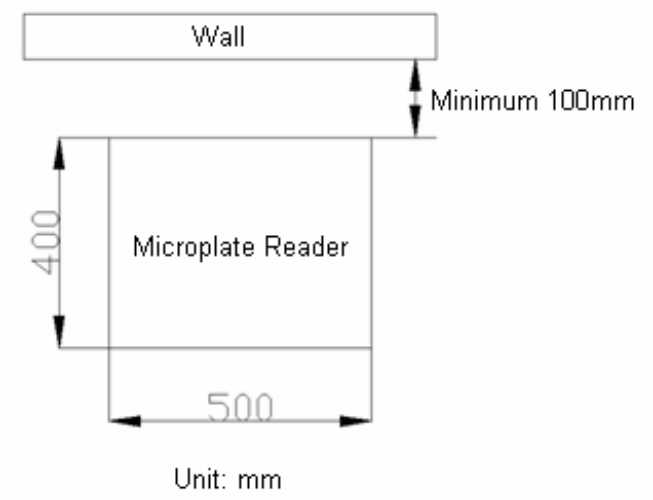
- Atmospheric pressure: 70 kPa-106kPa
- Ambient temperature: 5℃-35℃
- Relative humidity: 15%-85%, without condensation
- The instrument should be installed in a place that is far from electromagnetic fields and interference voltage and free of direct sunlight.

2.2.2 Power Requirements

- Power supply: AC 100V-240V~, 50/60Hz, three-wire power cord
- The instrument should be properly grounded.

2.2.3 Space and Accessibility Requirements

Figure 2-1 Space and Accessibility Requirements



- The installation space must be larger than the dimensions (437mm × 332mm × 174mm, L×W×H) of the instrument.
- The installation platform should be level with gradient less than 1:200.
- The bearing platform should be able to bear $5.9X10^{-5}kg/mm^2$ weight.
- The installation site should be well ventilated.

2.3 Installing the MR-96A

- Connect one end of the supplied power cord to the power jack of the MR-96A and the other end to the power supply.
- Place the power switch to On. The instrument starts initialization which takes about 1.5 minutes. After initialization, the main screen is displayed.

WARNING

Make sure the power socket is grounded correctly. Improper grounding may lead electric shock and/or equipment damage.

Be sure to connect the system to a power socket that meets the above-mentioned requirements and has a proper fuse installed.

3 Basic Operations

3.1 Input Tools and Operation

3.1.1 Touchscreen and Touchpen

The MR-96A Microplate Reader is provided with a touchscreen and pen, which are used as input tools and can be operated as follows:

- Click

'Click' means the act of moving the pen to the desired item and then touching the screen gently.

The 'click' operation is used to operate all buttons, options, edit boxes and popup keypad.

- Drag

'Drag' means the act of keeping touching the screen with pen and moving to desired place.

The 'drag' operation is used to move the scroll bars.

WARNING

Be sure to use the supplied pen to operate the touchscreen of MR-96A. Do not touch the screen with sharp-edged tools. Otherwise the screen may be damaged.

3.1.2 Popup Keypad

The popup keypad is used to input numbers, letters and characters.

- To view more words on other pages, select - and = to page up and down.
- Select Shift and CapsLock to switch between upper case and lower case. See Figure 3-1, Figure 3-2 and Figure 3-3.
- Select Shift and click a letter. The letter is input in upper case, but the following letters will be input in lower case.
- Select CapsLock . All letters you then enter are input in upper case. Select CapsLock again to switch to the lower case mode.
- To exit the popup keypad, select .

Figure 3-1 Popup Keypad – Upper case (with Caps Lock)

Figure 3-2 Popup Keypad – Lower case

Figure 3-3 Popup Keypad – Upper Case(with Shift)

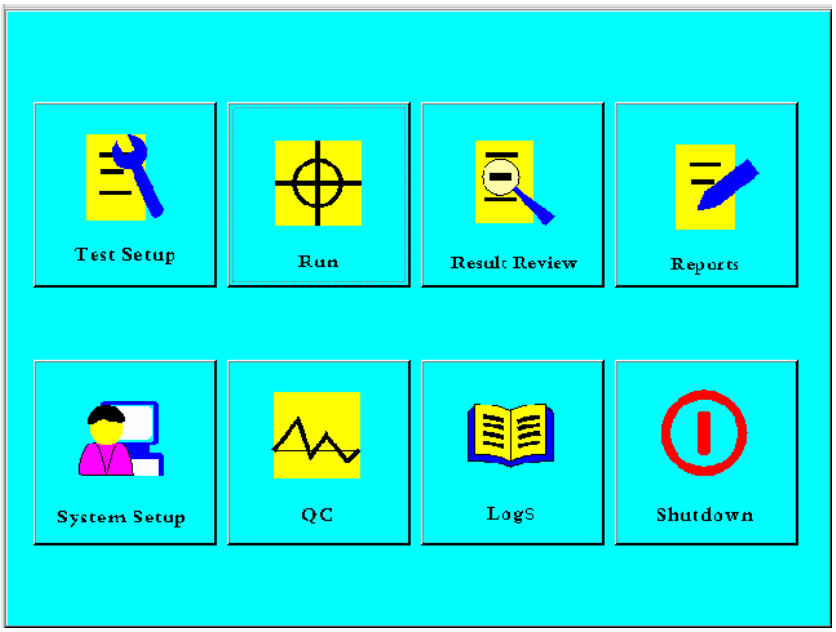
3.2 Shutdown

During the shutdown process, all data, including test information, system settings, patient information, test results, etc, are stored in the instrument memory. The whole process lasts for about 15 seconds.

4 Advanced Operations

When the startup initialization is finished, the main screen is displayed.

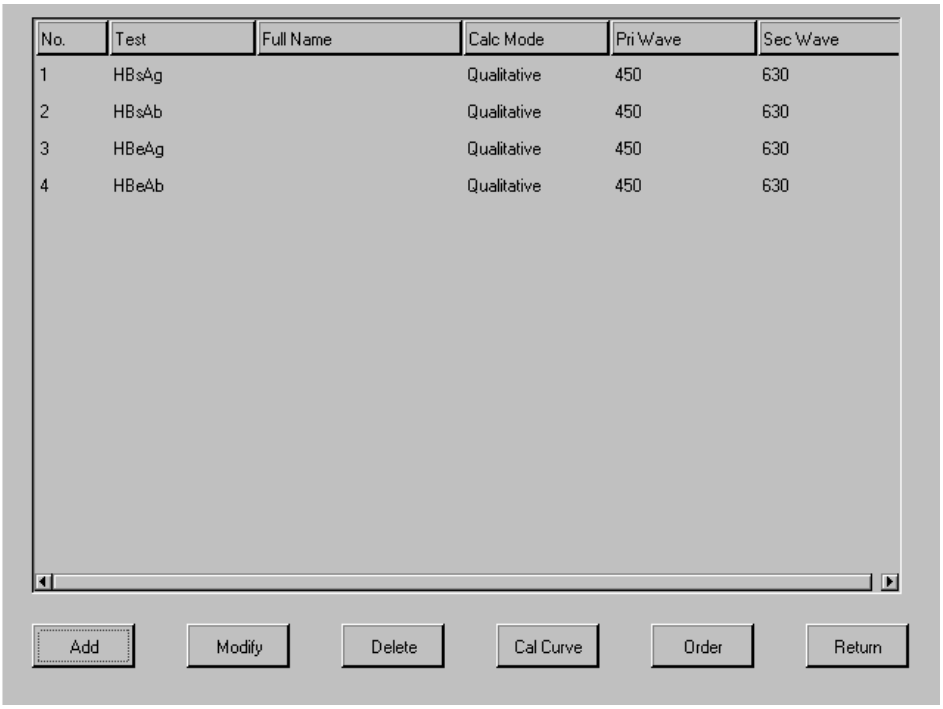
Figure 4-1 Main Screen



4.1 Test Setup

Click the ***Test Setup*** button. The Test Setup screen is displayed. You can set up the test information, such as test name, full name, calculation mode, primary wavelength and secondary wavelength. The test No. is produced automatically by the instrument.

Figure 4-2 Test Setup Screen



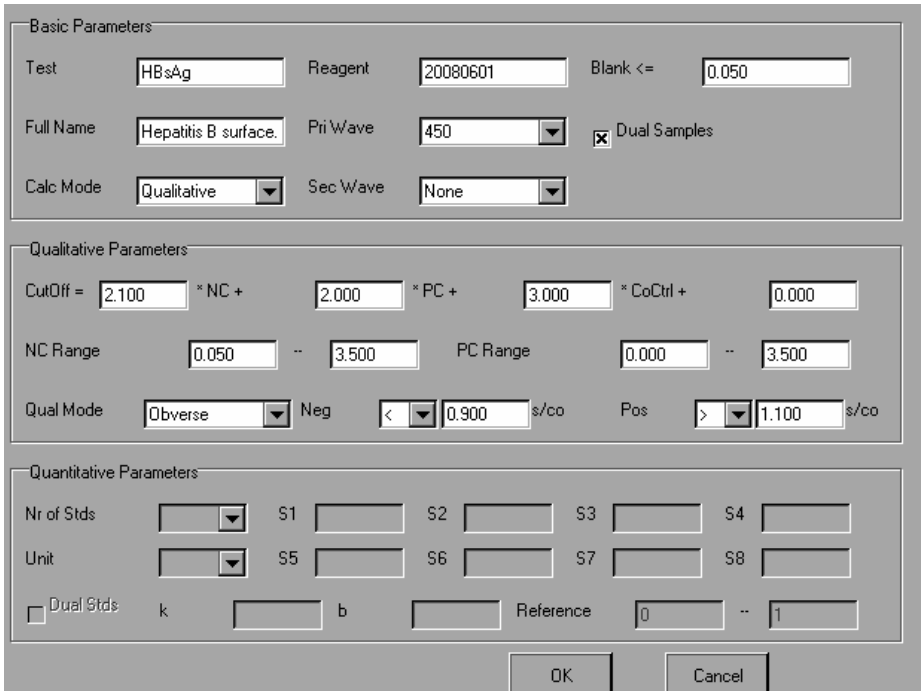
The following table introduces the buttons on the screen.

Button	Function
Add	Click this button to add a new test, which must not have the same name as existing test.
Modify	Click this button to change the test information, such as full name, wavelength, etc.
Delete	Click this button to delete the selected test.
Cal Curve	Click this button to view the test result and curve of a standard(s) for quantitative test.
Order	Click this button the rearrange the tests for printout.
Return	Click this button to return to the main screen.

4.1.1 Adding a Test

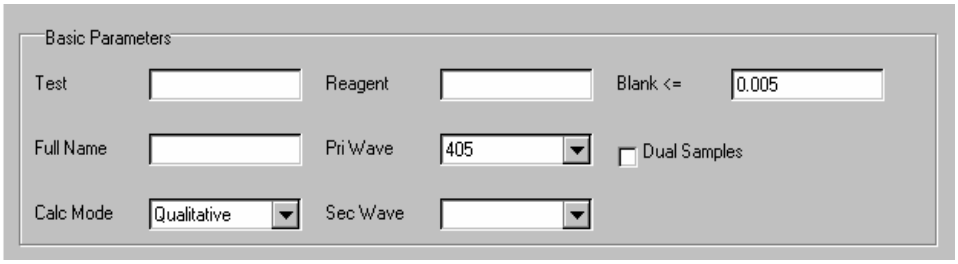
Select ***Add*** from the Test Setup screen. The parameter setup screen is displayed, including three parts: ***Basic Parameters***, ***Qualitative Parameters*** and ***Quantitative Parameters***.

Figure 4-3 Parameter Setup screen

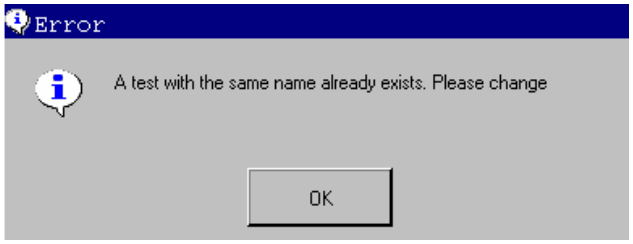


4.1.1.1 Basic Parameters

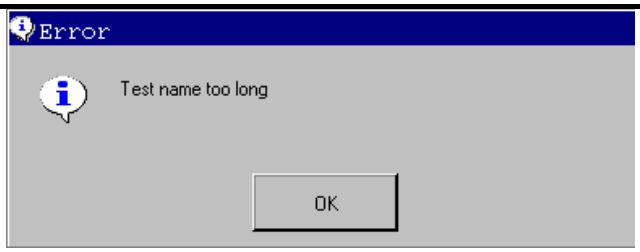
Figure 4-4 Basic Parameters area



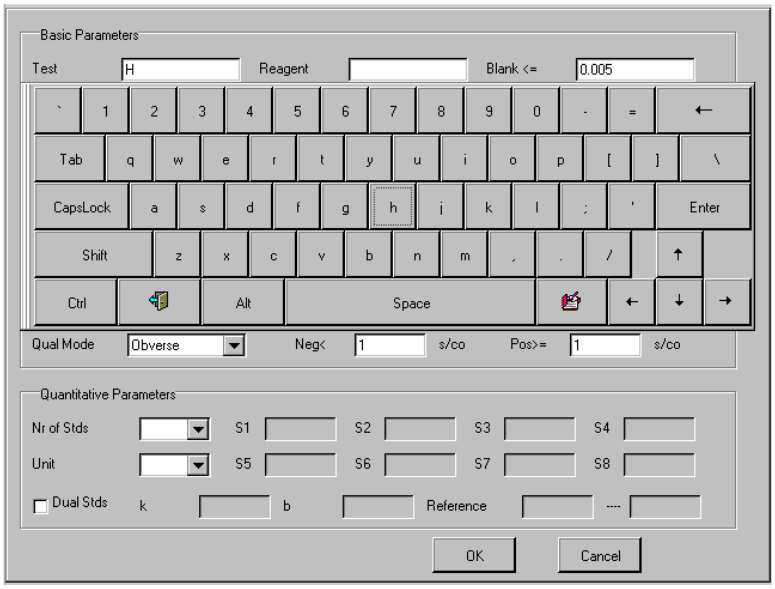
The following table explains the fields in the area.

Field	Description
Test	Enter name of the test. If an existing name is entered, the following dialog box pops up.  The test name has maximum of 20 characters. Otherwise the system prompts as follows.

Field	Description

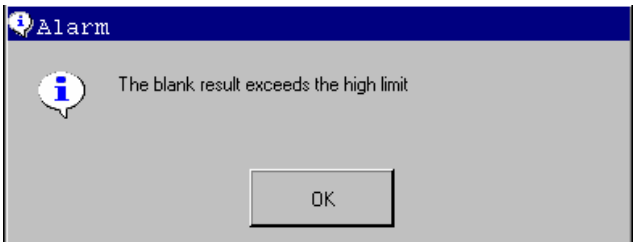


Click the edit box next to Test. The keypad pops up.



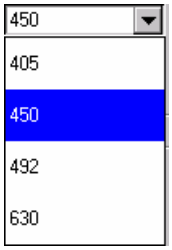
Reagent — Enter the reagent information like lot No., manufacturer, etc. This field can be left blank.

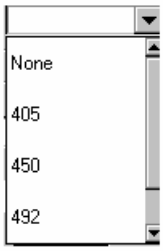
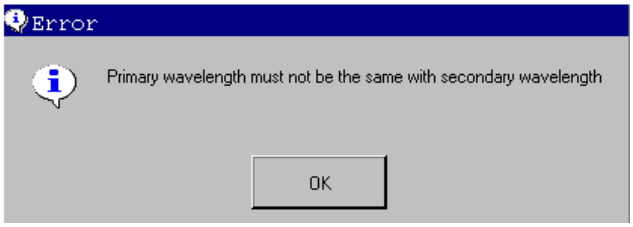
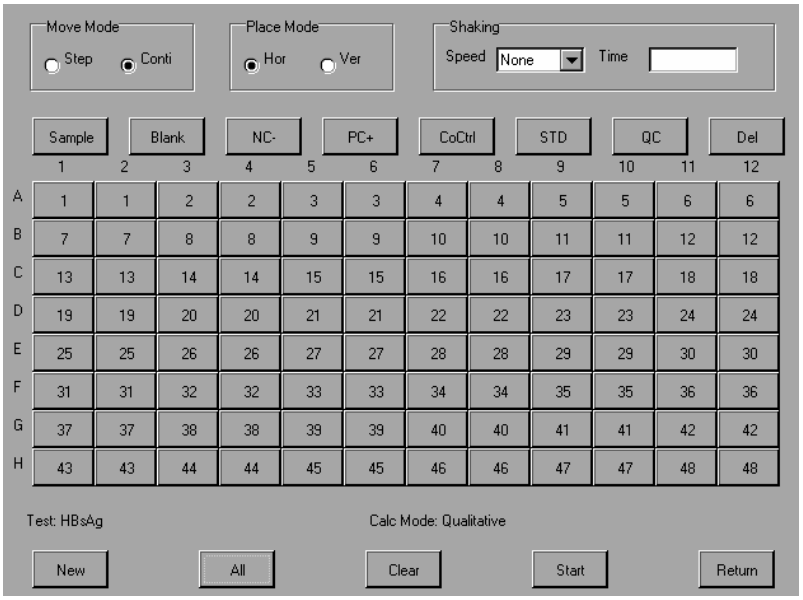
Blank — Enter the blank limit according to the reagent package insert. This field can be left void. If the blank result exceeds the limit, the following alarm message appears.

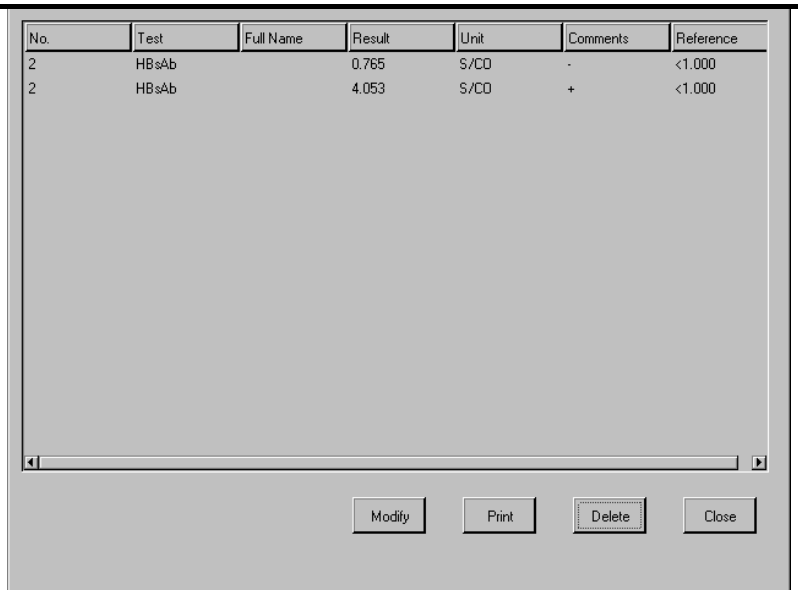


Full Name — Enter the full name of the test. This field can be left blank.

Pri Wave — Select a primary wavelength from the drop-down list box.



Field	Description
Sec Wave	Select a secondary wavelength from the drop-down list box. This field is not required.  You must not select same one for primary and secondary wavelength. Otherwise the follow error message appears. 
Dual Samples	When the ***Dual Samples*** check box is selected, the adjacent well of each sample will be set as a replicate with same sample ID. The sample ID can be edited.  The test with dual samples has two measuring results. See the figure below.

Field	Description
	

NOTE

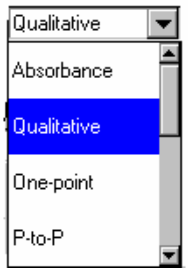
You can delete one of the results for printout if needed, or both results will be printed.

Calc Mode

There are three calculation modes, which are ***Absorbance***, ***Qualitative(Cut-off)*** and ***Quantitative***.

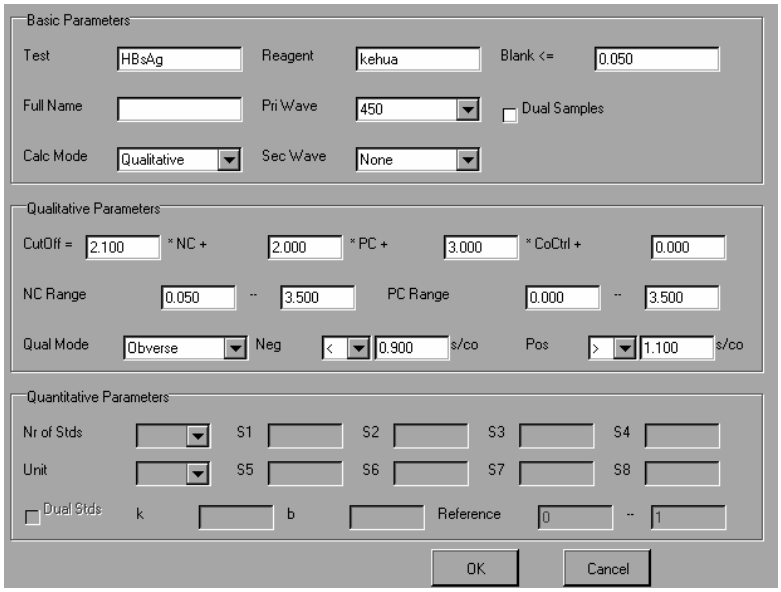
Quantitative mode includes: ***One-point***, ***Point-to-Point***, ***Multi-point%ABS***, ***Linear***, ***Exponential***, ***Logarithm***, ***Power*** and ***Factor***.

Select a calculation mode from the drop-down list box.



The following table explains the calculation modes one by one.

Calc Mode	Description
Absorbance	Samples are measured directly with absorbance calculated.

Calc Mode	Description
Qualitative	A C.O. value is calculated via the Cut-off formula. The qualitative mode judges whether the test result is negative or positive by comparing the sample absorbance with the C.O. value. Cut-Off Threshold Formula： $CutOff = X \times Neg.Control + Y \times Pos.Control + Z \times CutOffQC + Fac$ X, Y, Z and Fac are formula coefficient. Enter the values according to the reagent package insert. Other qualitative formula can also be converted to this one. For instance: If $SampleOD / NCOD \geq 2.1$ means positive, then $X = 2.1$, $Y = 0$, $Fac = 0$. Qualitative result is calculated by Sample absorbance/Cut-off, S/Co for short. If necessary, a grey area can be configured. If Negative<0.9S/Co and Positive≥1.1S/Co, then the results within 0.9-1.1 are considered doubtful and indicated by ±.  **NOTE** You can decide whether to set up a grey area as needed.

Calc Mode	Description
One-point	You should set one standard for one-point calibration. The calibration curve is formed by connecting the zero point and standard point. X-axis means concentration and Y-axis means absorbance. In one-point calibration, a blank point must be set to calibrate the 0 point.

NOTE

The concentration of standard must be greater than 0.

The k in $A = \mathrm{k} \times C$ can be obtained via the concentration of the standard and the measured absorbance. Therefore, the concentration(C_i) of samples can be calculated based on its absorbance(A_i) and factor k.

Point-to-Point

You should set 2 to 8 standards for point-to-point calibration. The calibration curve (ascending or descending) is formed by connecting all the standard points.

The slope, intercept and range of each line can be obtained by defining a line with two points.

For instance, there are three standards, which have concentration of C1, C2 and C3, and absorbance of A1, A2 and A3.Therefore two lines can be fit as follows:

Line $A = \mathrm{k}_1 C + \mathrm{b}_1$ is fit with (C1, A1) and (C2, A2), line $A' = \mathrm{k}_2 C + \mathrm{b}_2$ is fit with (C2, A2) and (C3, A3).

$$\mathrm{k}_1 = \frac{A_2 - A_1}{C_2 - C_1}, \qquad \mathrm{b}_1 = \frac{A_1 \times C_2 - A_2 \times C_1}{C_2 - C_1}$$

$$\mathrm{k}_2 = \frac{A_3 - A_2}{C_3 - C_2}, \qquad \mathrm{b}_2 = \frac{A_2 \times C_3 - A_3 \times C_2}{C_3 - C_2}$$

Up to 8 standards are allowed and will constitute a broken line consisting of 7 segments. Therefore, the slope and intercept of each line can be calculated.

NOTE

The standards must be arranged by concentration (from low to high).

If the test result is beyond the broken line, failed sample results will be indicated by "*", which means the result is out of calibration range.

Calc Mode	Description
Multi-point% ABS	You can set 2 to 8 standards with the greatest absorbance of 100%. The absorbance of other standards and samples are expressed in percentage (%). Multi-point calibration can be done in the same way as the point-to-point method. Suppose there are 3 standards. The third standard has the greatest absorbance A3(100%).The ratio between other standard absorbance and A3 is the Y-axis of calibration curve and concentration is the X-axis. The slope and intercept of the calibration curve can be calculated in the same way as the point-to-point method. **NOTE** The standards must be arranged by concentration (from low to high). If the test result is beyond the broken line, failed sample results will be indicated by "*", which means the result is out of calibration range.
Linear	You can set 2 to 8 standards, base on which a line $A = \mathrm{k}C + \mathrm{b}$ will be fit as the calibration curve. There are two calibration parameters k and b. Suppose Ci is the concentration of standard, Ai is the absorbance, and n is the number of standards. k and b can be obtained with the following equations: $$\mathrm{k} = \frac{\sum_{i=1}^{n} Ci\mathrm{A}i - (\sum_{i=1}^{n} Ci)(\sum_{i=1}^{n} \mathrm{A}i)/n}{\sum_{i=1}^{n} Ci^2 - (\sum_{i=1}^{n} Ci)^2/n}$$ $$b = (\sum_{i=1}^{n} \mathrm{A}i)/n - [\frac{\sum_{i=1}^{n} Ci\mathrm{A}i - (\sum_{i=1}^{n} Ci)(\sum_{i=1}^{n} \mathrm{A}i)/n}{\sum_{i=1}^{n} Ci^2 - (\sum_{i=1}^{n} Ci)^2/n}](\sum_{i=1}^{n} Ci)/n$$
Exponential	You can set 2 to 8 standards, base on which a line $A = \mathrm{k}e^{\mathrm{b}C}$ will be fit as the calibration curve. Concentration of standards is C1, C2…Ci, and absorbance of the standards is A1, A2…An. If the logarithm of A is calculated via $A' = L\mathrm{n}A$, then $A'_1, A'_2, \ldots A'_n$ can be used to replace Ai of linear regression. Therefore, exponential can be transformed into linear regression: $A' = \mathrm{k}'C + \mathrm{b}'$. **NOTE** The concentration of the standards must be greater than 0.

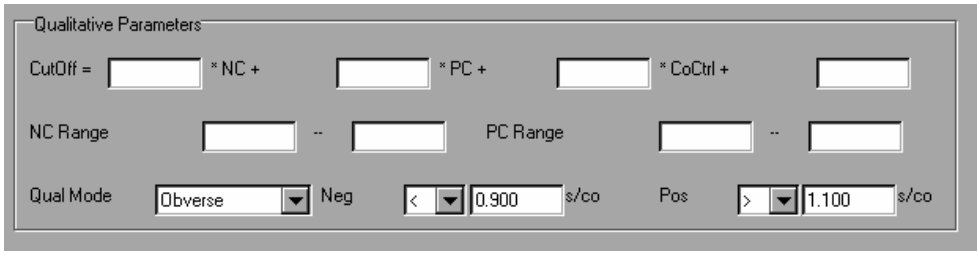
Calc Mode	Description
Logarithm	You can set 2 to 8 standards, base on which a line $A = \mathrm{k}LnC + \mathrm{b}$ will be fit as the calibration curve. Concentration of standards is C1, C2…Ci, and absorbance of the standards is A1, A2…An. If the logarithm of C is calculated with $C' = LnC$, then $C'_1, C'_2, \ldots C'_n$ can be used to replace Ci of linear regression. Therefore, logarithm can be transformed into linear regression: $A' = \mathrm{k}'C + \mathrm{b}'$. **NOTE** Concentration of the standards must be greater than 0.
Power	You can set 2 to 8 standards, base on which a line $A = \mathrm{k}C^{\mathrm{b}}$ will be fit as the calibration curve. The absorbance and concentration of each standard must be greater than 0. Concentration of standards is C1, C2…Ci, and absorbance of the standards is A1, A2…An. If the logarithm of C is calculated with $C' = LnC$ and logarithm of A is $A' = LnA$, then power can be transformed into linear regression: $A' = \mathrm{k}'C' + \mathrm{b}'$. **NOTE** The absorbance and concentration of each standard must be greater than 0.
Factor	Formula: $A = \mathrm{k}C + \mathrm{b}$. The k and b are entered by user. **NOTE** k must not be 0.
Logistic-Log4P	There should be at least 4 levels of calibrators. The concentration of the first level calibrator should be 0. The concentrations are aligned from the lowest to the highest. Calibration formula: $R = R_0 + K\dfrac{1}{1+\exp[-(a+b\ln C)]}$ If the absorbance of the sample is lower than the calibrator absorbance, no result will be calculated and “R! and *” will appear in the result area.

Calc Mode	Description
Spline	Calibration formula： $R = R_{0i} + a_i(C - C_i) + b_i(C - C_i)^2 + c_i(C - C_i)^3$ There should be 2-6 levels of calibrators. The concentration of the first level calibrator should be 0. The concentrations are aligned from the lowest to the highest. If the absorbance of the sample is lower than the calibrator absorbance, no result will be calculated and “R! and *” will appear in the result area; if the absorbance of the sample is higher than the calibrator absorbance, result will be calculated and flagged with “R!”.

4.1.1.2 Qualitative Parameters

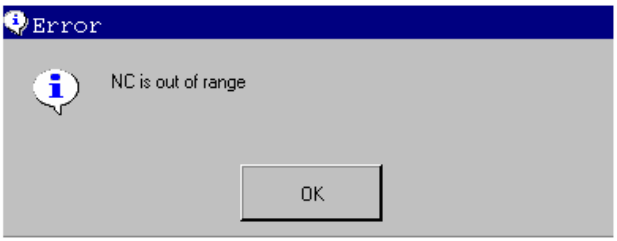
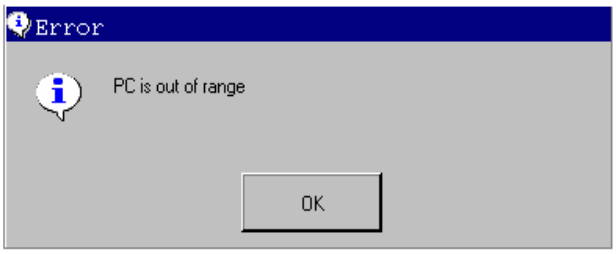
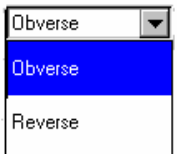
When selecting ***Qualitative*** in the ***Calc Mode*** field, you must set up the qualitative parameters as shown in the figure below.

Figure 4-5 Qualitative Parameters area



The following table explains the fields in the area.

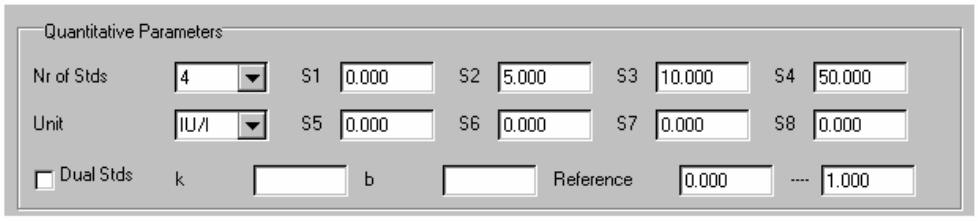
Field	Description
Cut-off	You should enter the three factors according to the reagent package insert. **NOTE** The Cut-off formula may vary slightly with different reagent manufacturers, but all such formulas can be transformed into the one as shown in Figure 4-5. For instance, the manual of a Hepatitis B Surface Antigen kit indicates, if $SampleOD/NCOD > 2.1$, then it is positive, otherwise it is negative. The formula can also transformed into the Cut-off form: $Cut\text{-}off = 2.1 \times NC * OD + 0 \times PC * OD + 0$. Where, the three factors are 2.1, 0 and 0.
NC Range and PC	Enter the reference ranges according to the reagent package insert. The two ranges are not required.

Field	Description
Range	For the tests of obverse qualitative mode, if the NC absorbance is lower than the low limit, the low limit should be used for calculation. If the NC absorbance exceeds the low limit, it should be used as it actually is. If the NC absorbance exceeds the high limit, an alarm message appears as follows. If the PC absorbance is lower than the low limit, an alarm message appears as follows. If the PC absorbance exceeds the low limit, it should be used as it actually is. If the PC absorbance exceeds the high limit, the high limit should be used instead of the actual absorbance. For the tests of reverse qualitative mode, if the NC absorbance is lower than the low limit, an alarm message appears as follows. If the NC absorbance exceeds the low limit, it should be used as it actually is. If the NC absorbance exceeds the high limit, the high limit should be used instead of the actual absorbance. If the PC absorbance is lower than the low limit, the low limit should be used for calculation. If the PC absorbance exceeds the low limit, it should be used as it actually is. If the PC absorbance exceeds the high limit, an alarm message appears as follows.   For example, the manual of a Hepatitis B Surface Antigen kit states, NC OD should be used as 0.05 if less than 0.05 and as the actual value if greater than 0.05. Then the low limit for NC should be set to 0.05.
Qual Mode	Select ***Obverse*** or ***Reverse*** according to the reagent package insert. 

Field	Description
NC and PC	In Obverse mode, if Negative<Negative Cut-off and Positive ≥ Positive Cut-off, then the interval between the two Cut-off values is a grey area, in which the results obtained are doubtful. In Reverse mode, if Negative⩾Negative Cut-off and Positive < Positive Cut-off, then the interval between the two Cut-off values is a grey area, in which the results obtained are doubtful. If a wrong S/Co is entered, the following message pops up. 

4.1.1.3 Quantitative Parameters

Figure 4-6 Quantitative Parameters area



NOTE

Enter the parameters according to reagent package insert. The concentration (S1-S8) you entered must be consistent with the number of standards.

When the number and concentration of standards are changed, the corresponding calibration parameters and curve of the test will be deleted. The test must be calibrated again.

The following table explains the fields in the area.

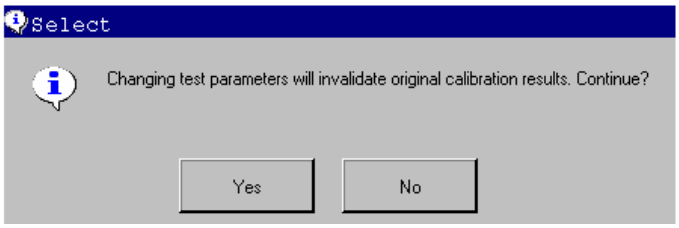
Field	Description
Nr of Stds	Enter the number of standards (maximum of 8).Enter the concentration in the edit boxes (S1-S8) next to Nr of Stds. Please note that the number of standards must be consistent with the selected calculation mode. See 4.1.1.1Basic Parameters. Wrong entry may trigger the following error message. 
Unit	Select concentration unit from the drop-down list box. This field is required. If no unit is selected, the following message will appear.(You should first set concentration units on the System Setup screen. See 4.5 System Setup） 
Dual Stds	When Dual Standards is selected, the adjacent well of each standard will be set as a replicate with same number, which can be edited. Un selection means single standard.
k and b	For the Factor calculation mode, you should enter k and b in the edit boxes next to k and b. For other calculation modes, these two fields are disabled.

NOTE

k must not be 0.

When you finish the settings, click ***OK*** to save the settings and return to the previous screen. Or click ***Cancel*** to abort the settings.

When quantitative parameters are changed, the following message appears (Changing k and/or b is another case).Select ***Yes*** to save the changes. All calibration parameters and curves of the test are deleted, and another calibration is required. Select ***No*** to abort the changes.



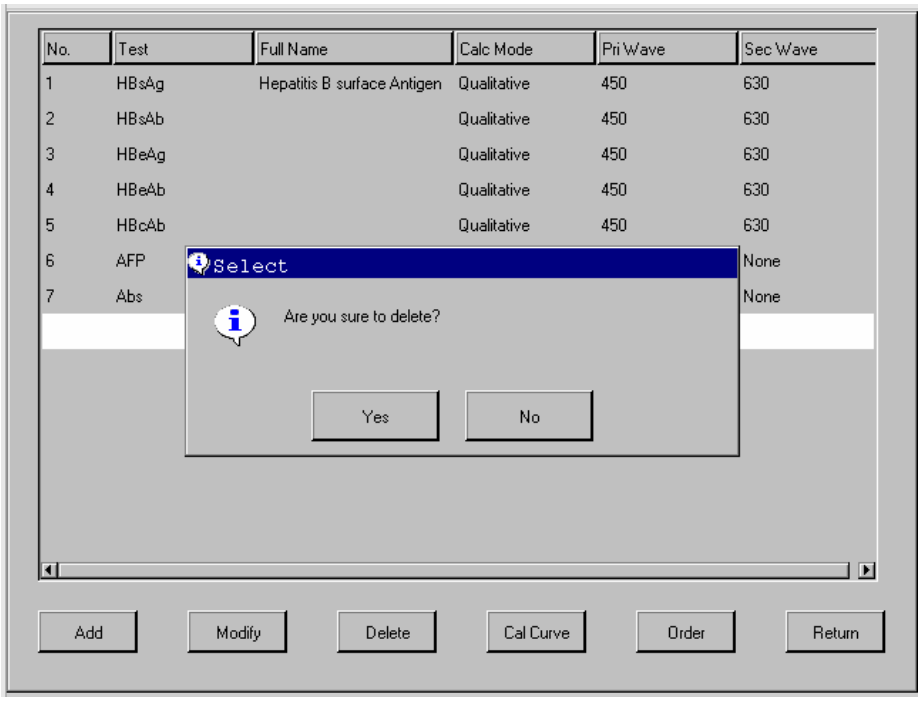
4.1.2 Modifying Parameter Settings

To change parameter settings of the selected test, see 4.1.1.1 ***Basic Parameters.***

4.1.3 Deleting a Test

Select a test and click ***Delete***. All information about the test is deleted, except for the test results, which can be recalled.

Figure 4-7 Deleting Test dialog box

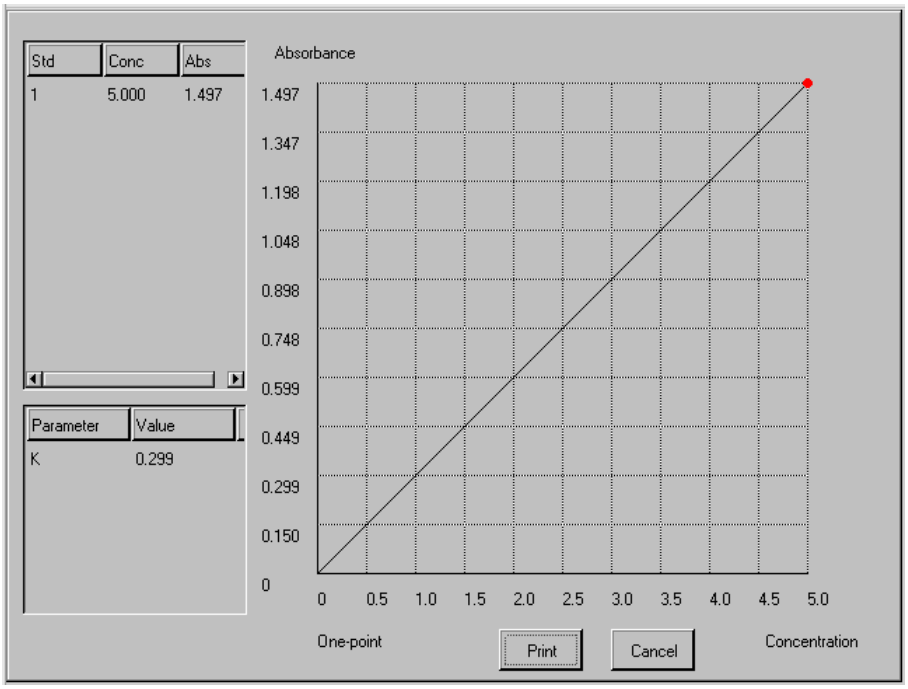


4.1.4 Viewing Calibration Curve

Standard results and curve for quantitative tests are saved automatically and can be review as you need.

On the Test Setup screen, select a test and click ***Cal Curve***. The calibration curve screen is displayed. You can view the absorbance for each standard concentration and corresponding calibration curve.

Figure 4-8 Calibration Curve screen

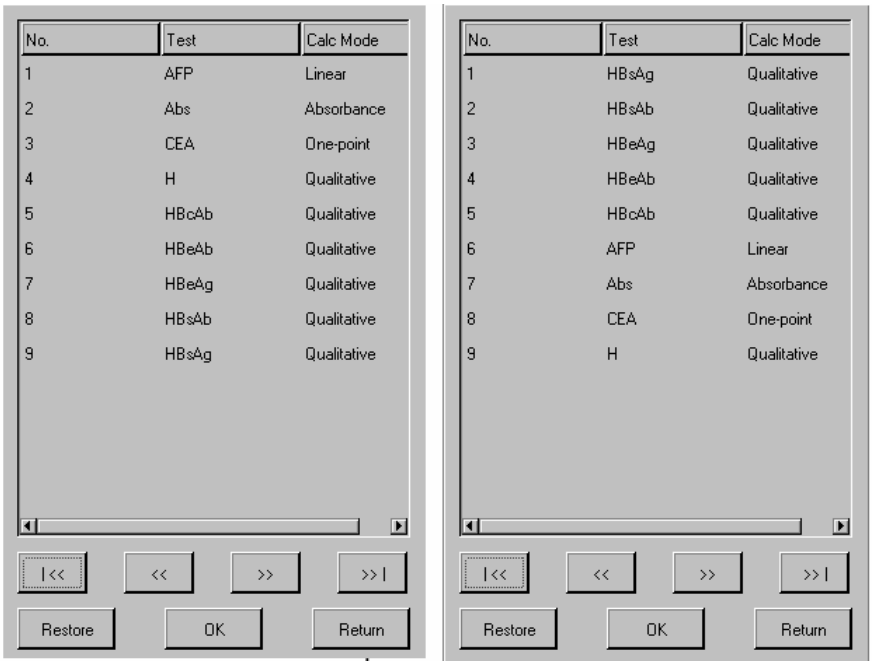


To print out the calibration curve, select ***Print*** in the bottom of the screen. Select ***Cancel*** to return to the previous screen.

4.1.5 Setting up Printing Order

Select ***Order*** on the test setup screen, the order setup screen is displayed. You can rearrange the tests in an order, in which the tests will be printed on patient reports.

Figure 4-9 Order Setup screen



- Select |<< to move the selected test to the first position.
- Select << to move the selected test to the previous position.
- Select >> to move the selected test to the next position.
- Select >>| to move the selected test to the last position.
- Select ***Restore*** to cancel the latest settings.
- Select ***OK*** to save the settings and return to the Test Setup screen.
- Select ***Return*** to abort the settings and return to the Test Setup screen.

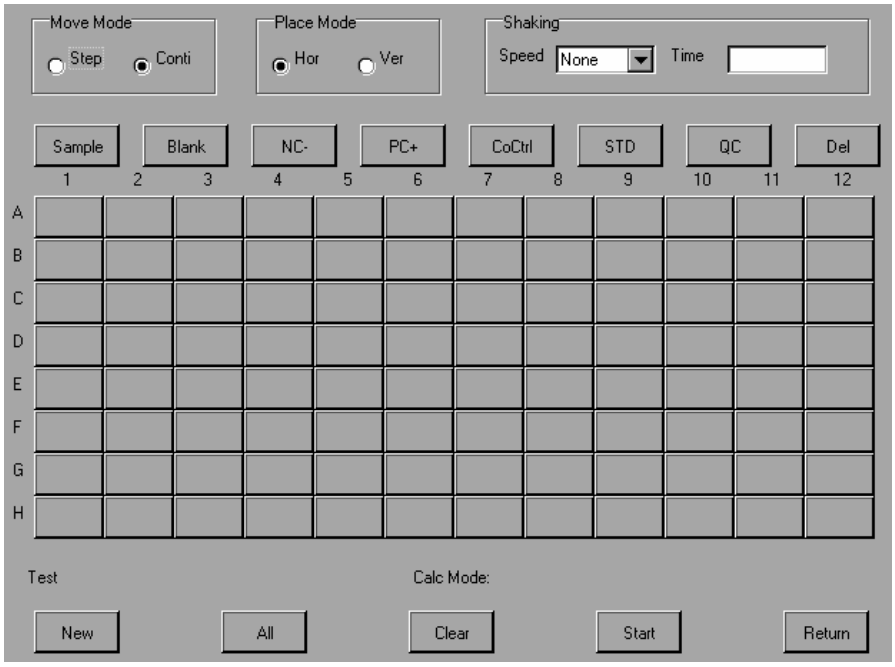
NOTE

Some test profiles like Hepatitis B(5 tests) should be arranged properly. See Figure 4-9. Otherwise the tests will distribute randomly on printout.

4.2 Run

Select ***Run*** on the main screen. The following screen is displayed.

Figure 4-10 Running Setup screen



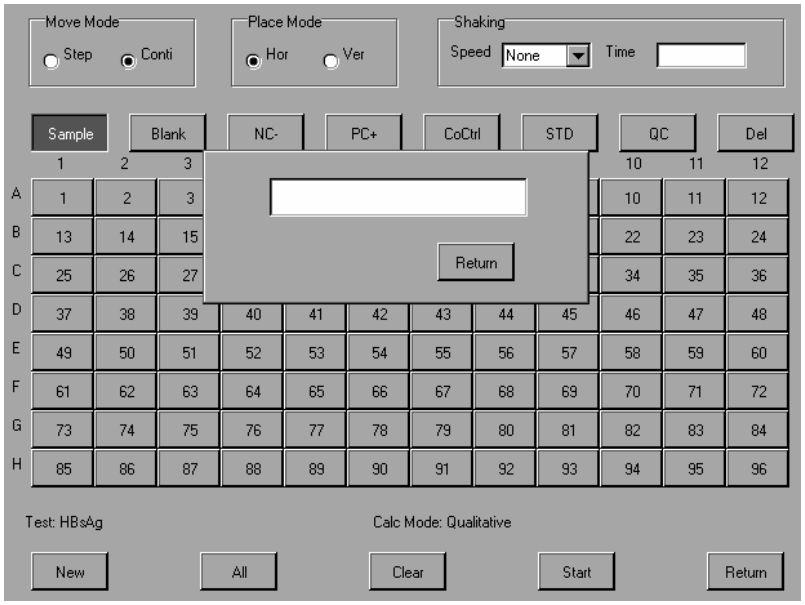
The following table explains the fields on the screen.

Field	Description
Move Mode	It refers to the mode of plate movement. There are two options available: ***Step*** and ***Conti*** (Continuous). ***Step***: Higher precision of measurement can be achieved with Step mode. ***Conti***: Measurement speed can be accelerated with Continuous mode.

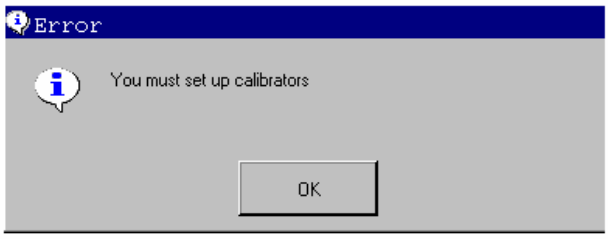
Field	Description
Place Mode	It refers to the mode of plate placement. There are two options available: ***Hor*** (Horizontal) and ***Ver*** (Vertical).
Shaking	In this area you can set the speed and time of shaking. The options provided for speed are: ***Void***, ***Low***, ***Med***(Medium) and ***High***. ***Void*** means no shaking. The shaking time should be within 0-60. 0 means no shaking.
Test	Name of the test.
Calc Mode	Calculation method for the test.

The following table introduces the buttons on the screen.

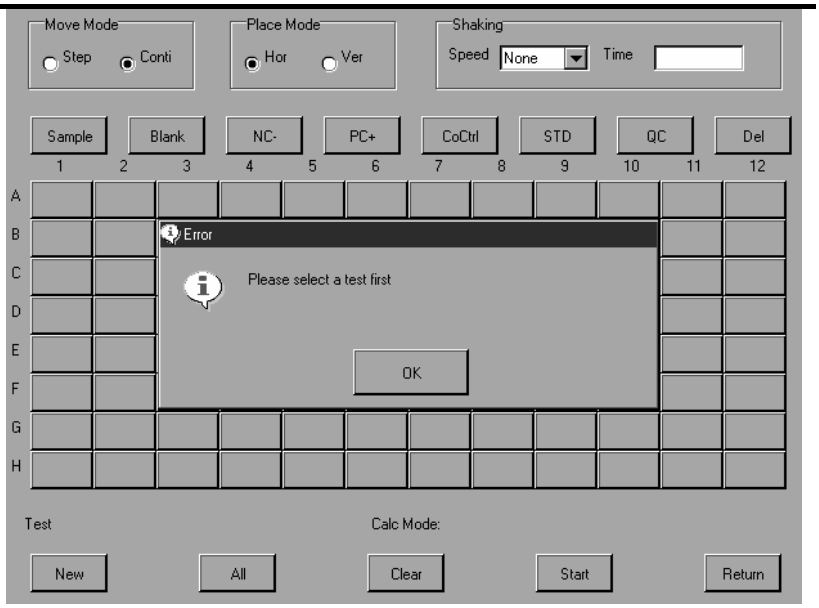
Button	Function
Sample	Select any well that you want run sample, sample ID (1-999) will be assigned from 1 to the well. To change the sample ID, click the well again. Enter the sample ID in the popup edit box. If a sample with same ID already exists, you will be prompted by a message.



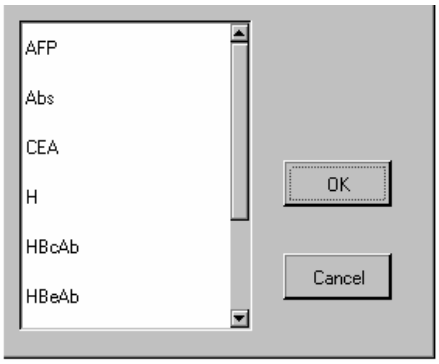
Button	Function
Blank	Blank is used to zero the absorbance of a test and should be subtracted from the absorbance of other wells during measurement. However, blank is not required for all tests and can be run when needed. Blank results for each test are saved automatically and will be used for following calculations of same test if new blank is not run. N (N≤96) blank wells are allowed for each test on one plate. The system will average the blank results and save the mean value as the only blank result of the test.  **NOTE** If a blank is set on each plate, its absorbance will be subtracted from that of other wells on the plate. If no blank is set, the previous blank result will be recalled for absorbance calculation. Different tests should have different blanks.
NC- （Negative Control）	It is only valid to tests of Cut-Off calculation method. The No. of negative control can be repeated. Multiple negative controls are allowed and the system will average these negative controls to yield a result which will be eventually saved. If coefficient is set in front of the NC- in the calibration parameter Cut-Off formula, negative control should be set when running the test for the first time. Proceeding tests can adopt the previous result or new negative control can be set.
PC+ （ Positive Control）	It is only valid to tests of Cut-Off calculation method. The No. of positive control can be repeated. Multiple positive controls are allowed and the system will average these negative controls to yield a result which will be eventually saved. If coefficient is set in front of the PC+ in the calibration parameter Cut-Off formula, positive control should be set when running the test for the first time. Proceeding tests can adopt the previous result or new positive control can be set.
Co.Ctrl	It is only valid to tests of Cut-Off calculation method. The No. of positive control can be repeated. Multiple Co.Ctrls are allowed and the system will average these Co.Ctrls to yield a result which will be eventually saved. If coefficient is set in front of the Cut-Off QCs in the calibration parameter Cut-Off formula, Co.Ctrl should be set when running the test for the first time. Proceeding tests can adopt the previous result or new Co.Ctrl can be set.

Button	Function
STD	A standard must be configured for the quantitative tests that are run for the first time. If the tests have already been calibrated, no standard is required, or all standards should be configured again if one standard is changed. Program standards according to the standard parameters on the Test Setup screen. Only setting partial standards is not allowed. Select the wells that you want to run standards. The wells will be numbered S1, S2, S3….When all standards for a test are configured, the system will prompt ” Number of standards exceeds the limit” if another standard is set. If you start measurement or create new test when standard settings are not finished, the following message (lower) will appear.  
QC	Before programming QC, you must set up QC parameters on the QC screen. Otherwise the following message pops up.  Number of controls is not limited. The system averages all QC results and saves the mean value as the final result. Only the last QC result is saved for a test each day.
Del	Click this button and click desired well to delete its programmed information.
New	Before programming a plate, you must select ***New*** to select an existing test. Otherwise the following message will be triggered.

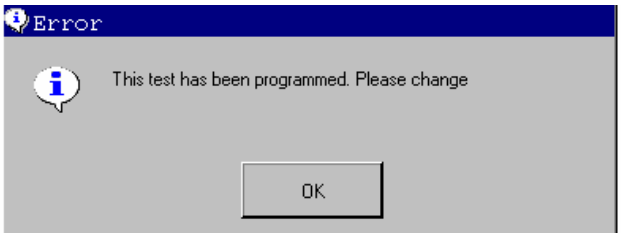
Button	Function



Select a test from the list, then select ***OK***.

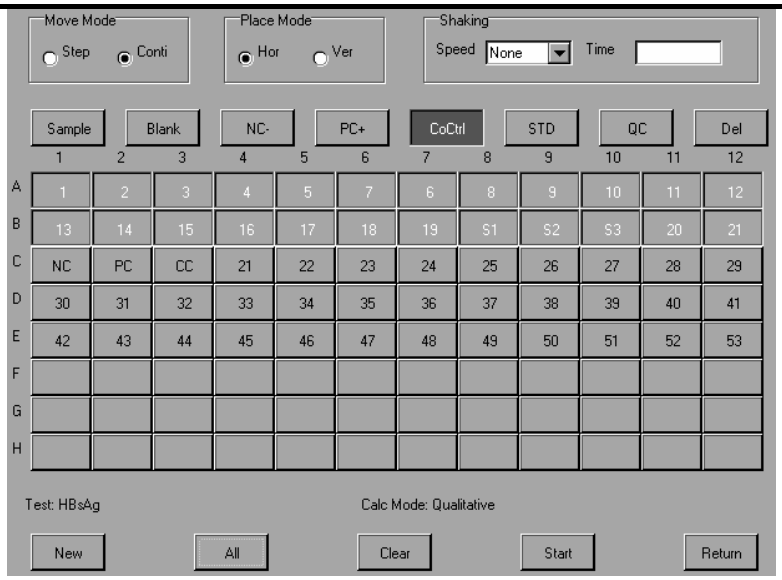


Each test can only be programmed once on a plate; otherwise the following message appears.

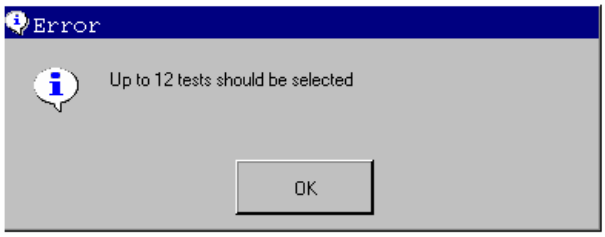


After programming a test, select ***New***. The programmed wells appear grey and cannot be edited.

Button	Function



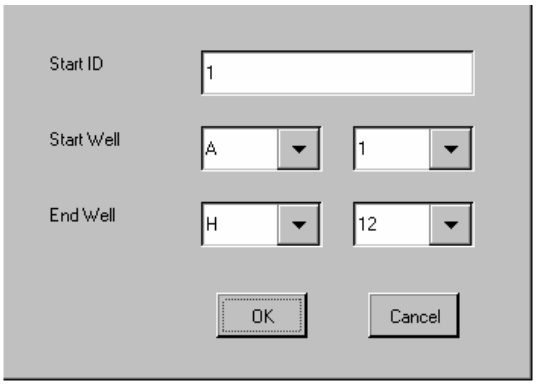
Each test must be programmed once on a plate, and up to 12 tests are allowed for each plate. When the 13th test is configured, the following message appears.



All

Select ***All***. The following dialog box is displayed.

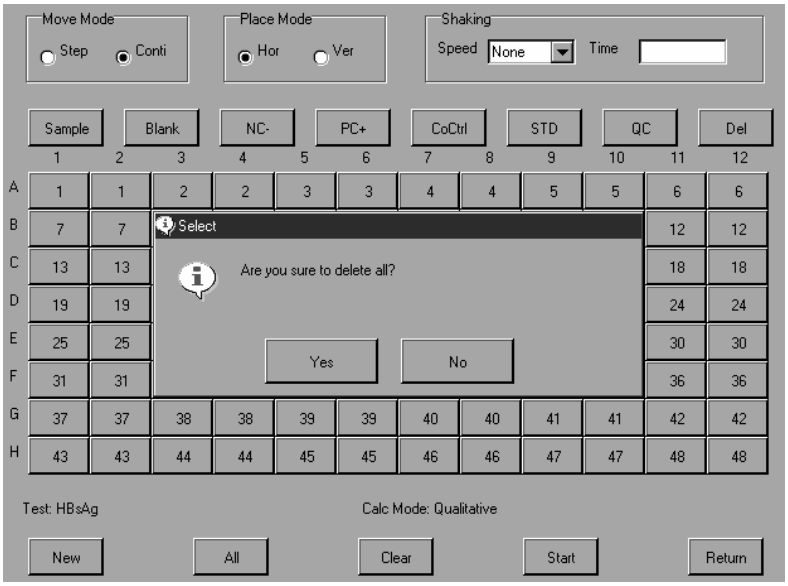
You can number the samples in an area of the plate. The start sample ID is 1 by default. The start well is A1 and end well is H12.



If ***Dual Samples*** is selected for a test, two adjacent wells in horizontal or vertical direction will be numbered identically. You can also change the generated numbers as needed.

Each patient sample must have a unique ID during a day. On the printout of test results, each patient should have one sample ID for all tests.

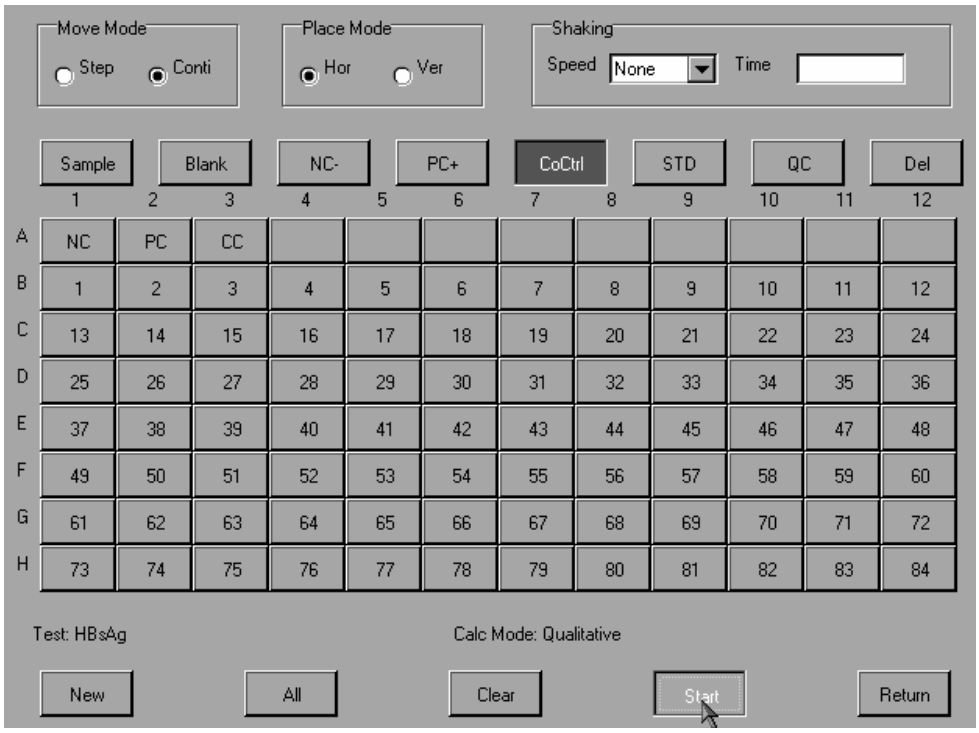
Button	Function
	NOTE The system gathers all test results of each sample ID on the current day. While programming, please ensure each sample ID corresponds to the patient.
	You can change the wells that have been programmed.
Clear	Click this button to delete all programmed information of the wells on the plate.



Start	Click this button to start running all tests on the plate.
Return	Click this button to return to the main screen.

4.2.1 Starting Analysis

Figure 4-11 Starting Analysis screen



After programming, select ***Start*** to start measuring the current plate. The test results will be displayed on each well.

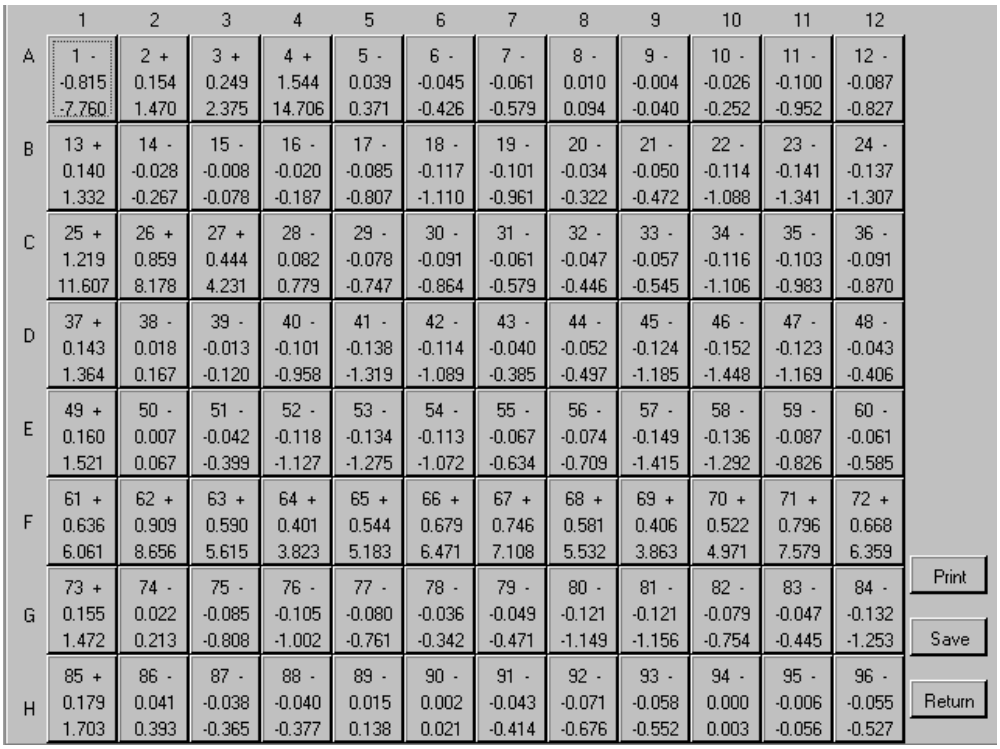
NOTE

When a test is finished, click Return to return to the Running Setup screen. To rerun a test, select ***Clear*** and then click ***New*** to select a new test. Otherwise the following test is run using the settings of previous test.

4.2.2 Result Display

When all tests on a plate are finished, the results are displayed on each well as follows.

Figure 4-12 Test Results screen

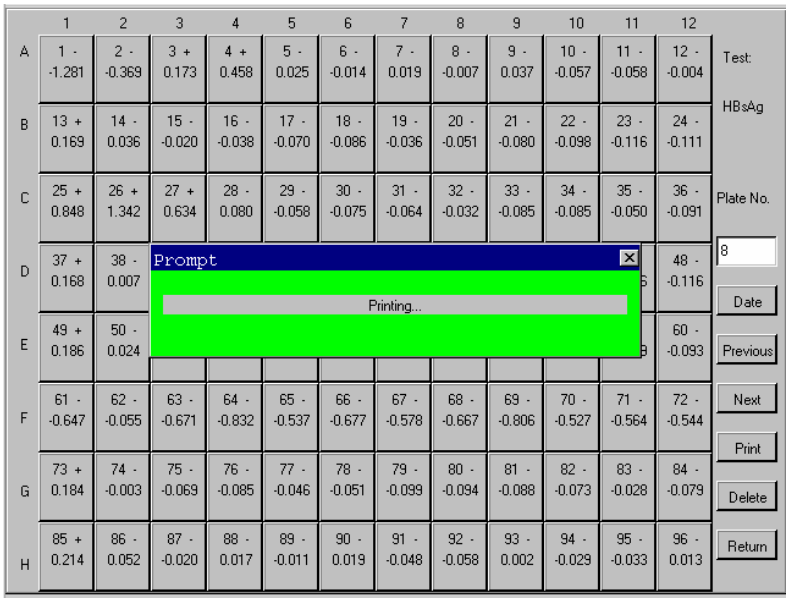


NOTE

If the concentration of a well cannot be calculated, no result is displayed and the well is indicated by "*".

The following table introduces the buttons on the screen.

Button	Function
Print	Click this button to print all test data on the current plate.

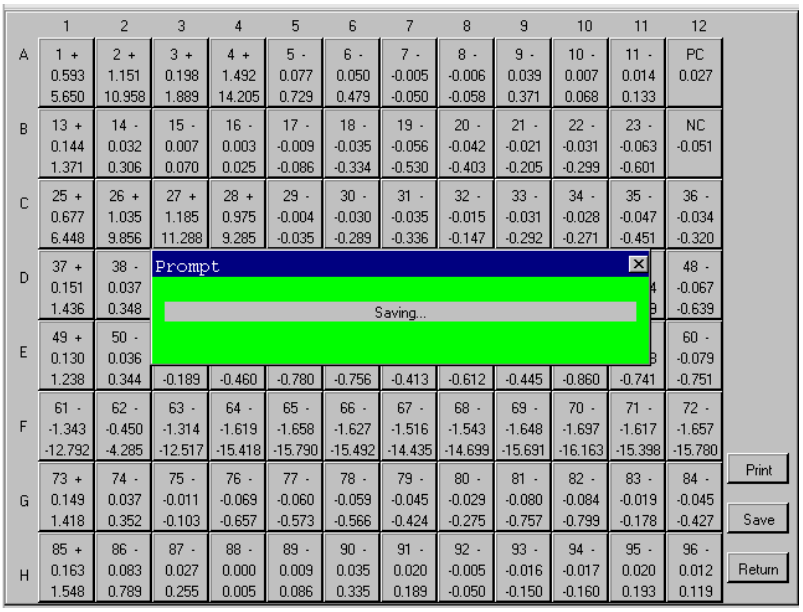


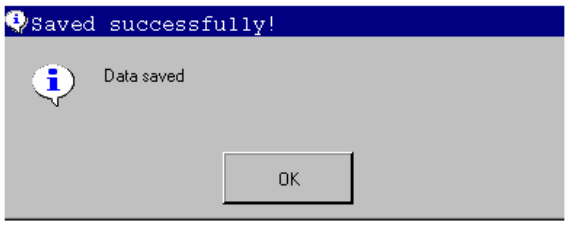
Button	Function

NOTE

The print format differs slightly between the internal recorder and the external printer. Both formats will display the well No., absorbance, qualitative or quantitative result. The printer format for the internal recorder will not display the sample ID. Please pay much attention to the correspondence between well No. and sample ID.

Save — Click this button to save the test data of current plate.





NOTE

If you return to the previous screen without selecting ***Save***, the test results will not be stored and available for inquiry.

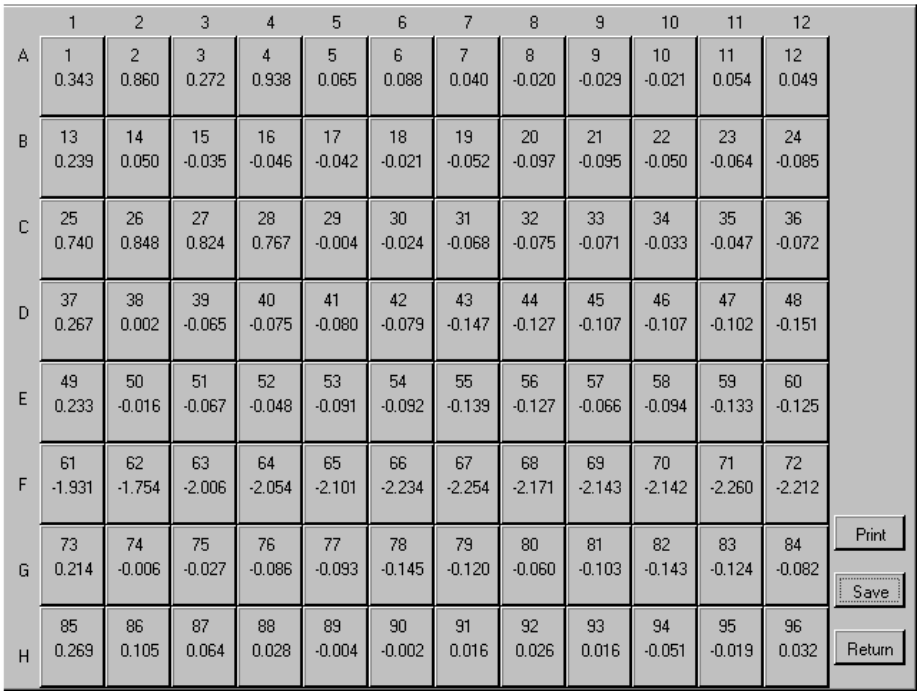
If the database capacity is exceeded, the system will remind you to delete the earliest records using ***Delete History*** on the System Setup screen.

Return — Click this button to return to the Starting Analysis screen.

Results in Absorbance Mode

When all tests on a plate are finished, the sample ID and absorbance value of each well are displayed. On each well, the upper number is sample ID and the lower number is absorbance value. Empty wells will display nothing.

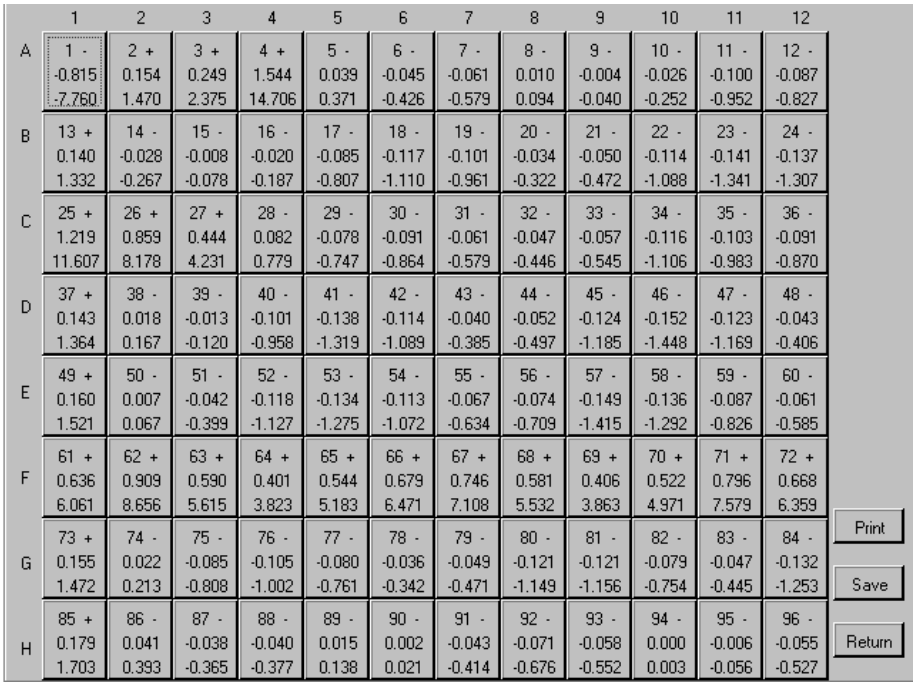
Figure 4-13 Absorbance Results



Results in Qualitative Mode

In qualitative mode, the test results are displayed on each well, with upper line of sample ID and qualitative result “+”/”-”, middle line of absorbance value and lower line of S/Co value. Empty wells will display nothing. The blank or NC/PC wells have no S/Co or qualitative results.

Figure 4-14 Qualitative Test Results



	1	2	3	4	5	6	7	8	9	10	11	12
A	1 - -0.815 -7.760	2 + 0.154 1.470	3 + 0.249 2.375	4 + 1.544 14.706	5 - 0.039 0.371	6 - -0.045 -0.426	7 - -0.061 -0.579	8 - 0.010 0.094	9 - -0.004 -0.040	10 - -0.026 -0.252	11 - -0.100 -0.952	12 - -0.087 -0.827
B	13 + 0.140 1.332	14 - -0.028 -0.267	15 - -0.008 -0.078	16 - -0.020 -0.187	17 - -0.085 -0.807	18 - -0.117 -1.110	19 - -0.101 -0.961	20 - -0.034 -0.322	21 - -0.050 -0.472	22 - -0.114 -1.088	23 - -0.141 -1.341	24 - -0.137 -1.307
C	25 + 1.219 11.607	26 + 0.859 8.178	27 + 0.444 4.231	28 - 0.082 0.779	29 - -0.078 -0.747	30 - -0.091 -0.864	31 - -0.061 -0.579	32 - -0.047 -0.446	33 - -0.057 -0.545	34 - -0.116 -1.106	35 - -0.103 -0.983	36 - -0.091 -0.870
D	37 + 0.143 1.364	38 - 0.018 0.167	39 - -0.013 -0.120	40 - -0.101 -0.958	41 - -0.138 -1.319	42 - -0.114 -1.089	43 - -0.040 -0.385	44 - -0.052 -0.497	45 - -0.124 -1.185	46 - -0.152 -1.448	47 - -0.123 -1.169	48 - -0.043 -0.406
E	49 + 0.160 1.521	50 - 0.007 0.067	51 - -0.042 -0.399	52 - -0.118 -1.127	53 - -0.134 -1.275	54 - -0.113 -1.072	55 - -0.067 -0.634	56 - -0.074 -0.709	57 - -0.149 -1.415	58 - -0.136 -1.292	59 - -0.087 -0.826	60 - -0.061 -0.585
F	61 + 0.636 6.061	62 + 0.909 8.656	63 + 0.590 5.615	64 + 0.401 3.823	65 + 0.544 5.183	66 + 0.679 6.471	67 + 0.746 7.108	68 + 0.581 5.532	69 + 0.406 3.863	70 + 0.522 4.971	71 + 0.796 7.579	72 + 0.668 6.359
G	73 + 0.155 1.472	74 - 0.022 0.213	75 - -0.085 -0.808	76 - -0.105 -1.002	77 - -0.080 -0.761	78 - -0.036 -0.342	79 - -0.049 -0.471	80 - -0.121 -1.149	81 - -0.121 -1.156	82 - -0.079 -0.754	83 - -0.047 -0.445	84 - -0.132 -1.253
H	85 + 0.179 1.703	86 - 0.041 0.393	87 - -0.038 -0.365	88 - -0.040 -0.377	89 - 0.015 0.138	90 - 0.002 0.021	91 - -0.043 -0.414	92 - -0.071 -0.676	93 - -0.058 -0.552	94 - 0.000 0.003	95 - -0.006 -0.056	96 - -0.055 -0.527

Print

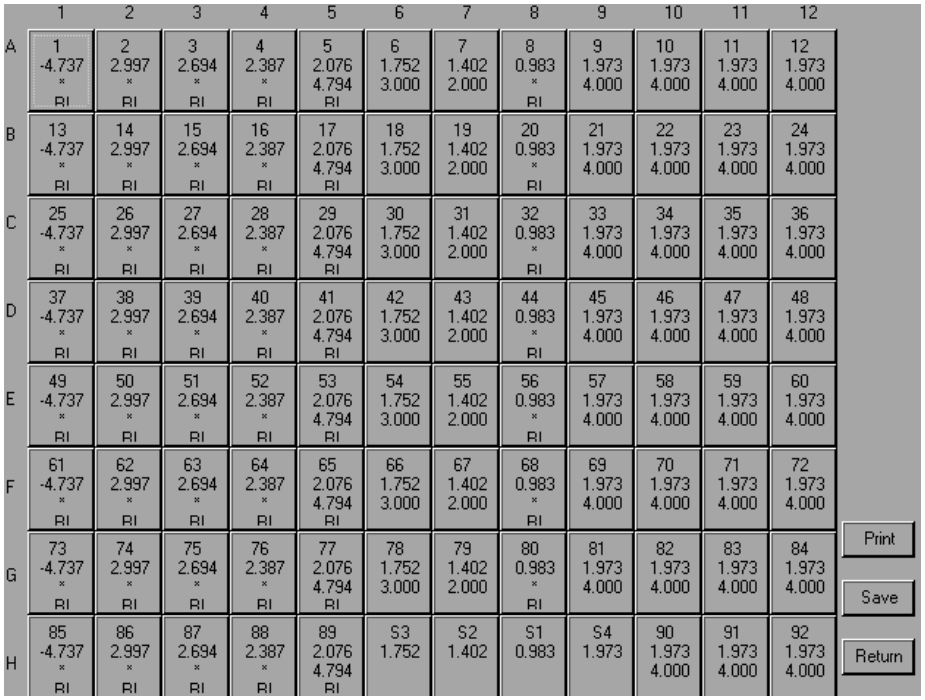
Save

Return

Results in Quantitative Mode

In quantitative mode, the test results are displayed on each well, with upper line of sample ID, middle line of absorbance and lower line of concentration. If the concentration of a well cannot be calculated, an asterisk "*" appears. Empty wells will display nothing. For the standard and blank wells, only absorbance value is displayed without quantitative result.

Figure 4-15 Quantitative Test Results



	1	2	3	4	5	6	7	8	9	10	11	12
A	1 -4.737 * BI	2 2.997 * BI	3 2.694 * BI	4 2.387 * BI	5 2.076 4.794 BI	6 1.752 3.000	7 1.402 2.000	8 0.983 * BI	9 1.973 4.000	10 1.973 4.000	11 1.973 4.000	12 1.973 4.000
B	13 -4.737 * BI	14 2.997 * BI	15 2.694 * BI	16 2.387 * BI	17 2.076 4.794 BI	18 1.752 3.000	19 1.402 2.000	20 0.983 * BI	21 1.973 4.000	22 1.973 4.000	23 1.973 4.000	24 1.973 4.000
C	25 -4.737 * BI	26 2.997 * BI	27 2.694 * BI	28 2.387 * BI	29 2.076 4.794 BI	30 1.752 3.000	31 1.402 2.000	32 0.983 * BI	33 1.973 4.000	34 1.973 4.000	35 1.973 4.000	36 1.973 4.000
D	37 -4.737 * BI	38 2.997 * BI	39 2.694 * BI	40 2.387 * BI	41 2.076 4.794 BI	42 1.752 3.000	43 1.402 2.000	44 0.983 * BI	45 1.973 4.000	46 1.973 4.000	47 1.973 4.000	48 1.973 4.000
E	49 -4.737 * BI	50 2.997 * BI	51 2.694 * BI	52 2.387 * BI	53 2.076 4.794 BI	54 1.752 3.000	55 1.402 2.000	56 0.983 * BI	57 1.973 4.000	58 1.973 4.000	59 1.973 4.000	60 1.973 4.000
F	61 -4.737 * BI	62 2.997 * BI	63 2.694 * BI	64 2.387 * BI	65 2.076 4.794 BI	66 1.752 3.000	67 1.402 2.000	68 0.983 * BI	69 1.973 4.000	70 1.973 4.000	71 1.973 4.000	72 1.973 4.000
G	73 -4.737 * BI	74 2.997 * BI	75 2.694 * BI	76 2.387 * BI	77 2.076 4.794 BI	78 1.752 3.000	79 1.402 2.000	80 0.983 * BI	81 1.973 4.000	82 1.973 4.000	83 1.973 4.000	84 1.973 4.000
H	85 -4.737 * BI	86 2.997 * BI	87 2.694 * BI	88 2.387 * BI	89 2.076 4.794 BI	S3 1.752	S2 1.402	S1 0.983	S4 1.973	90 1.973 4.000	91 1.973 4.000	92 1.973 4.000

Print

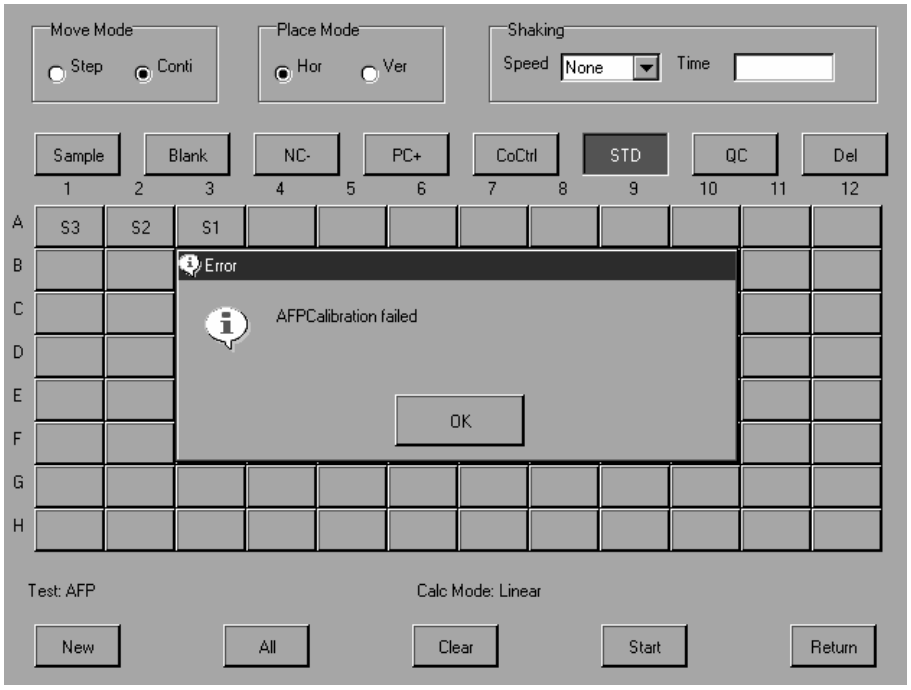
Save

Return

Results in Calibration Mode

For the standard wells, only absorbance value is displayed without concentration. If the calibration curve cannot be produced according to the calibration parameters and absorbance you've configured, the system will alert you to run a calibration again.

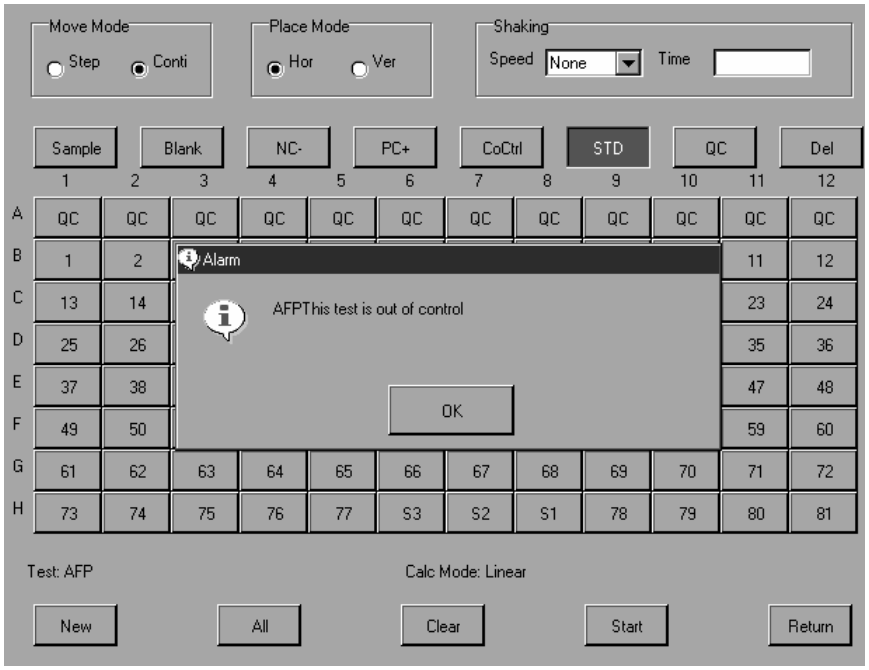
Figure 4-16 Calibration Results



Results in Quality Control (QC) Mode

In QC mode, the wells for quality control display the absorbance value, the wells for qualitative tests display the S/Co value, and the wells for quantitative tests display the concentration. If the QC result is beyond the calibration curve range or out of control, the system will trigger an error message as follows.

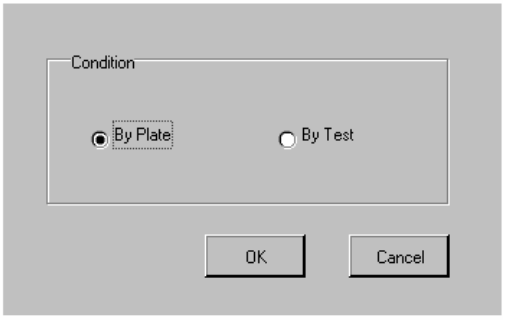
Figure 4-17 QC Results (out of control)



4.3 Result Review

The MR-96A provides two modes for result query: by plate and by test.

Figure 4-18 Select Query Mode



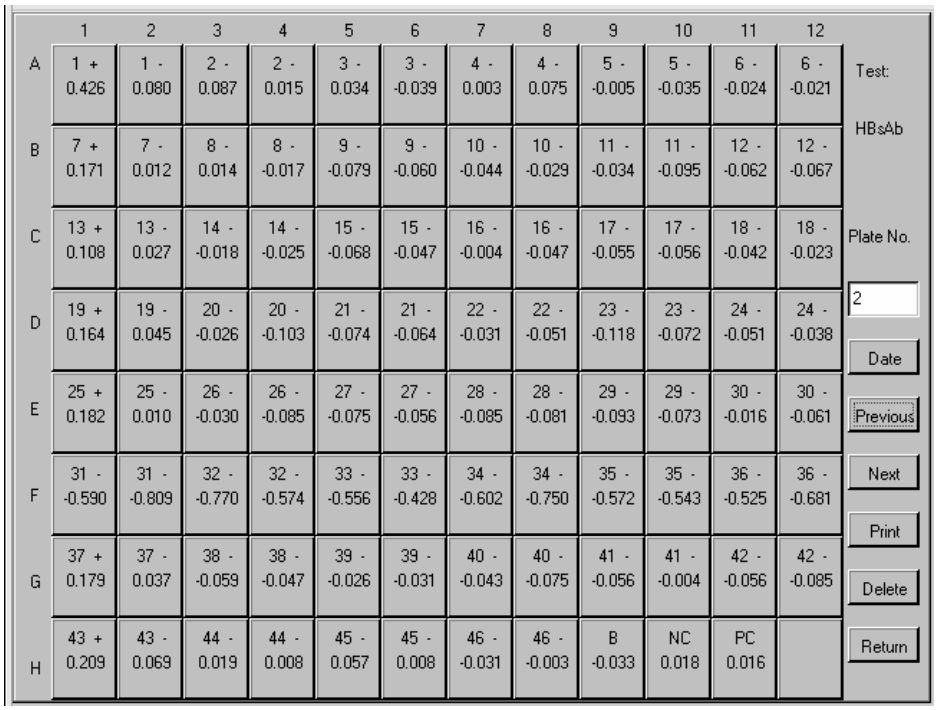
Query by Plate

Select the date and enter the desired plate No. The screen displays as follows.

NOTE

The results displayed on the plate are obtained from the latest measurement of the current day.

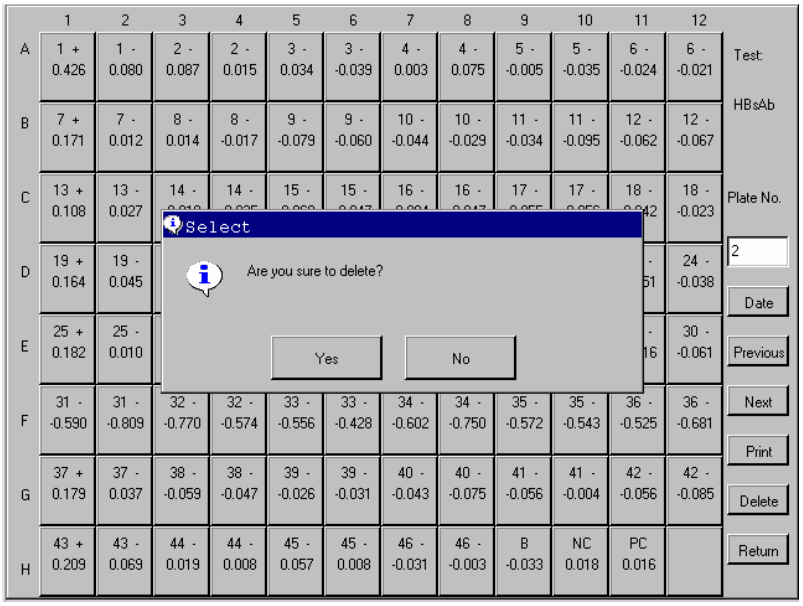
Figure 4-19 Query by Plate



The following table introduces the buttons on the screen.

Button	Function
Date	Select the date to search for desired test results.
Previous	Select to view the test results of the previous plate.
Next	Select to view the test results of the next plate.
Print	Click this button to print all test data on the current plate.

Button	Function
Deleting a Test	Click this button to delete all test data on the current plate. On the popup dialog box, select ***Yes*** to delete the data or select ***No*** to abort the deletion.



NOTE

Deleted test results cannot be restored or inquired.

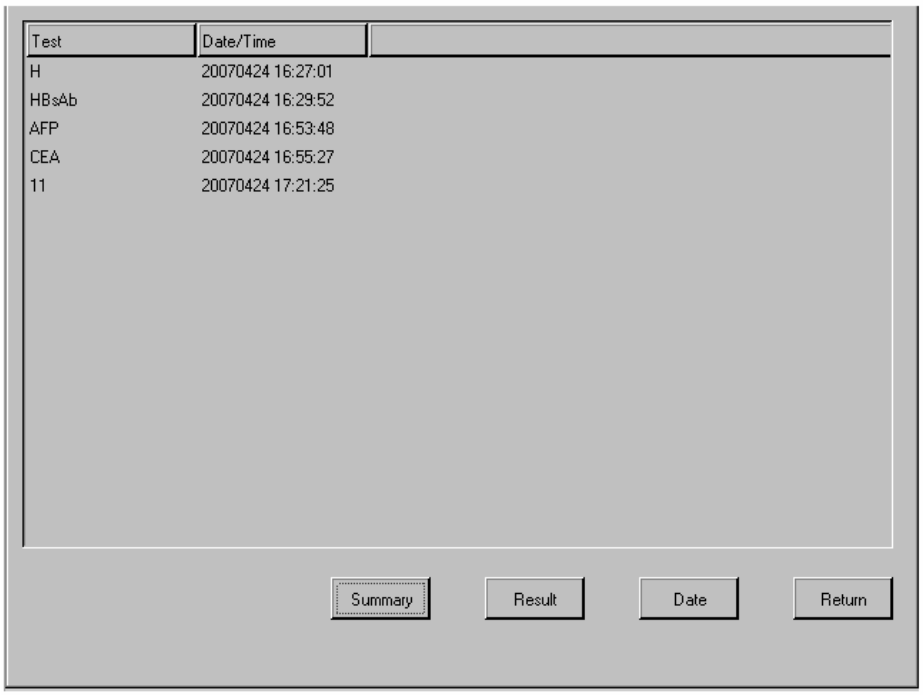
Return	Click this button to return to the main screen.

Query by Test

The results of the current day are displayed by test in the order of test time.

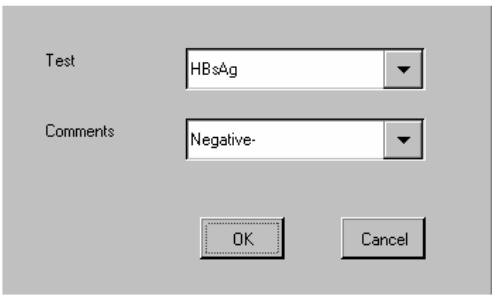
The query by test screen is show below.

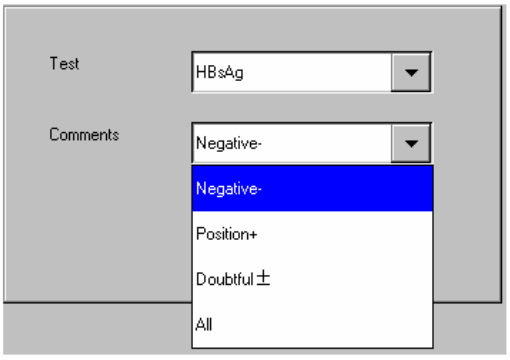
Figure 4-20 Query by Test



The following table introduces the buttons on the screen.

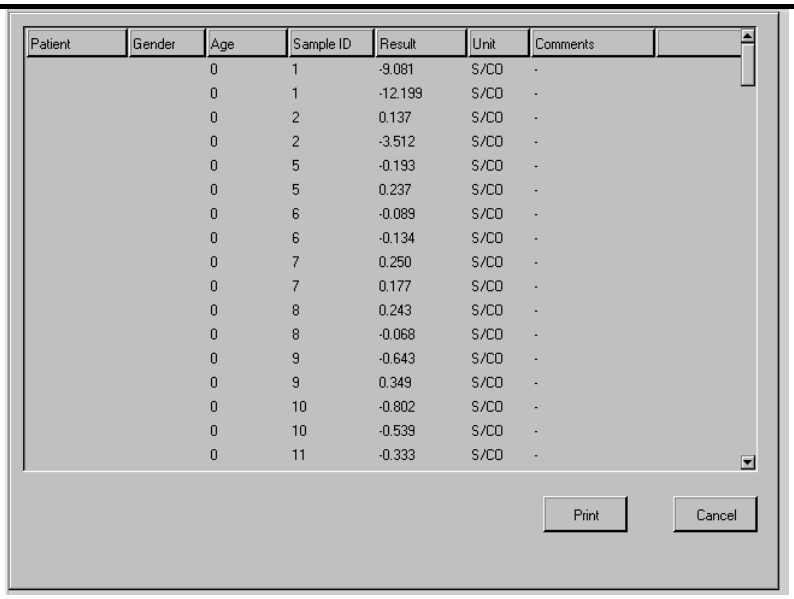
Button	Function
Summary	Select this button to view the desired test results according to specified test and condition. Select a test and select ***Summary***. The following dialog box pops up.





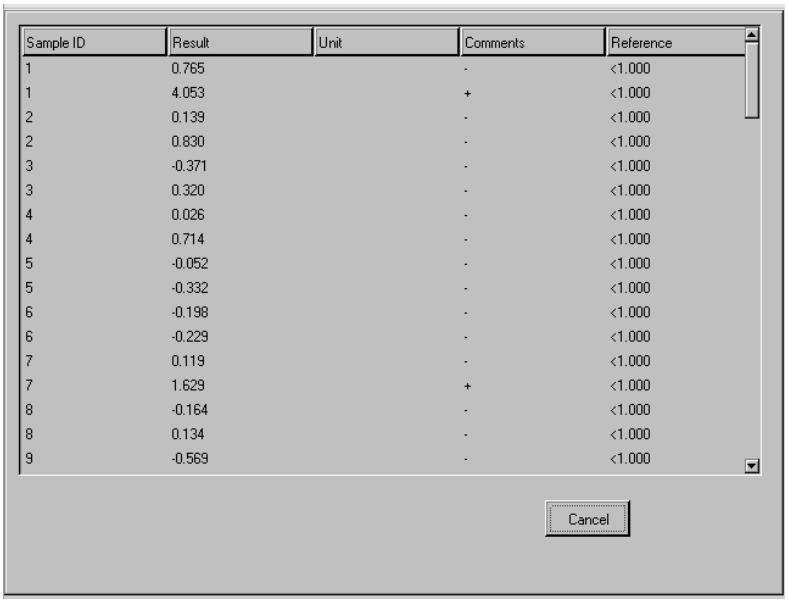
Select a test and result type, then select ***OK***. The following screen is displayed.

Button	Function



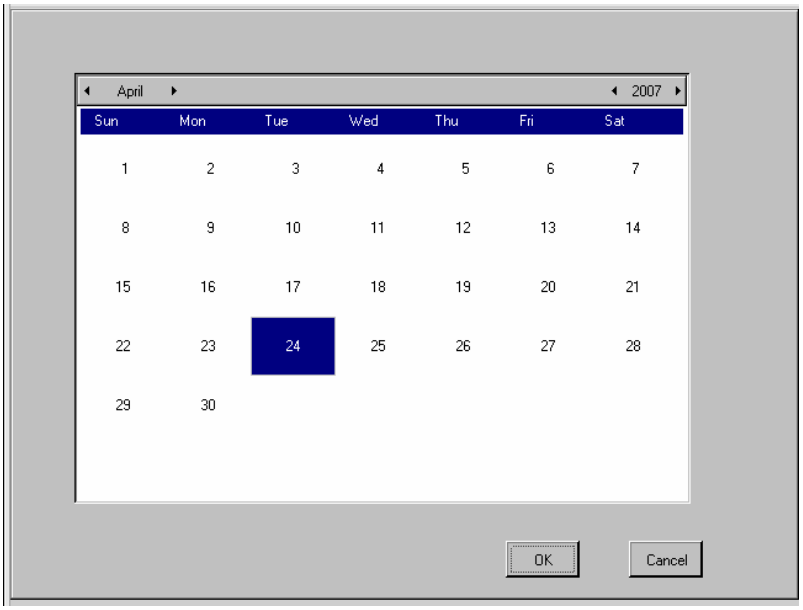
Select ***Cancel*** to return to the Query by Test screen.

Result — On the Query by Test screen, select a test and click ***Result***. All results of the test are displayed on the screen.



Select ***Cancel*** to return to the Query by Test screen.

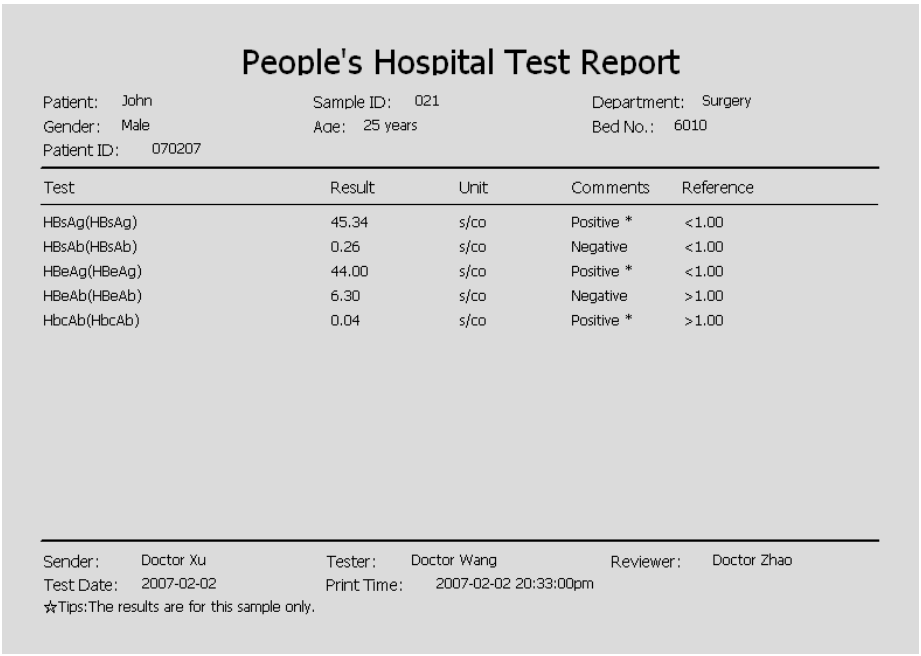
Button	Function
Date	Click this button to view the history test results of the specified date.
Return	Click this button to return to the main screen.



4.4 Reports

The reports function allows you to enter and edit the patient information and print them out together with corresponding test results on the current day. The printout by an external printer is shown below.

Figure 4-21 Patient Report



People's Hospital Test Report

Patient: John Sample ID: 021 Department: Surgery
Gender: Male Age: 25 years Bed No.: 6010
Patient ID: 070207

Test	Result	Unit	Comments	Reference
HBsAg(HBsAg)	45.34	s/co	Positive *	<1.00
HBsAb(HBsAb)	0.26	s/co	Negative	<1.00
HBeAg(HBeAg)	44.00	s/co	Positive *	<1.00
HBeAb(HBeAb)	6.30	s/co	Negative	>1.00
HbcAb(HbcAb)	0.04	s/co	Positive *	>1.00

Sender: Doctor Xu Tester: Doctor Wang Reviewer: Doctor Zhao
Test Date: 2007-02-02 Print Time: 2007-02-02 20:33:00pm
☆Tips:The results are for this sample only.

Select ***Reports*** on the main screen. The following screen is displayed.

Figure 4-22 Reports screen 1

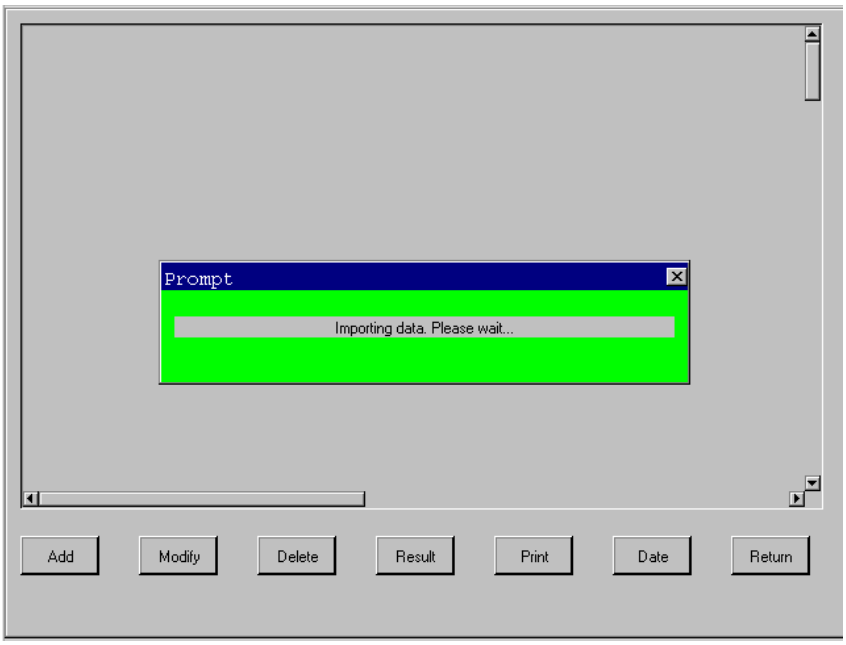
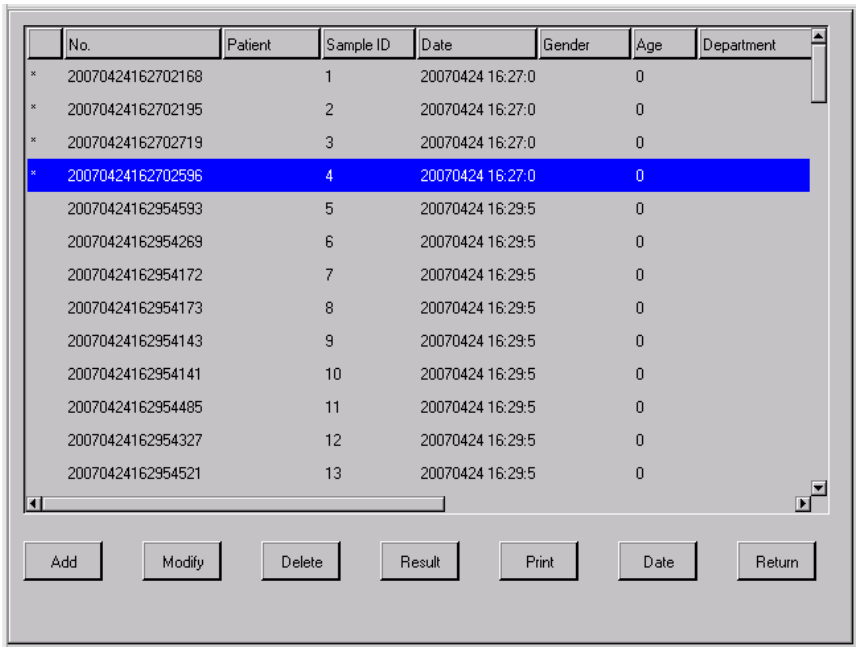


Figure 4-23 Reports screen 2

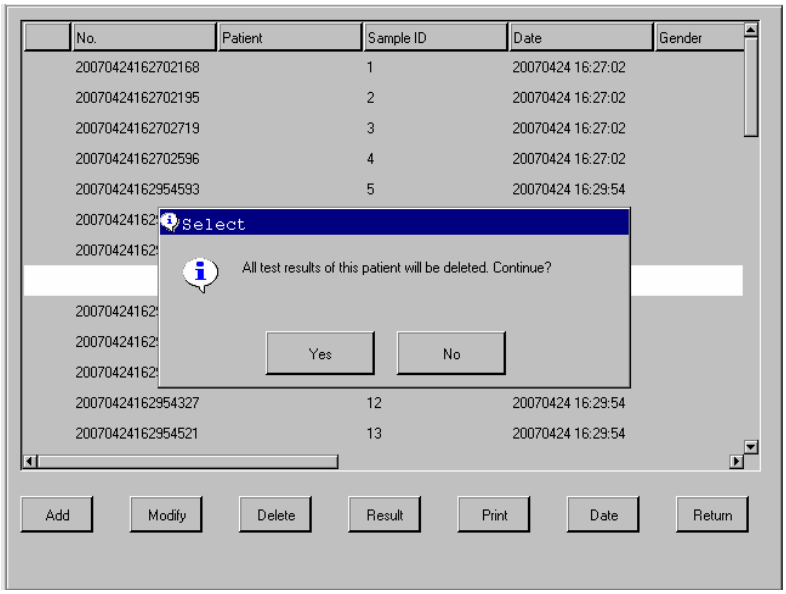


NOTE

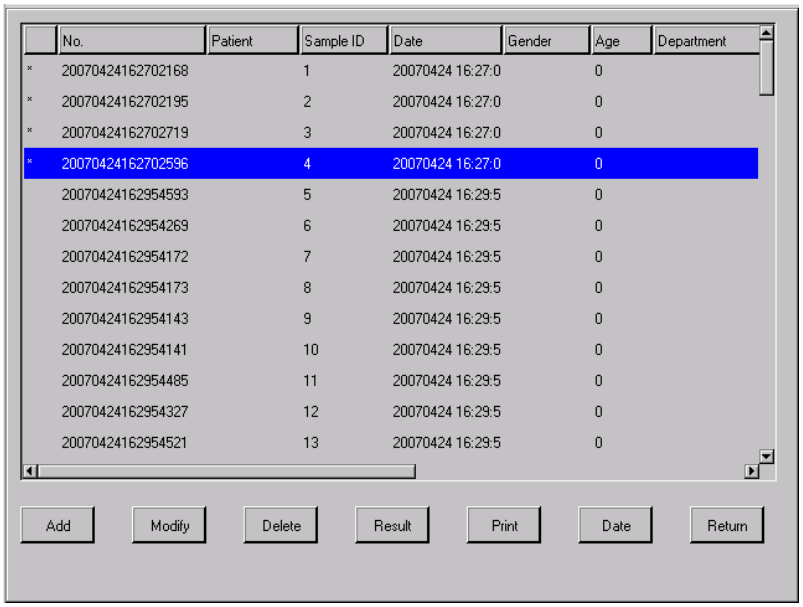
All test results of a sample ID on the current day are gathered by the system. While programming tests, please ensure same IDs correspond to one patient.

The following table introduces the buttons on the screen.

Button	Function
Add	Click this button to add a new patient.
Modify	Select a patient and click this button to change the patient information.
Delete	Click this button to delete the selected patient. Select a patient from the Reports screen, and click ***Delete***. The confirm dialog box pops up. Select ***Yes*** to delete the patient and associated test results.



Result	Select a patient and click ***Result***. You can review all test results of the patient.
Print	Click this button to print out the test results of the selected patient. Multiple patient results can be printed out at one time.



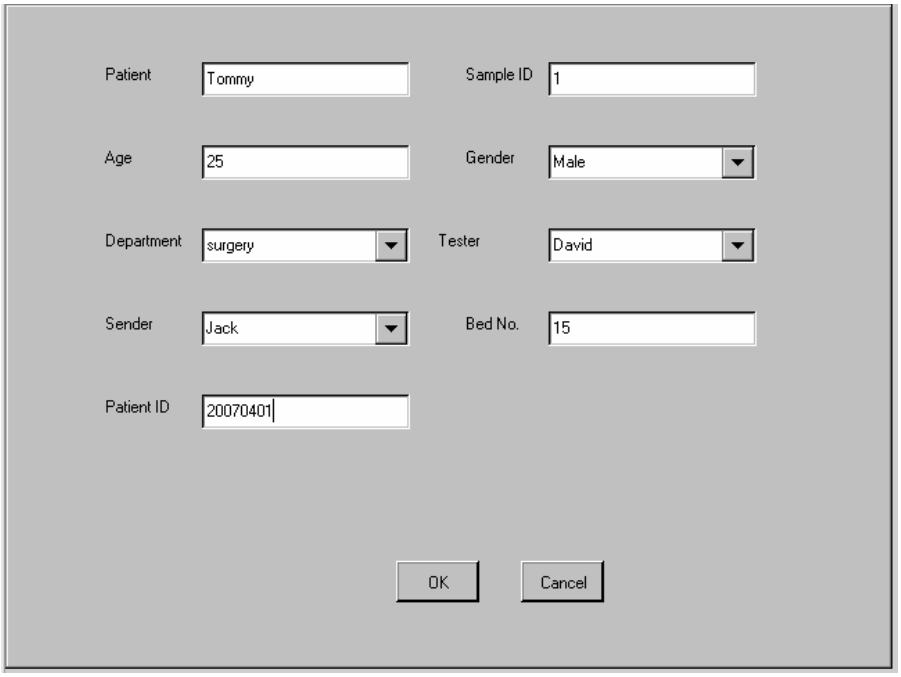
When selected, the test result is indicated by an asterisk "*". To deselect the result, click on other place and then click the result again. The "*" will disappear. Select multiple test results and click ***Print***. All results indicated by "*" are printed out.

Button	Function
Date	Click this button to view the history test results of specified date.
Return	Click this button to return to the main screen.

4.4.1 Entering Patient Information

Select ***Add*** on the Reports screen. The Edit Patient Information screen is displayed.

Figure 4-24 Edit Patient Information screen



The following table explains the fields on the screen.

Field	Description
Name	Enter the name of patient. This field is not required.
Sample ID	Enter the sample ID of patient. This field is required.
Age	Enter the patient age. This field is not required.
Gender	Select patient gender from the drop-down list box. The options include ***Mail***, ***Female*** and ***Unknown.*** This field is not required.
Department	Select a department from the drop-down list box. You should first configure the department information on the Dictionary screen. This field is not required.
Tester	Select a tester from the drop-down list box. You should first configure the tester information on the Dictionary screen. This field is not required.
Sender	Select a sender from the drop-down list box. You should first configure the sender information on the Dictionary screen. This field is not required.
Bed No.	Enter the bed No. of patient. This field is not required.

Field	Description
Patient ID	Enter the patient ID of patient. This field is not required.

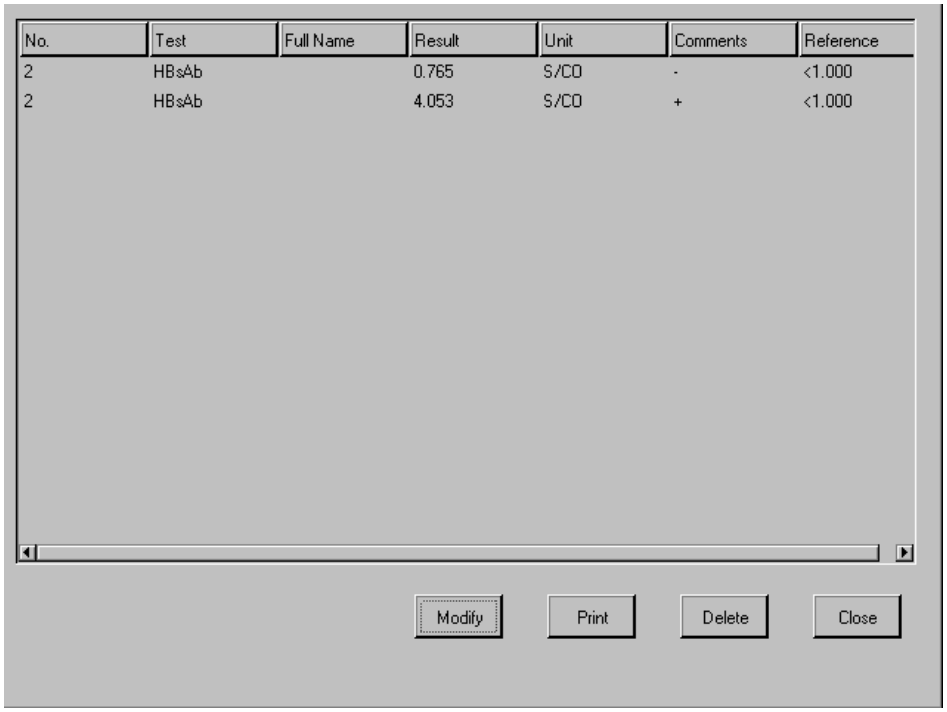
4.4.2 Modifying Patient Information

Select ***Modify*** on the Reports screen. You can edit the patient information as needed. Refer to 4.3.1 Entering Patient Information for details.

4.4.3 Inquiring Test Result

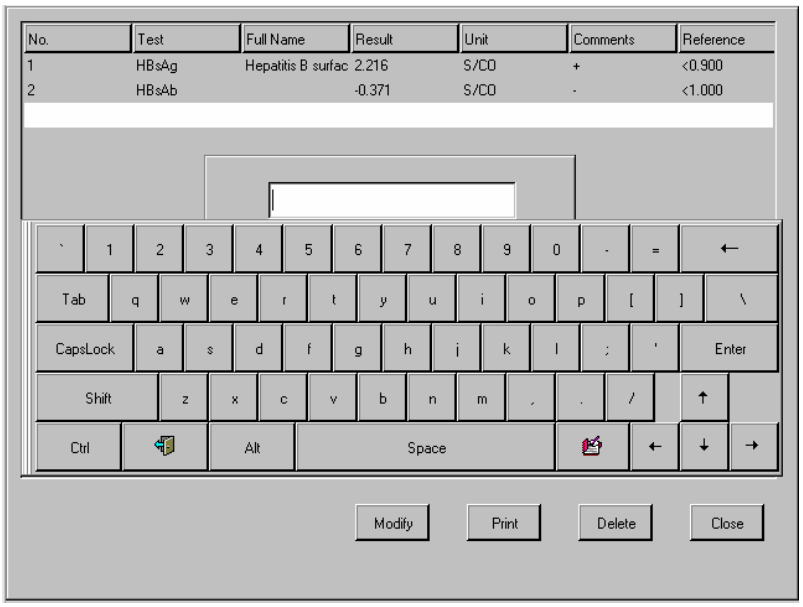
Select a patient on the Reports screen and select ***Result***. All test results of the patient are displayed.

Figure 4-25 Inquiring Test Results screen



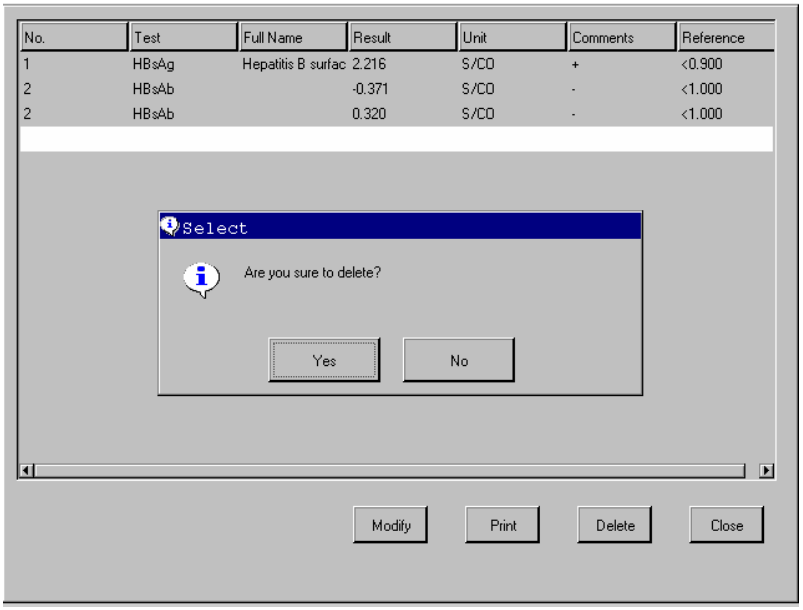
The following table introduces the buttons on the screen.

Button	Function
Modify	Click this button to modify a test result. Select a test and click ***Modify***. An edit box pops up. Enter the new result in the edit box and click ***OK***.
Print	Click this button to print out all test results currently displayed.



NOTE

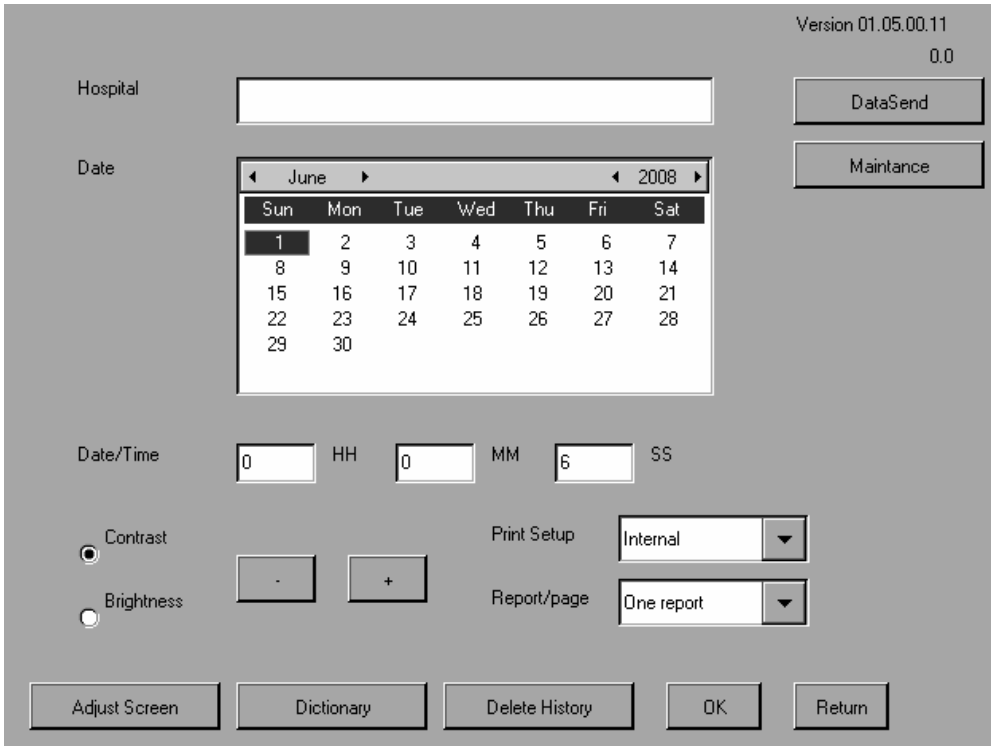
All test results can be modified only on the Inquiring Test Results screen. Users can only change the S/Co value and concentration in quantitative calculation rather than the absorbance value.

Button	Function
Delete	Select a test on the Inquiring Test Results screen and click ***Delete***. The confirm dialog box pops up. Select ***Yes*** to delete the data or select ***No*** to abort the deletion. 
Close	Click this button to return to the main screen.

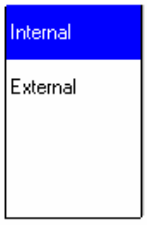
4.5 System Setup

Select System Setup on the mains screen. The System Setup screen is displayed. You can set up the hospital information, date and time, dictionary, adjust the screen display and delete history data, upload data, etc.

Figure 4-26 System Setup screen



The following table explains the fields on the screen.

Field	Description
Hospital	Enter the hospital name in the edit box.
Date	Click ◂ and ▸ on two sides of month and year to set the date, then select a day in the date list.
Time	Enter the time in the edit boxes next to ***HH***(hour), ***MM***(month) and ***SS***(second).
Contrast	Use "**-**" and "**+**" to adjust the contrast of the screen.
Brightness	Use "**-**" and "**+**" to adjust the brightness of the screen.
Printer Setup	Select ***Internal*** or ***External*** from the drop-down list. You can print test results using an internal recorder or an external printer. See **1.6 Printing Device** for details. 
Report/page	It is only valid to external printer. You can set to print one report or two reports on one report sheet.

The following table introduces the buttons on the screen.

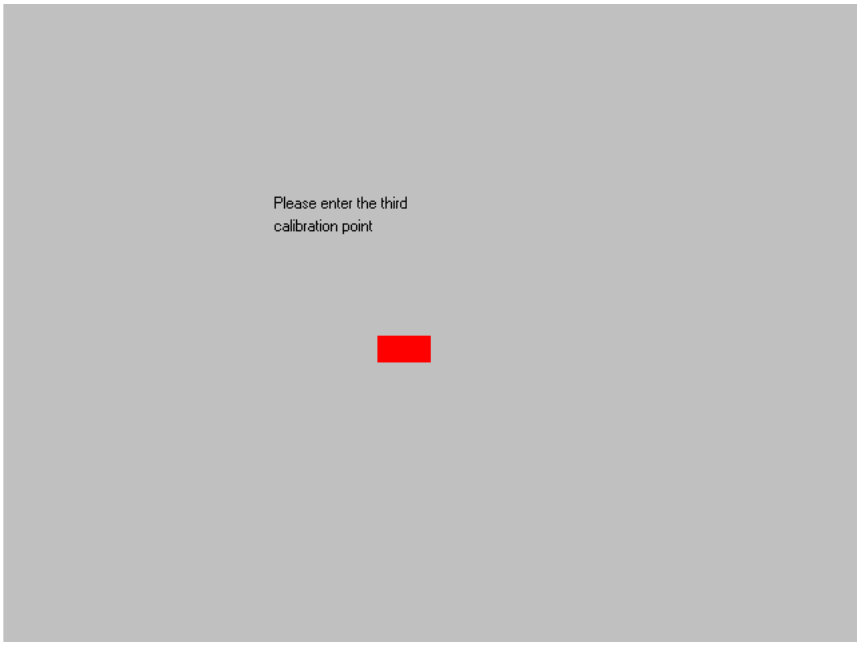
Button	Function
DataSend	When the system is connecting the data management software, click this button to send test information, results and etc to the management software.
Maintenance	Only available to the service personnel of Mindray or the local distributor.
Adjust Screen	When the screen display deviates, that is, the clicking position does not match the pointer, the entering may be degraded and you can click the ***Adjust Screen*** button to correct the screen display.
Dictionary	Click this button to set up senders, departments, testers and concentration units.
Delete History	Click this button to delete specified history test results.
OK	Click this button to save your settings.
Return	Click this button to return to the main screen.

Follow this procedure to adjust screen display. Select ***Adjust Screen*** on the System Setup screen. The following screen appears. Click the red point on the screen using the touch pen.

Figure 4-27 Adjust Screen 1

Figure 4-28 Adjust Screen 2

Figure 4-29 Adjust Screen 3

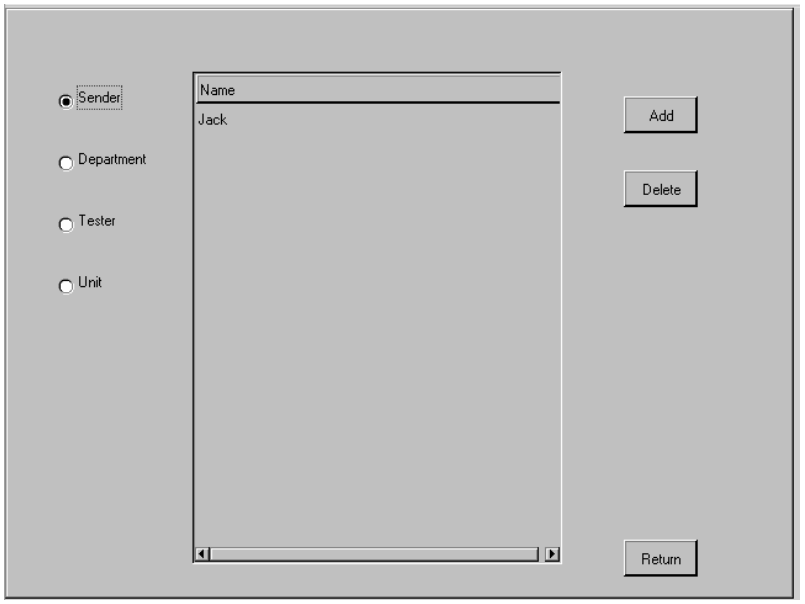


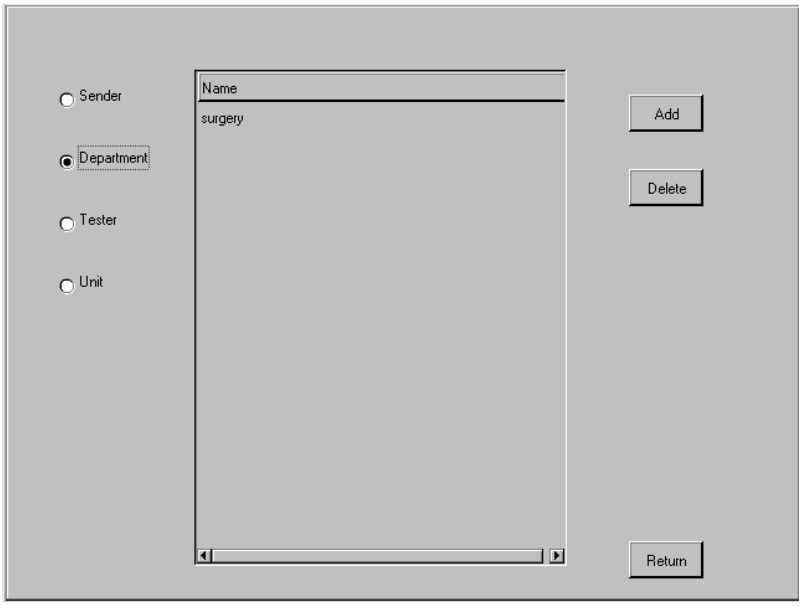
When adjustment is finished successfully, the message “Calibration succeeded” will appear. Otherwise, the system alerts you with “Calibration failed”, and you should adjust again.

Figure 4-30 Adjust Screen 4

Select ***Dictionary*** on the System Setup screen. The following table introduces the buttons on the screen.

Button	Function
Add	After selecting a data group (sender, department, tester or unit), click ***Add*** to add a new item as follows:





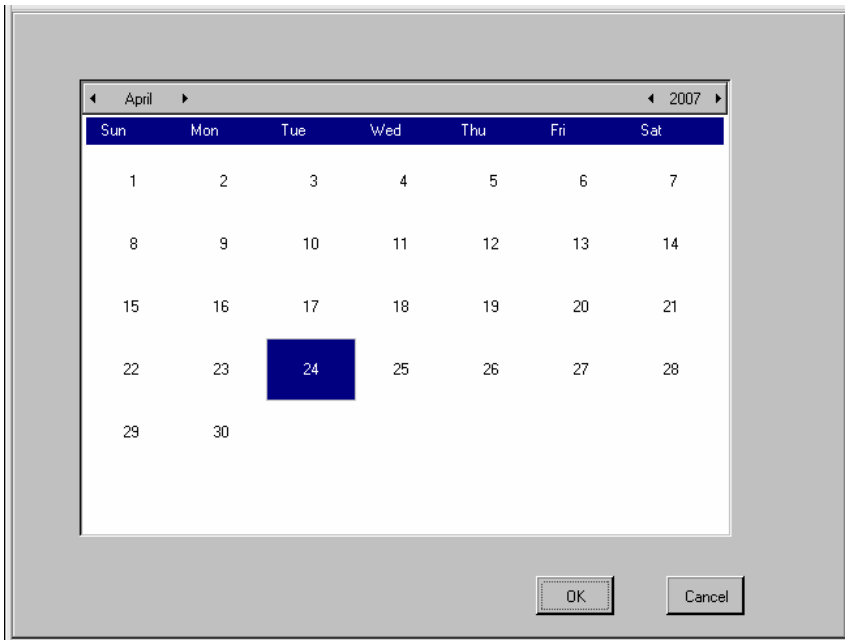
NOTE

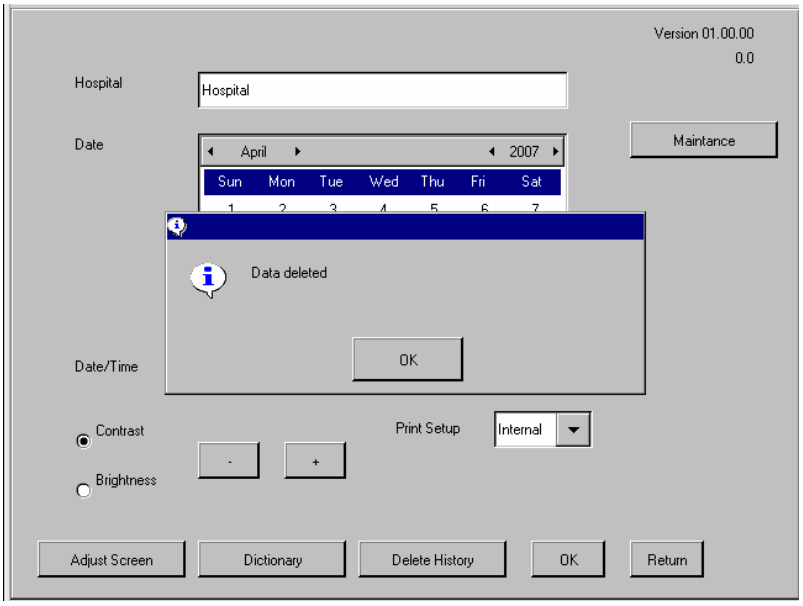
Two identical items are not allowed for the same data group.

Delete	Click this button to delete the selected item.
Return	Click this button to return to the System Setup screen.

Select ***Delete History*** on the System Setup screen. The following screen is displayed.

Figure 4-31 Delete History screen

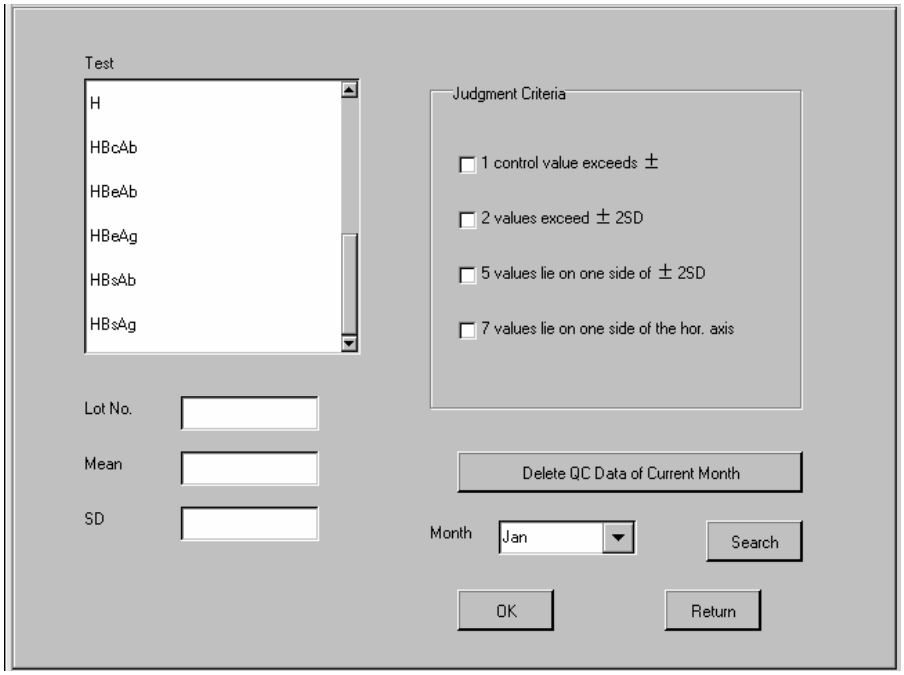


Button	Function
OK	Click this button to delete all test results before the selected date (including the day).
	
Cancel	Click this button to return to the previous screen.

4.6 Quality Control (QC)

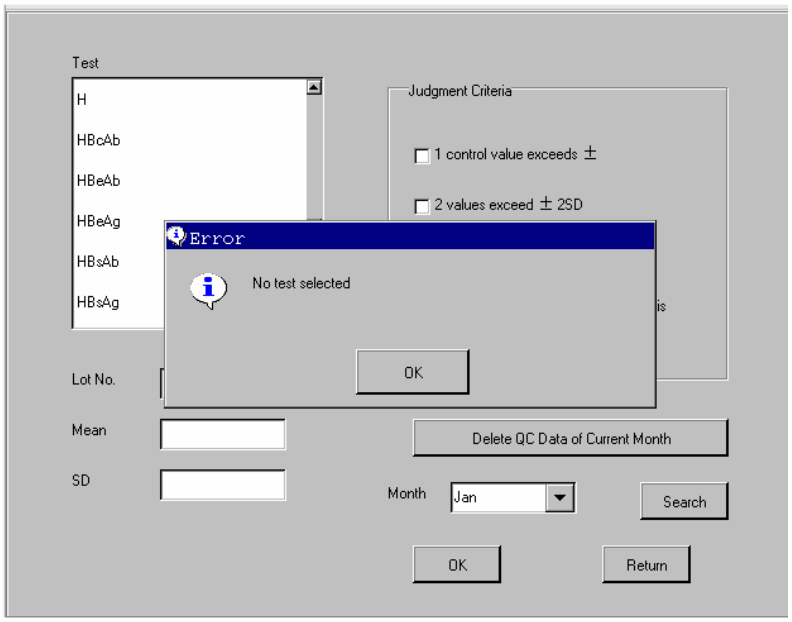
Before programming quality controls, you should set up the quality control of the tests. Select ***QC*** on the main screen, the following screen is displayed.

Figure 4-32 Quality Control screen

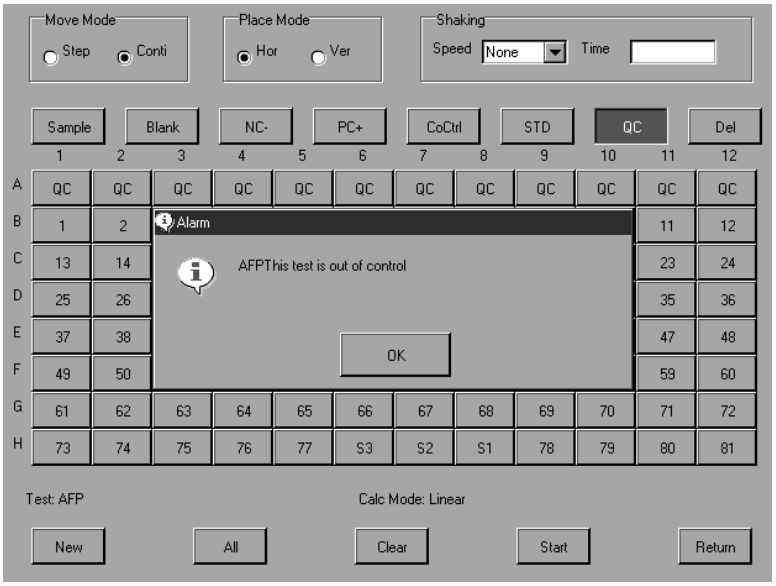


The following table explains the fields on the screen.

Field	Description
Test	Select a test for which you want to run quality control.



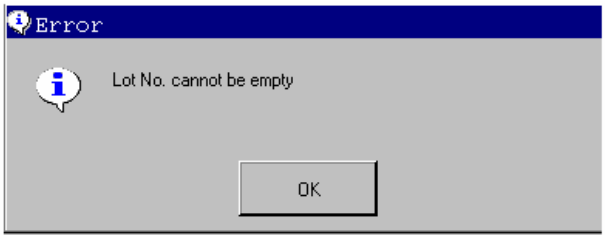
Field	Description
Judgment Criteria	There are four criteria provided to judge the QC results. You can select one or all of them as needed. If a QC result is out of control, the system will alert you as follows.



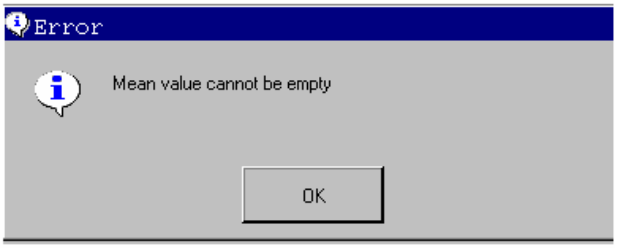
NOTE

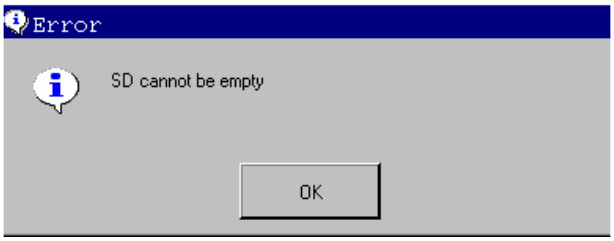
If none of the four conditions is selected, the system will not judge whether the QC result is out of control or not.

Lot No.	Enter the lot No. of the control solution. If the lot No. is not entered, the following message will be triggered.



Mean	Enter the mean concentration of the selected control solution. If the mean concentration is not entered, the following message will be triggered.

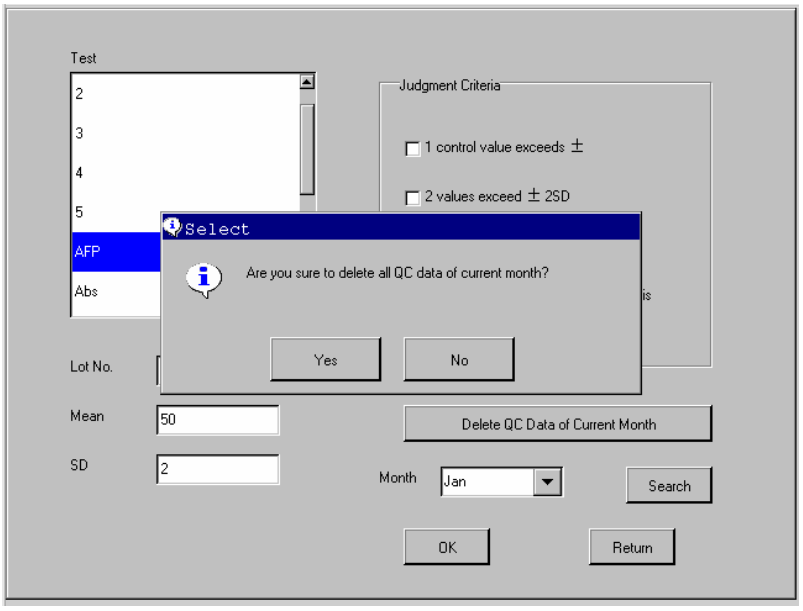


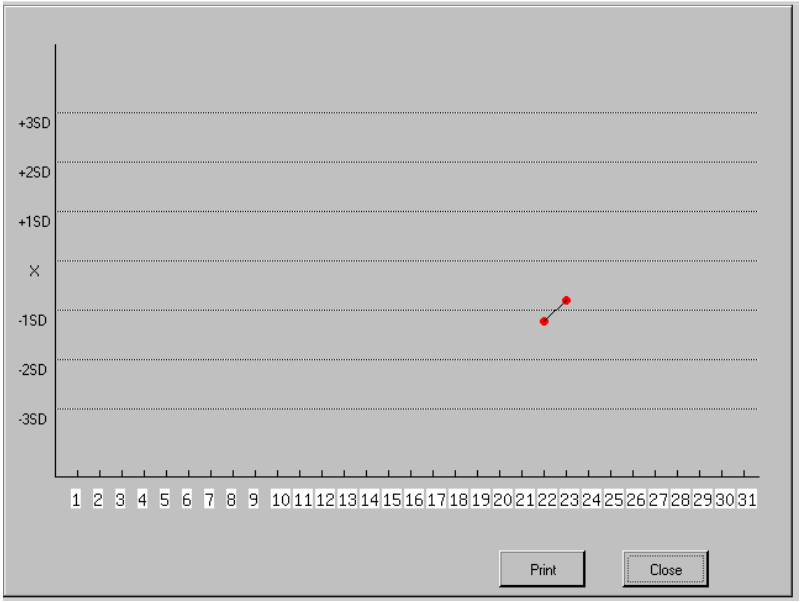
Field	Description
SD	Enter the standard deviation of the selected control solution. If the standard deviation is not entered, the following message will be triggered. 
Month	Select a month that you want to review the QC results.

NOTE

Among the multiple QC results of a test during a day, only the last one is saved.

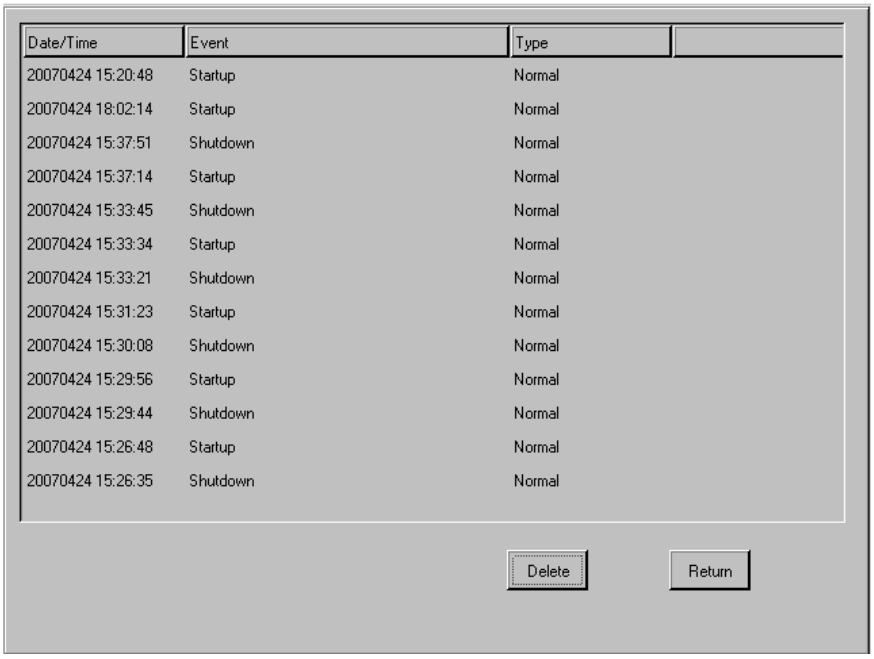
The following table introduces the buttons on the screen.

Button	Function
Clear QC Data of Current Month	Click this button to clear all QC data of the current month. The confirm dialog box pops up. Select ***Yes*** to delete the data or select ***No*** to abort the deletion. 

Button	Function
Search	Select a month from the drop-down list box next to Month and click ***Search***. The QC graph for the test in current month is displayed. 
OK	Click this button to save the settings.
Return	Click this button to return to the main screen.

4.7 Logs

Figure 4-33 Logs screen



On the Logs screen you can review the event logs of the MR-96A.

Each log should include the following information:

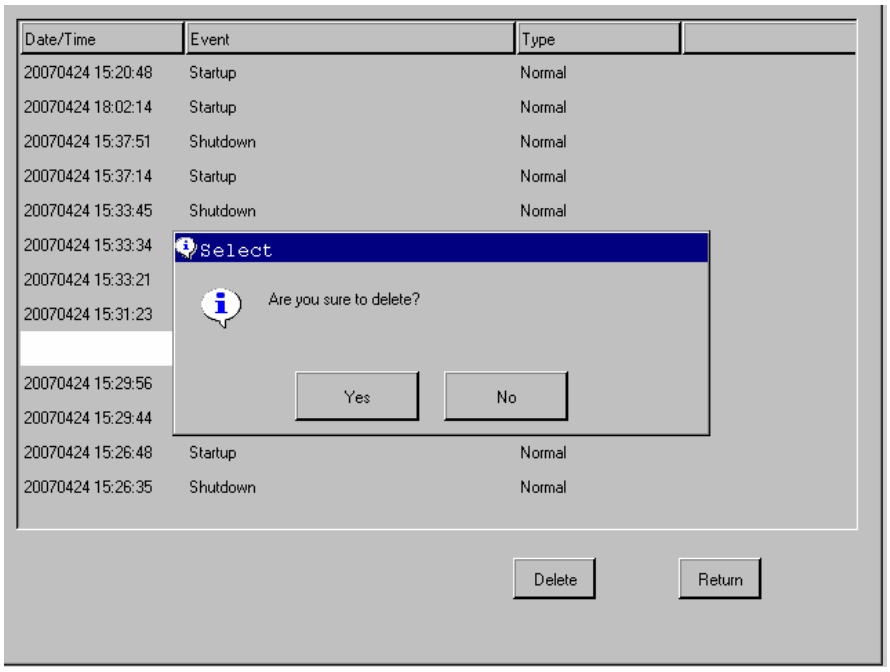
- Date/Time
- Event
- Type

The log type includes Normal and Error.

- Normal: startup, shutdown, etc
- Error: startup failure, shutdown failure, etc.

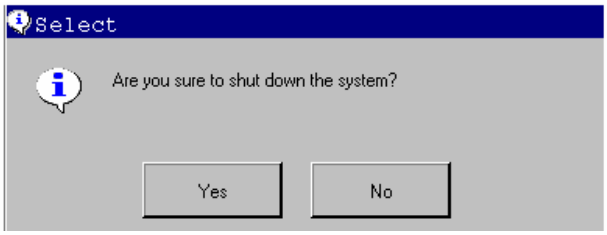
The logs are generated by the system and arranged by time. When the database is full, the earliest records will be deleted. Select ***Delete***. The confirm dialog box pops up. Select ***Yes*** to delete all logs currently displayed. Or select ***No*** to abort the deletion.

Figure 4-34 Confirm dialog box-Delete logs

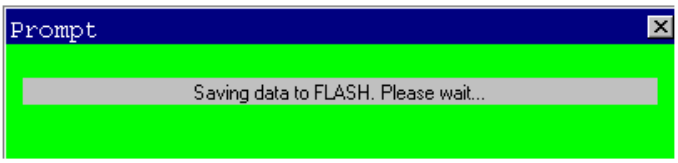


4.8 Shutdown

Select ***Shutdown*** on the main screen. The following message appears.



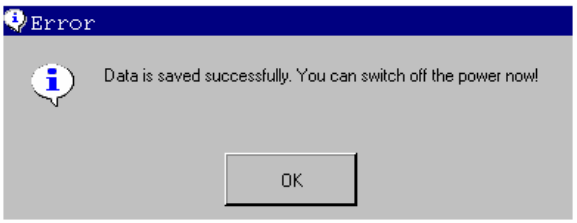
Select ***Yes***. The shutdown procedure is started and will last for about 15 seconds. Select ***No*** to return to the main screen.



CAUTION

Please ensure the instrument is always connected to power during the shutdown process. If the power is interrupted or switched off during shutdown process, the data may be lost.

When data is saved, the system will remind you to switch off the power.



CAUTION

Do not switch on the power immediately after switching off it. Please wait for at least 30 seconds prior to next startup.

5 Maintenance and Troubleshooting

5.1 Tools Required for Maintenance

The following tools will be used for maintenance of the system.

- Hex wrenches (M1.5, M3 and M4)
- Cross-headed screwdrivers (large, medium and small)
- Needle tube
- Tweezers
- Clean gauze
- scissors

5.2 Cleaning

5.2.1 Cleaning Instrument Panels

The MR-96A Microplate Reader is a precise measuring instrument and should be maintained properly to ensure best performance.

Perform the following steps to maintain the instrument:

- Keep the operating environment dry and clean. Cover the measurement assembly after using the instrument everyday to avoid dust ingression.
- Switch off the power supply. Use clean soft cloth dipped with distilled water to wipe the instrument panels and screen.

BIOHAZARD

Wear gloves while cleaning the instrument panels and screen.

Before being serviced or packaged for transportation, the used instrument must be disinfected to avoid personal injury.

5.2.2 Cleaning Recorder

Paper scrap and foreign matters may accumulate on the print head of the recorder which has been used for a long period, and will affect the print quality and service life of the print head and roll shaft.

Follow this procedure to clean the recorder:

1 Before cleaning, take necessary measures to avoid damage to the recorder by static charge, such as wear disposable static rings, etc.

2 Open the recorder door and remove the recording paper.

3 Use cotton balls dipped with ethanol to wipe the print head.

4 Wait until the print head is dry, then install the recoding paper and close the recorder door.

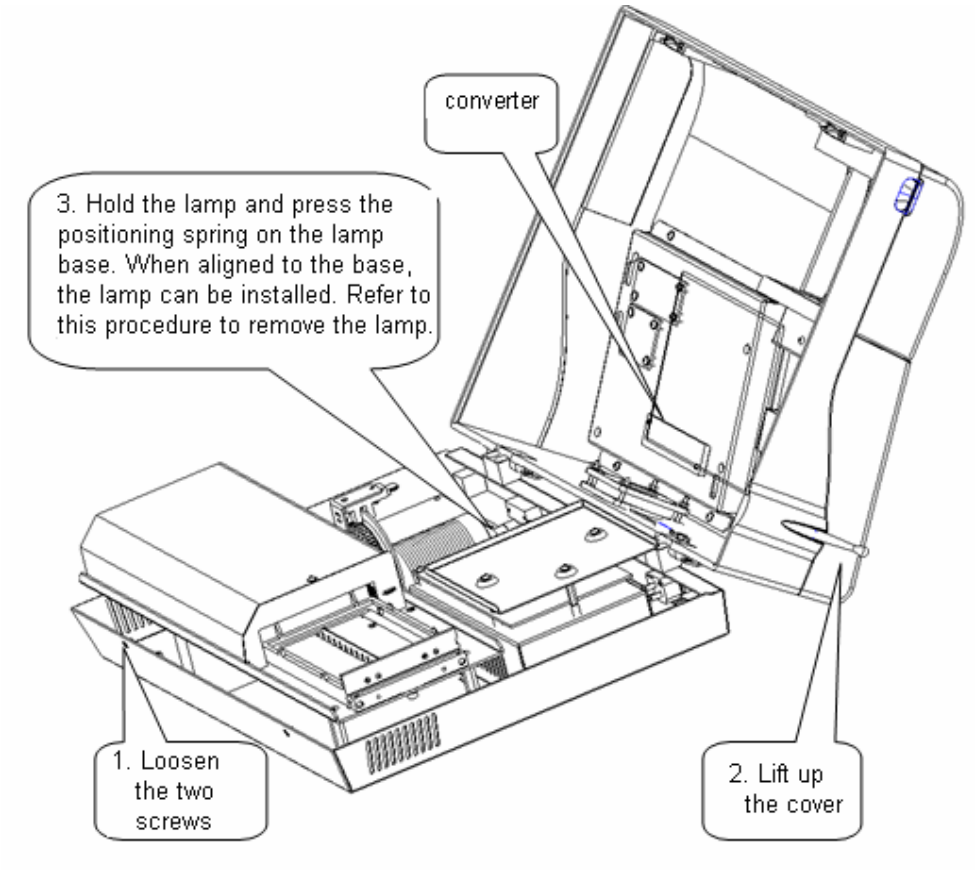
5.3 Replacing Lamp

WARNING

Prior to replacement, disconnect the instrument from the power supply.

Follow the procedures in Figure 5-1 to replace the lamp.

Figure 5-1 Replacing Lamp



WARNING

Exercise caution while replacing the lamp. Otherwise you may get burnt. After switching off the power, please wait at least 15 minutes for the lamp to cool down prior to replacing the lamp.

Do not touch the converter while replacing the lamp.

NOTE

Use the lamp (OSRAM64255 8V 20W) specified by Mindray. Other lamp may degrade the system performance.

5.4 Troubleshooting

Failure	Probable Causes	Corrective Actions
The instrument cannot be powered on	Power cord is not connected properly.	Reconnect the power cord.

Failure	Probable Causes	Corrective Actions
Abnormal sound occurs during operation	Microplate is blocked; Foreign matters exist; Mechanical movement goes wrong	Relocate the microplate. Remove the foreign matter; Contact Mindray customer service department or your local distributor.
Light is too strong	Filter is not installed correctly	Check if the filter and filter wheel are installed correctly
Light is too weak	Lamp is damaged	Replace the lamp
Absorbance of one of the 8 channels is incorrect	Photocell of the channel is damaged; The fiber of the channel is damaged; The circuit of the channel is damaged;	Contact Mindray customer service department or your local distributor.
Filter wheel keeps rotating and cannot stop at specified position	Position sensor goes wrong or the sensor cable is damaged	Contact Mindray customer service department or your local distributor.
Microplate cannot be reset normally	Microplate position sensor goes wrong	Contact Mindray customer service department or your local distributor.
While printing, abnormal sound occurs or recording paper is not output correctly	Paper jam occurs.	1. Open the recorder door; 2. Remove the recording paper and cut off the crinkled part; 3. Reinstall the recording paper and close the recorder door.

6 Appendices

This chapter includes specifications, external printer, supplies and index.

Appendix A Specifications

Environment for Use	Indoor use
Power supply	AC 100-240V~, 50/60Hz
Voltage fluctuation	±10%
Power consumption	120VA
Fuse	250VAC T3.15A
Dimensions	437mm×332mm×174mm (L×W×H)
Weight	8.5kg
Input device	Touchscreen and touch pen
LCD	7.8” LCD (resolution: 640×480, color: 8)
Operating temperature	5℃-35℃
Storage temperature	0℃-40℃
Relative humidity	15%-85%, no condensation
Altitude height	-400m-3,000m（-1,300feet-6,500 feet）
Atmospheric pressure	70 kPa-106kPa
Noise	No greater than 75dB
Communication interface	RS-232 serial port
Printer interface	USB port, which complies with the USB 2.0 protocol.
EMC	This instrument complies with the emission and immunity requirement description in this part of the EN 61326-1:2006 and EN 61326-2-6: 2006.
Safety Classification	Overvoltage type：II Pollution level: 2 Working Mode: Continuous IP(Ingress Protection):IPX0, (0 means not waterproof)

Appendix B External Printer

The MR-96A is compatible with (not limited to) the following printers:

- HP 2568
- HP 2668
- HP 0J8000
- HP 0J6000

Appendix C Supplies

To ensure personal safety and system performance, use only supplies manufactured or recommended by Mindray. Contact the Mindray Customer Service Department or your local distributor for details.

Part	Part No.	Location	Remark
Lamp assembly	801-0104-00016-00	Lamp base	Regularly-replaced part
CPU board	801-0104-00023-00	On the bottom panel	As needed
Power supply board	801-0105-00002-00	On the t bottom panel	As needed
7.8"LED displayer (touch screen)	801-0104-00003-00	On the panel	As needed
Analogue board	051-001301-00	On the carriage assembly	As needed
Carriage assembly	801-0104-00020-00	On the bottom panel	As needed

Appendix D Index