Microplate Reader
User's Manual

VERSION: 1.2e

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How to use the manual

Thank you to be the user of MICROPLATE READER.

This manual is a user's guide for the Reader. It contents system installation, operating procedures, System parameters setting and maintenance, and so on. We suggest that the user read the manual carefully before user operate this device.

If you have any question, you can contact with Local distributor.

The instruments with different versions or collocations will have some differences in functions

Note: *Contain useful tips on using your instrument. They appear in italicized type.*

Cautions: **cautions should be followed carefully to ensure your instrument operates correctly and is not damaged. Cautions appear in bold type like this.**

1. INSTALLATION

1.1 Unpacking

Unpack MICROPLATE READER carefully and check for any damage that may have been caused during transportation.

check the components: :

- MICROPLATE READER instrument
- Operator's manual
- Packing list
- Guarantee
- Accessories :panel pen ,power cable ,print cable ,RS-232 serial cable ,pstn line ,lamp , fuses

Keep the original package for future transportation

Notice : report any damage or missing to your local representative。

1.2 Environmental Requirements

Locate MICROPLATE READER to avoid exposure to excess dust, vibrations, strong magnetic fields, direct sunlight, draft, excessive moisture or large temperature fluctuations.

Leave sufficient clearance (10 cm) at both sides of the unit for adequate air circulation.

Notice : instrument be operated within an ambient temperature range of 10 -40 and humidity of 20%-85%。

1.3 Electrical Setup

Power requirements

- **AC110V - AC250V**
- **50 - 60Hz**
- **80W**

warning :

- ***Ac power plug must be grounded at the main socket.***
- ***The circuit used should be substantially free of large voltage transients such as large pumps, large centrifuges etc.***

- ***If found smog, strange sound in instrument, please turn instrument off immediately and contact your dealer***

Connect the supplied power cable to the rear of the instrument as shown. Plug the other end of the power cable into an AC outlet.

1.4 External Printer Connection

With both the instrument and the external printer off, connect the parallel cable to the rear of the instrument. Plug the other end of the parallel cable into the printer. Then plug power cable into printer. Install printer paper if needed.

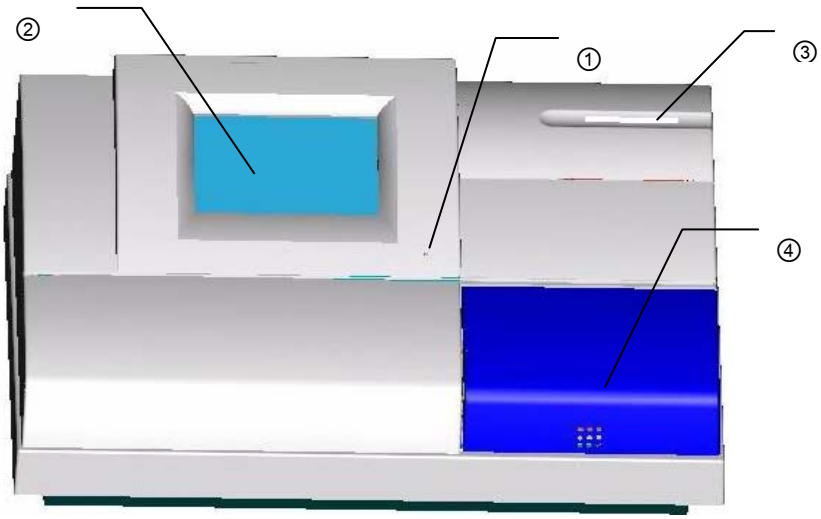
2. FUNCTIONAL DESCRIPTION

2.1 Introduction

1) MICROPLATE READER is a microprocessor –controlled, general purpose photometer system designed to read and calculate the result of assays ,including contagion , tumorous mark , hemopathy , dyshormonism ,which are read in microtiter plate.
2) Touch panel let your operation easily.
3) 100 pre-programmed tests.
4) Multiple calculations：
   - Absorbance mode (ABS)
   - Cut-Off mode
   - Single standard mode
   - Point to point mode
   - % Absorbance Multi-Point Mode
   - Linear regression mode
   - Exponent regression mode
   - Logarithm regression mode
   - Power regression mode
5) visualization mark plate，you can set blank, control, sample ,standard in any place，and run mostly 12 different tests in one 96 microplate.
6) Test time ＜5s/plate,and mix plate before test
7) Max save 500 program and 1000 patients data and 10000 sample records.
8) generalization report ，support multi-type printers.
9) MICROPLATE READER can dial up to rayto service computer and update software. MICROPLATE READER also can connect to Microplate Washer and update Microplate Washer's software.
10) information manage function：Department database, operator database, system log database.

2.2 General Description

2.2.1 MICROPLATE READER front view



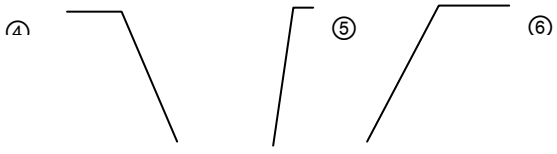
power pilot lamp： It light when opens the instrument

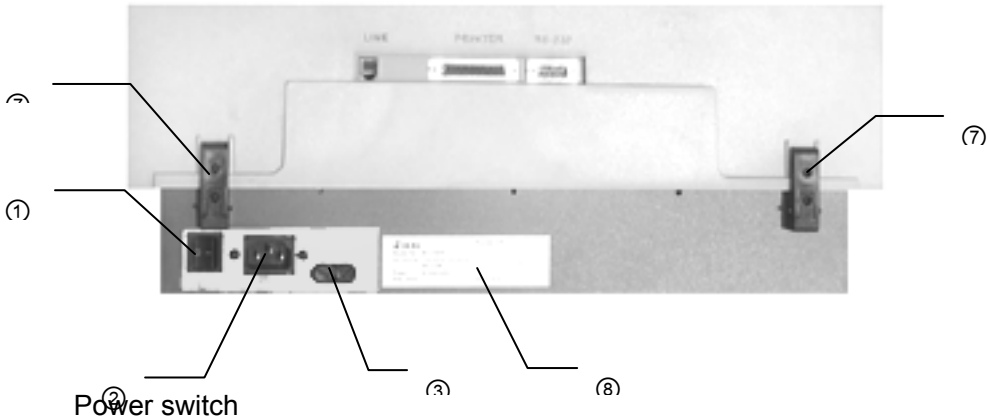
touch panel： display program

internal printer

Plastic cover

2.2.2 MICROPLATE READER rear view





Power switch
Power sokect
Fuses
PSTN connector
PRINTER interface
RS-232 interface

2.3 Technical Specifications

Weight:	10kg
Overall dimensions:	450mm (L) ×330mm (W) ×140mm (H)
Power:	AC110V-AC250V，50-60Hz
Fuses:	250V/3.15A
Work Environment:	temperature 10 -40 ；Humidity 20%-85%
Store Environment:	-20 -50
Lamp:	OSRAM64607，8V/50W，
Standard Wavelength:	405，450，492，630nm，(substitute filters from 340-700nm available on special order)
Abs range:	0-3.500A
Measurement range:	0-2.000A
Accuracy:	0-2.0A：±1.0%or±0.007A
Precision:	0-2.0A：±0.5%or±0.005A
Linearity:	±2.0% or±0.007A
Reading speed:	Continuous mode < 5s，step by step mode < 15s
Warm up time:	1 minute
CPU:	Embedded RISC cpu
Store content:	500 test，1000 patient information，10000 test data
Interface:	RS-232C serial interface, parallel printer interface , telephone line (modem) interface

Display:	5.7″LCD display（320×240 discernibility,256 gray scale）
Input:	Touch panel and pen, external mouse（special order）

3. OPERATION INSTRUCTIONS

3.1 Touch Panel & Pen

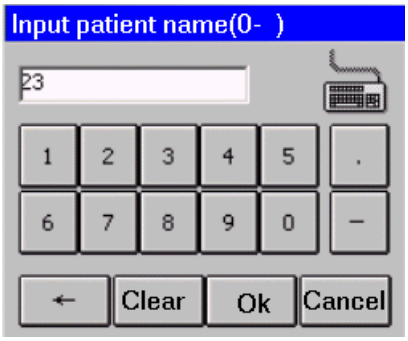
MICROPLATE READER has a touch panel, you can operator the instrument by pen.

---

warning：please use the pen to touch the panel。

Notice：You also can use a RS-232 mouse to operate the instrument。

3.2 Digital Number Keyboard



Input integer (age), float number (abs value), digital number (phone code), press "OK" button to saved, or press "cancel" button to exit and no saved.

Edit : press ← button to del a character before cursor. Press "clear" button to clear all characters.

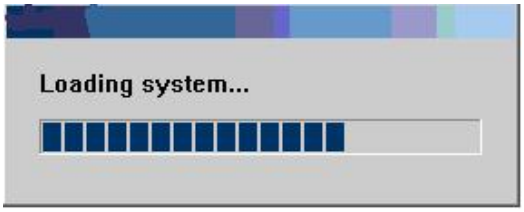
3.3 Character Soft Keyboard

You can operator this keyboard like PC keyboard and move windows by dragging.

4. OPERATION

4.1 Power on

Switch the instrument on using power switch and wait several seconds , you will see such display :



During the initialization,MICROPLATE READER will complete some task:

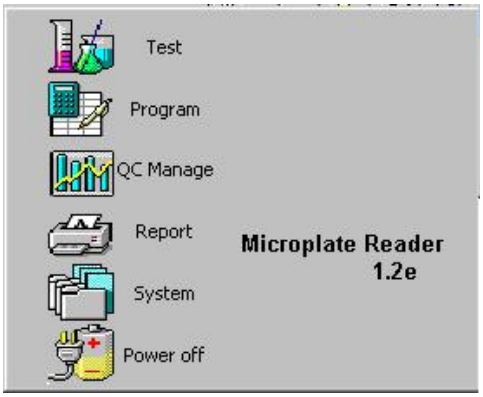
1) load system
2) check system
3) read user data
4) initialize front
5) waiting for lamp stable
6) check the circuit of light(in the course of checking ,the filter will rotate)

instrument will self-check , and initialization data will be load

Error report will be display if the instrument has not pass the self-check.

4.2 Main menu

After self-check,system display main menu :

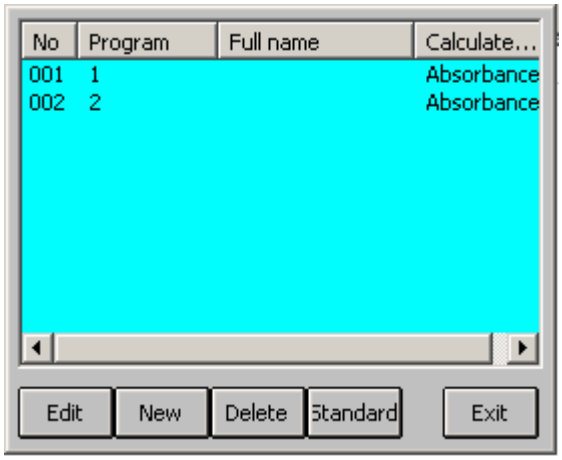


The main menu is the entrance to all operation for this instrument. When user click the icon in the window, the relative operation will be performed.

Whe the "Rayto" icon at the right, the information of version and authority about system will be found. After the exit button is clicked, system will be return.

5. Program

Press "program " icon, program list will be displayed:



You can pre-program 100 tests in MICROPLATE READER.

5.1 Mode setting

MICROPLATE READER support 10 calculation modes. They can be divided three types:

5.1.1 ABS mode

MICROPLATE READER only display and print out absorbance of samples by this mode.

5.1.2 Cut-Off mode

Cut-Off formula : $Cov = X \times NC + Y \times PC + Fac$

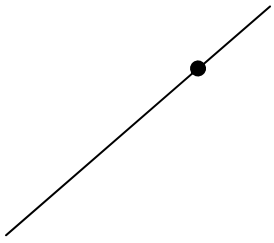
In this cut-off mode, where NC is the mean of the negative controls, PC is the mean of the positive controls, Cov is the cutoff absorbance .X, Y, Fac are coefficients that have any positive and negative numerical value (including 0 and 1) e.g. sample OD/NC≥2.1 is positive , that X=2.1 , Y=0 , Fac=0.

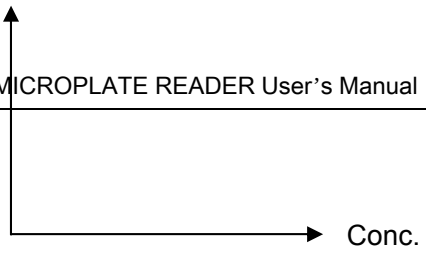
In regular cutoff mode, MICROPLATE READER award that sample is positive if sample OD/Cov>1.

5.1.3 Calculation mode

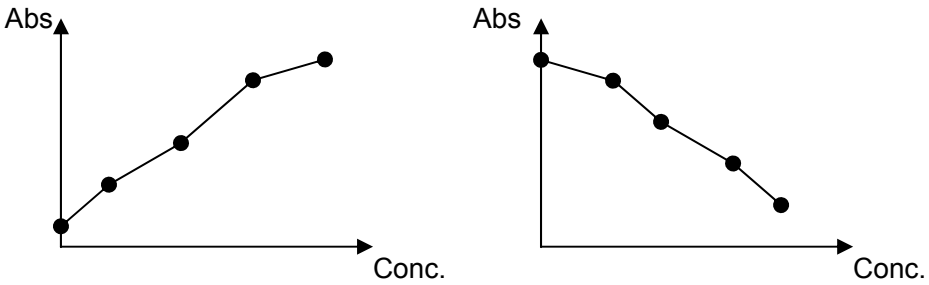
1) Single standard mode : A single calibrator material of known concentration is used so that concentrations of unknown samples may be calculated according to Beer's Law.

Abs





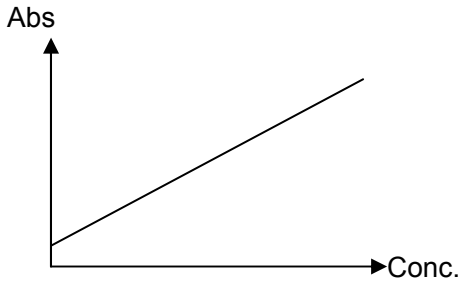
2) point to point mode：you can set 2-8 standards，the resulting calibrator curve is a series of lines connecting the calibrator points, which may be entered in ascending or descending order of absorbance.



3) %ABS： You can set 2-8 standards. The highest absorbance standard will be assigned a value of 100, and each sample and standard is reported as a percent of the absorbance of the highest calibrator. The resulting calibrator curve is a series of lines connecting the calibrator points, which may be entered in ascending or descending order of absorbance.

4) Linear regression mode: You can set 2-8 standards. This is a multi-point standard mode that calculates a best fit linear equation based upon the standard points.

Equations: $Y = kX + b$ ：This is used when the absorbance and the concentration is linear.



5) Index regression mode: You can set 2-8 standards. Equation: $Y = ke^{bX}$; This is used when the natural log of the absorbance is plotted against the concentration.

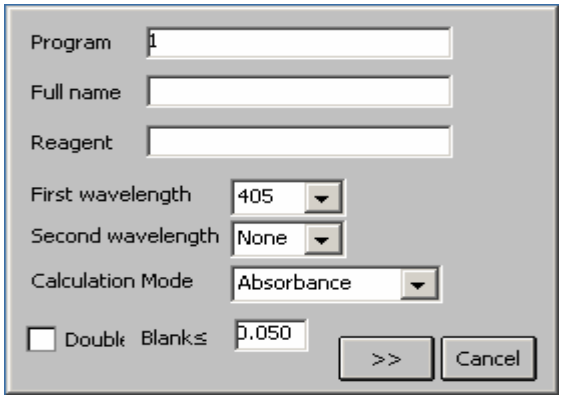
6) Logarithm regression mode: you can set 2-8 standards. Equation: $Y = kLnX + b$; This is used when the natural log of the concentration is plotted against the absorbance

7) Exponent regression mode: You can set 2-8 standards. Equation: $Y = kX^{b}$; This is used when the natural log of the absorbance is plotted against the natural log of the concentration.

8) Percent logarithm mode: You can set 4-8 standards. By these standards a new curve can be drawed, then you can look it as a standard curve. By regression means the sample concentration will be got.

5.2 Edit Program Setting

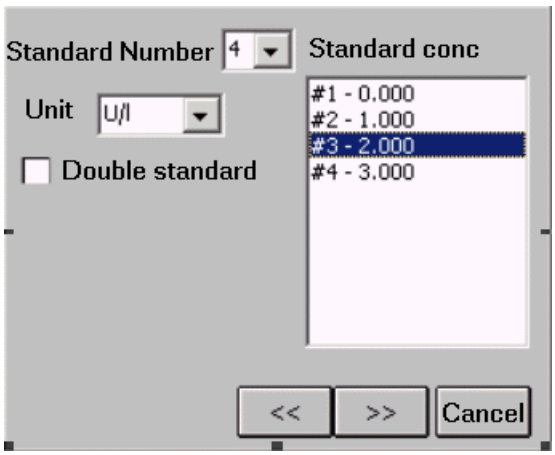
Select existed program (it will be marked), press "Edit" button, display the following windows:



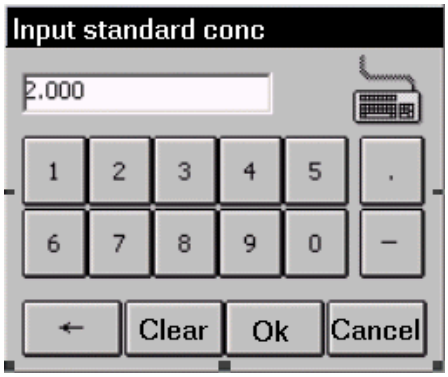
- program：program name, don't input the name existed.
- reagent：Input reagent name, you can ignore it.
- wavelength
- calibration mode
- Double sample : If select it, samples must be pipetted into consecutive two wells, the mean absorbance reading will be used to calculate a single concentration.
- Blank :You can set range of the blank abs. If blank absorbance out of range, system will display: "blank abs is out of range."

  You can press >> button , come to next windows, or press << button , come back this windows, you can press "cancel" button, exit program configuration windows.

1) Standards mode setting windows:

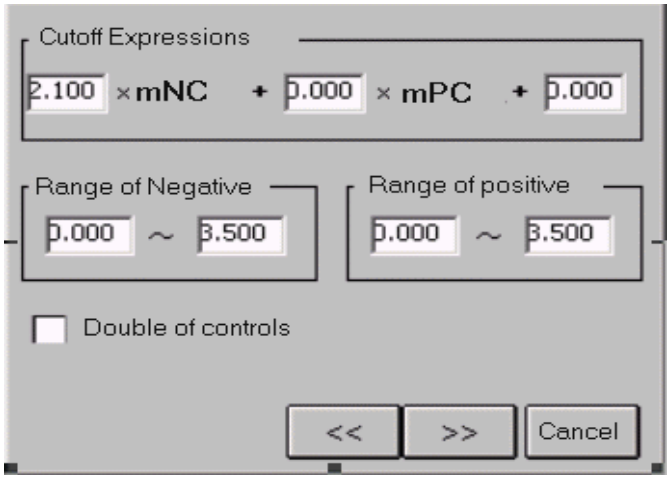


- Standard number: you can select up to 8。
- Concentration unit: you can select it from listing.
- Double standards: if select it, standards must be pipetted into consecutive two wells, the mean absorbance reading will be used to calculate a single concentration
- Standard conc. : double point standard conc. Listing, you can input standard concentration.



Notice: Standards may be entered in ascending order of absorbance. Standard 1 is the lowest concentration.

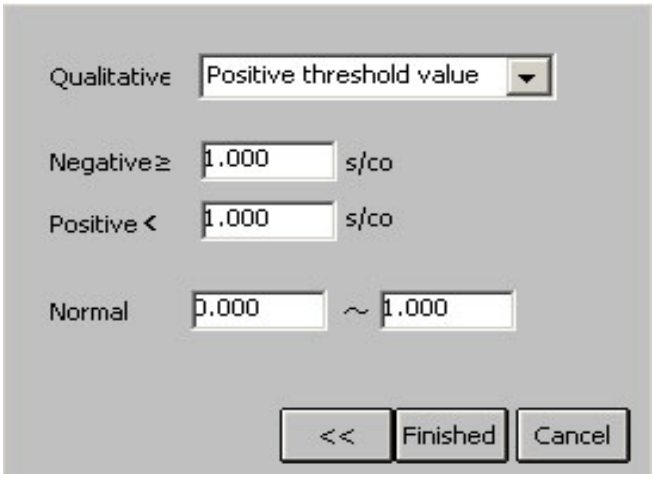
2) Cut-Off mode setting windows:



- Cut-Off formula parameter：Cov=X*N+Y*P+Fac.

  (Please see section 5.1.3)
- Range of Negative and positive: if absorbance of negative control and positive control is out of range, MICROPLATE READER calculates as min or max abs.
- Double of controls: if select this, controls must be pipetted into consecutive two wells, the mean absorbance reading will be used to calculate a single concentration

3) Positive and negative setting windows



Qualitative mode: In this option you can select regular cov, reverse cov, none.

- Regular cov: Samples with values higher than the positive cutoff are labeled as positive. Sample with values lower than the negative cutoff are labeled as negative. Any samples with values falling between the negative cutoff and the positive cutoff are labeled as equivocal.
- Reverse cov: Samples with values lower than the positive cutoff are labeled as positive. Sample with values higher than the negative cutoff are labeled as negative.
- None: you can select none if you don't award negative or positive.

Normal range: please input the values with reagent instruction

Press "Finished" button, come back program listing windows.

5.3 Creating program

Press "new" button to create a new program, then input the parameters. If the program name has existed, system will warning:"program exists."

5.4 Deleting program

Select one program in program listing, press "delete" button, system display windows:

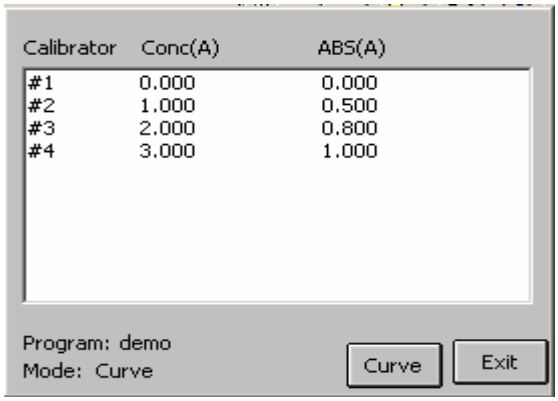
Press "Yes" button to delete program. Press "NO" button to cancel.

5.5 Standard

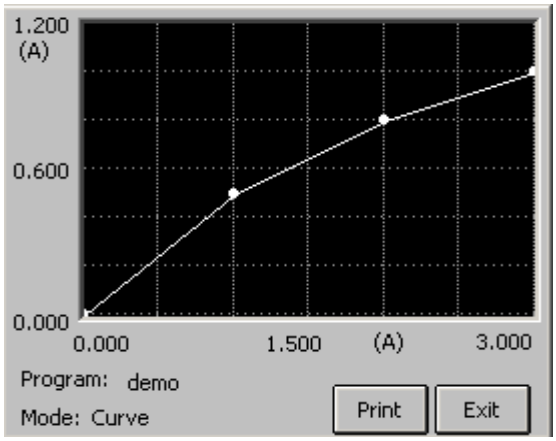
Standard test results and curve will be stored. Operator can review and print the results.

Select one program in program listing, Press "standard" button, system display standard

conc. and abs.



Press "curve" button, system will display standard curve:



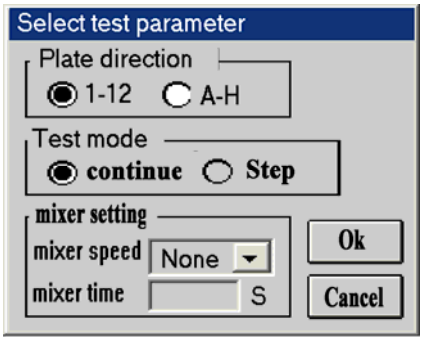
Press "print" button, system will print standard curve.

Notice : Old standards will be deleted if modifying program setting. (Wavelength, calculate mode, standard number, standard conc.etc.)

6. RUN THE TESTS

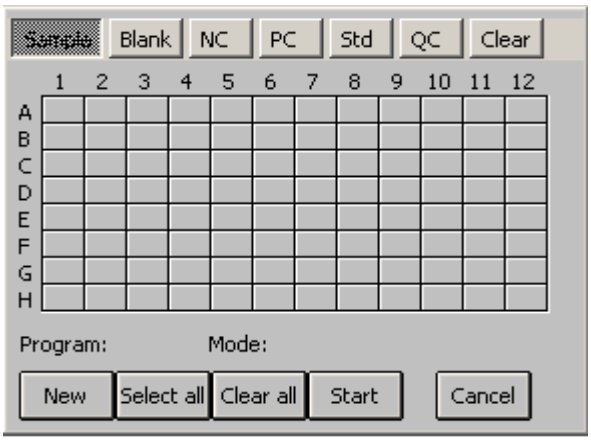
6.1 Plate Parameters Setting

Press "test" icon in main menu, pop up such windows：



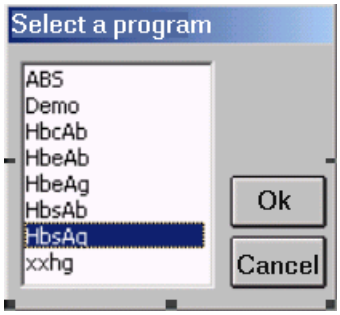
- Plate direction: A-H direction and 1-12 direction.
- Test mode: You can select continue mode(< 5 seconds = or step mode (< 15 seconds = 。
- Mixer setting：

  Mixer speed: you can select fast, normal, slow or none.
  Mixer time: you can select 1-60 seconds.
  Press "Ok" button, come to next windows:



6.2 Select Test Program

MICROPLATE READER support 12 programs in one plate, first press "New" button, the following windows display:

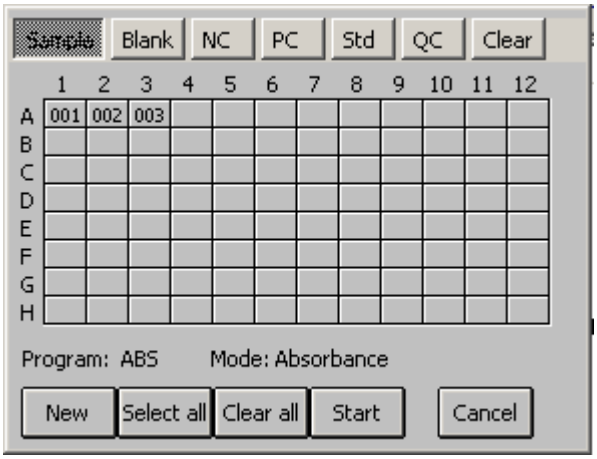


select the program，press "OK" button.

NOTICE: if you test multi-programs in one plate, you must set the programs one by one. STD: standard

6.3 Mark well

You can set each well's function. Select well's function firstly, and click the well which you will mark.



mark label： sample：1–999

blank：B

negative controls：NC

positive controls：PC

standard：S1–S8

Quality Control：QC

6.3.1 Sample

Click the well which will be tested, then the well will be marked .If you modify sample No., please click that well again. A windows display:

Input sample No.again.If you input No. already exist, system display "sample NO. Already exist, input again."

Notice : One patient is marked by only one sample NO. In one day. Negative controls:NC Positive controls :PC

6.3.2 Blank

You can select blank well or no in different program. One program only set a blank well. Old blank value will be saved automatically and be used.

6.3.3 Negative controls

You must set one negative control in one program other than negative control factor is 0.。

6.3.4 Positive controls

You can see negative control setting. (Section)

6.3.5 Standard

This option is valid only when one program needs standards. If this program has old standards values, you can select set standards or not.

Notice : If one program set standards and test good , new values of standards will cover old values.

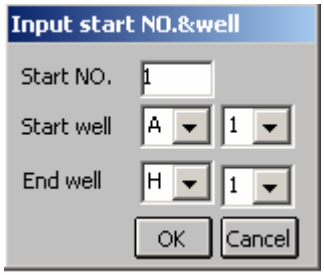
6.3.6 Clear

If you want delete marked wells, press "clear" button, then point wells that what you want.

6.4 Select All

Use this button; you can quickly mark the sample wells.

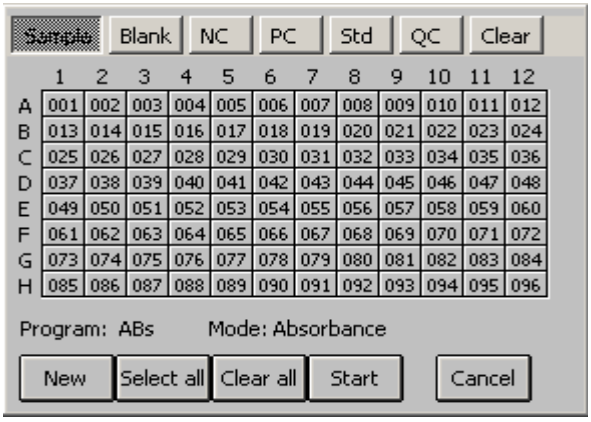
Press "select all" button, display such windows:



input start number(1-999)and start well(row number and line number),press "Ok" button.

All wells in this plate will be marked samples. Start No. is that you input.

In this option all set program and wells will be deleted. You should set standards and controls after "select all".



6.5 Clear All

Press "Clear all" button, system display:

Press "yes" button, clear all well setting.

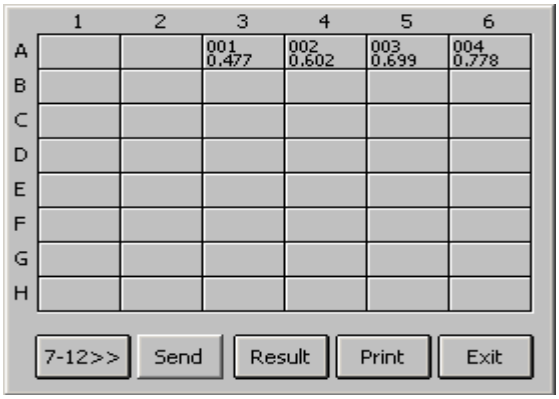
6.6 Test

Press "start" button, system will test the plate:

You can press "stop" button to stop the test.

6.7 Results

The test results will be displayed:

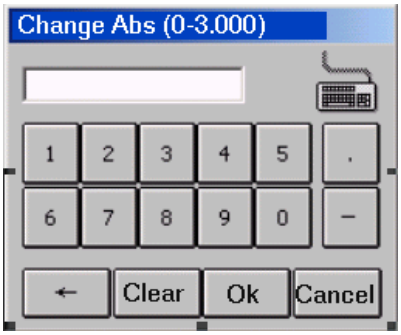


1-6 columns abs results will be displayed, press 7-12>> button, windows will display 7-12 columns abs results.

Sample: 001 is sample number, 0.040 is abs results.

Notice：if abs results> 3.500A ，will display 3.500* ，and calculate by 3.500,if abs<0.000A,display 0.000* ，and calculation by 0.000.

you can modify the well result by click the well：

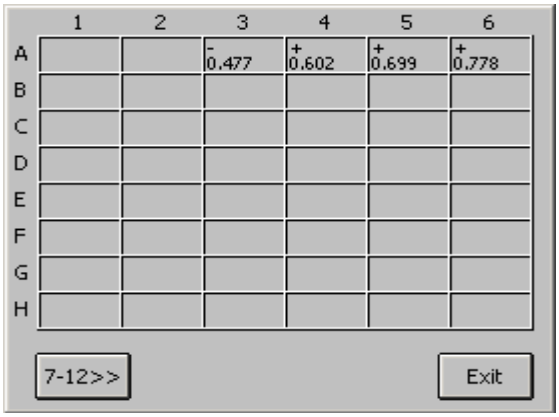


Input abs value and press "ok" button.

notice：Standard or control abs change will affect all results in this program!

6.8 Calculation Results

Press "result" button in abs result windows, display calibration results:



You can see the values and negative/positive mark display in every well. If the values in some well <0.0 ,"*" will be labeled to this well.

6.9 Printing

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notice：QTA: quantitative analysis

QLA: qualitative analysis

Press "Print" button in testing windows, MICROPLATE READER will print all test results.

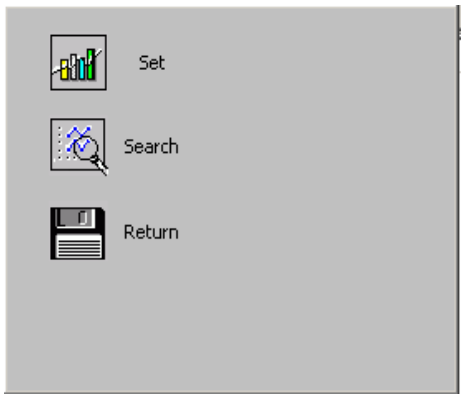
6.10 Storing Test Results

Press "cancel" button in Abs windows, The instrument will automatically store the test results in history database.

7. QC MANAGE

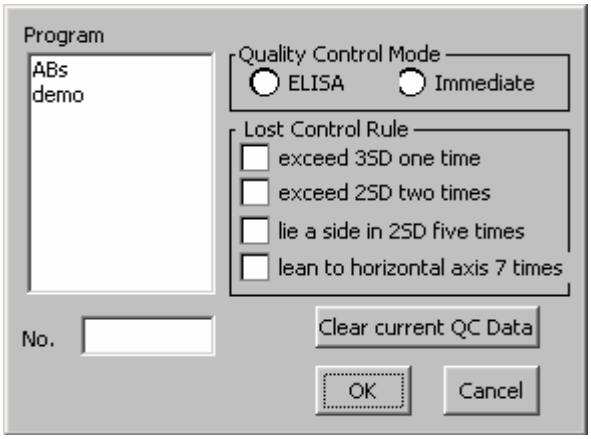
7.1 OPERATION

Press "QC Manage" in main menu, system display such windows:



Now QC set and QC search function will be introduce.

7.2 QC SET



At first you can select one program in the program list, then select a way about quality control.

The next step is to input the number of quality control, and press the "OK" button to memory your setting.

7.2.1 ELISA SET

The way of ELISA have four kinds of condition to estimate the quality control data controlled or not. Of course, you can select one condition or more.

7.2.2 IMMEDIATE SET

Select the immediate button and the data of QC test will be estimate by the immediate way.

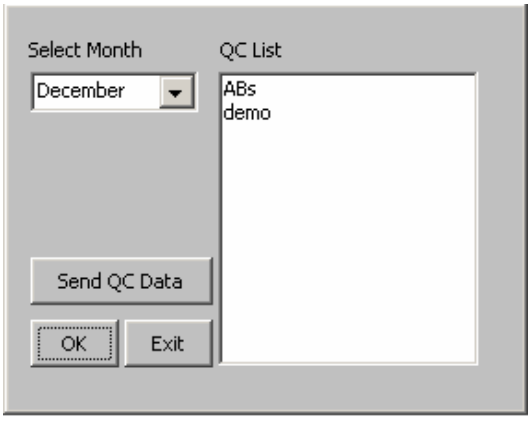
NOTE: when the way of quality control is changed, you must clear the data of quality control. Otherwise the estimation of quality control will be invalid.

7.2.3 CLEAR DATA OF THE CURRENT MONTH

Press the "Clear current QC data" button, the all data of current month will be deleted.

7.3 QC SEARCH

7.3.1 OPERATION

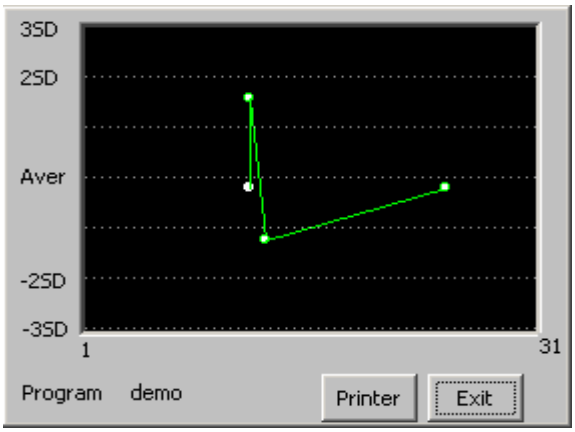


Select the searched month from the month list and select the program. Then the relative figure of quality control will be displayed in the windows.

Select the searched month from the month list and select the program. Then press "Send QC Data" ,you can send the QC data of the selected month about the selected program to PC.

NOTE: if QC test doesn't set in the selected month, the figure of quality control will be empty in the month. If you want to get the figure, you must set the way of quality control and quarantee the program number is identical.

7.3.2 QC FIGURE

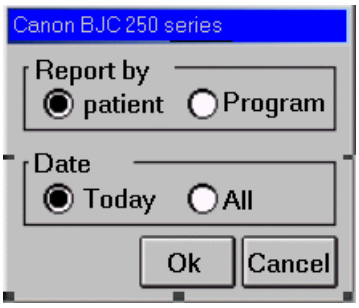


Press the "Printer" button, the figure of quality control can be printed.

8. REPORT

8.1 Report form

Press "report" in main menu, system display such windows:

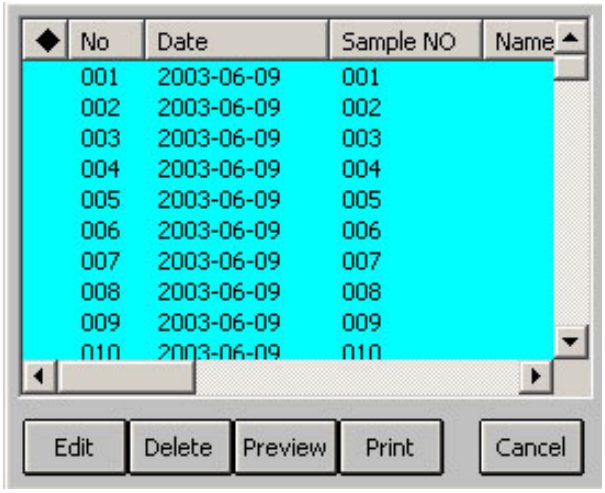


Select report form:

- Report form: report by patient list or program list.
- Date range: today and all of days.

8.2 Report By Patient list

Select "patient ", press Ok button, display following windows:

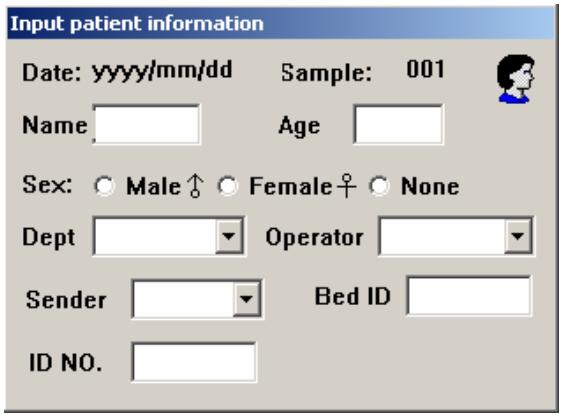


1) Select one patient

2) Mark multi-patients：You can mark all patients by pointing first line in the title bar.

8.2.1 Edit patient data

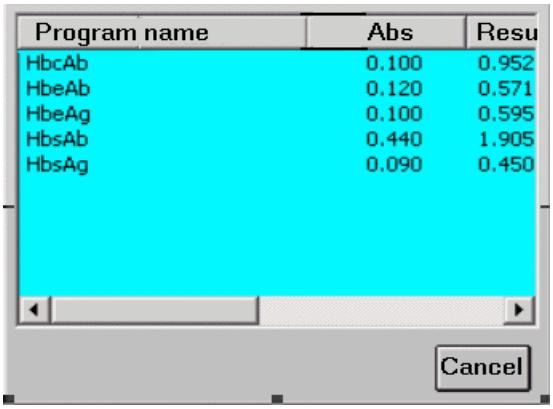
Select one patient, press "Edit" button, patient's information windows pop up:



Input the information. Press "Ok" button to save information, press "cancel" button to exit without save.

8.2.2 Preview report

Select a patient, press "preview" button, that patient 's data display in list.



8.2.3 Delete patient data

Press "delete" button,windows pop up:

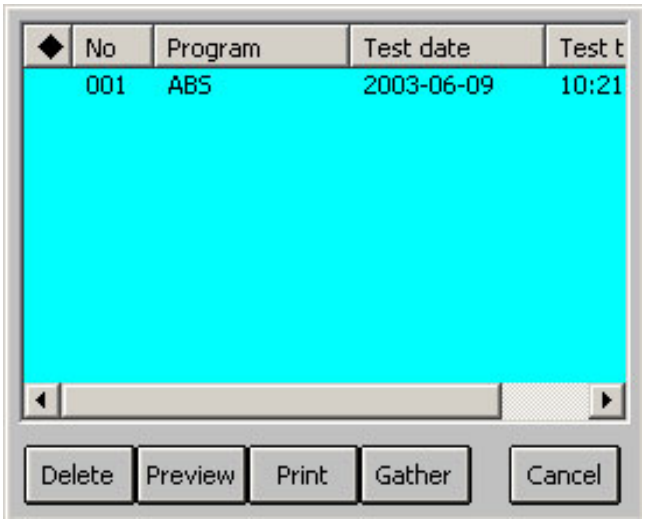
Press "yes" button, all marked patient data will be delete. Press "no" button, exit without save.

8.2.4 Print report

Press "print" button, all marked patient report will be print.

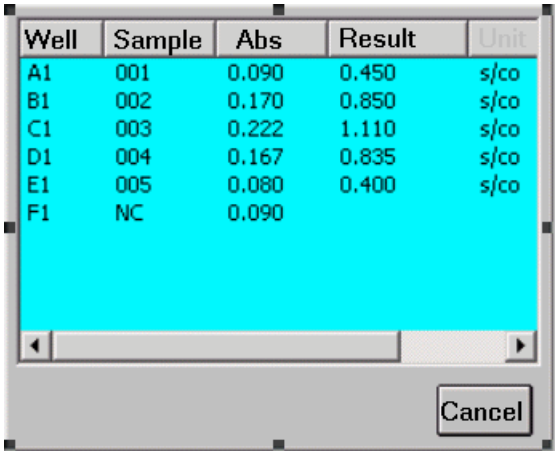
8.3 Print By Program list

Select "program", press "ok" button, and pop up program list windows:



8.3.1 Preview report

Select one program, press "preview" button, and pop up preview windows:



8.3.2 Delete program

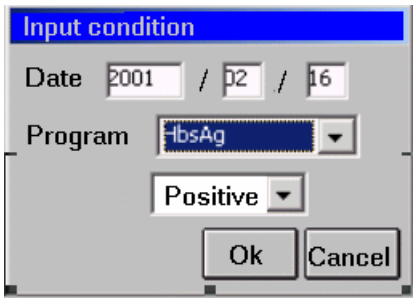
Press "delete" button and "yes" button,all marked program and test data will be delete.

8.3.3 Print report

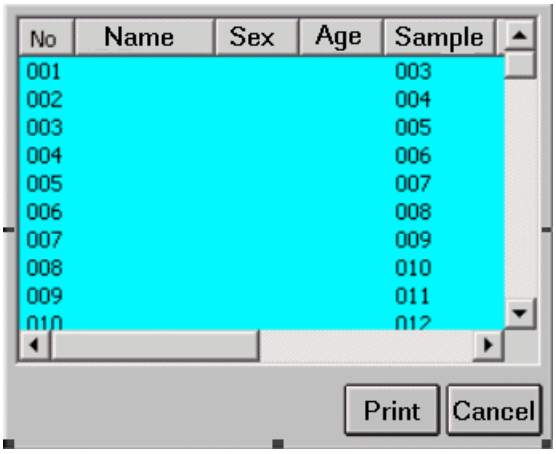
Press "print" button, all marked program's standard curve and test data will be print.

8.3.4 Gather print

MICROPLATE READER support gather print, you can quickly print all negative or positive patient data in one day. Press "gather" button, come to next windows:



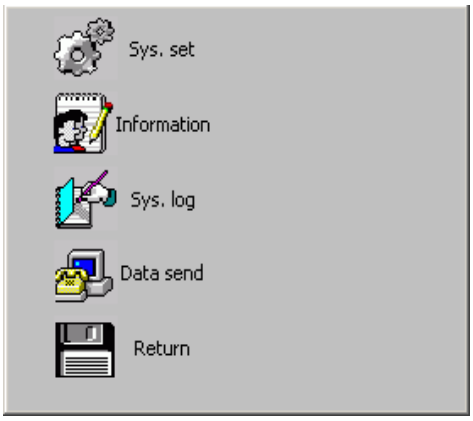
Input date, select program and results from list, press "OK" button, all patients coincidence condition display in listing windows：



Press "print" button, all data will be printed.

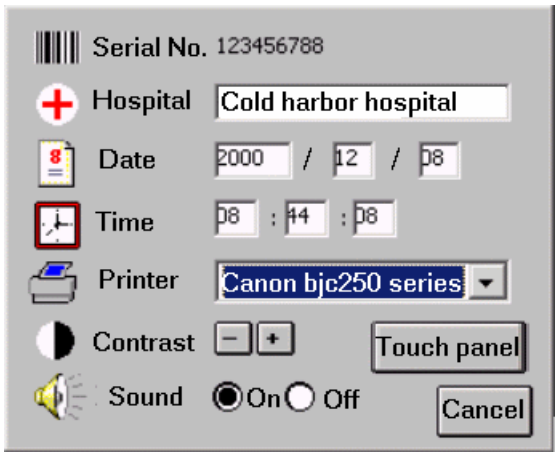
9. System Manage

Click "System" icon in main menu, the following windows will be displayed:

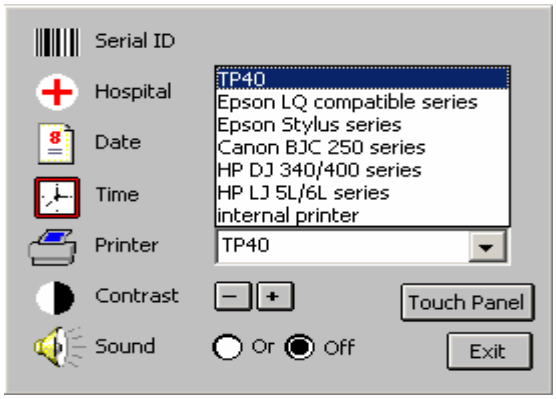


9.1 System setting

Press "sys. set" button in the above windows, the following windows will be displayed:



1) Serial NO
2) Hospital: hospital name.
3) Date and time
4) Printer: MICROPLATE READER support 7 series printers: TP40, Canon BJC 250 series ,HP DJ 340/400 series ,HP LJ 5L/6L series, Epson LQ series ,Epson Stylus series, and internal printer. please see such windows:



You can choose one of printers

Notice：If printer setting is wrong, maybe printer works error.

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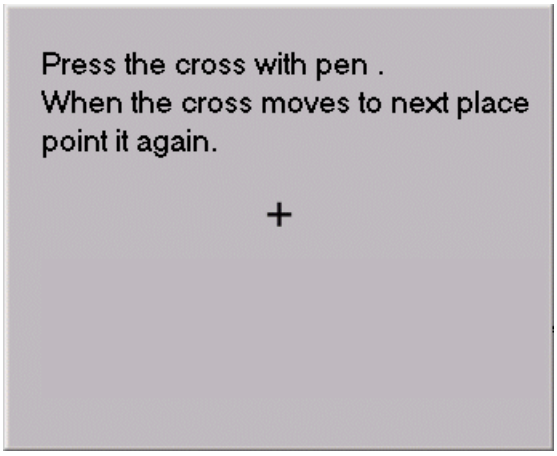
5) Contrast adjust : press + button to increase contrast , press - button to decrease contrast. New value will be saved and used.

6) Sound switching：Turn on or off the speaker

7) Touch panel calibration ： You can calibration touch panel. Press "touch panel " button, come to calibration windows：



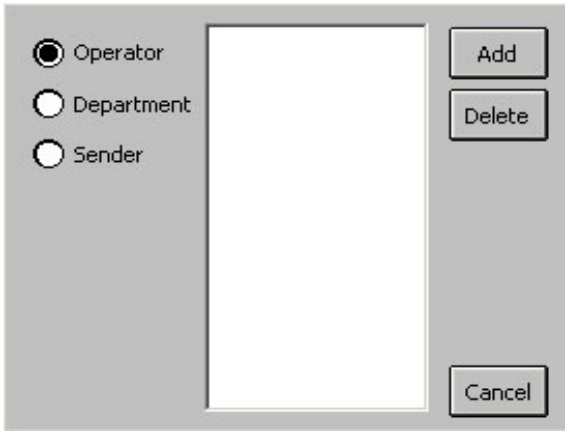
Press the cross center by pen, wait one second, the cross moves to next place automatically. You should continue press cross with pen again. The same operation repeats 5 times, system will display next windows:

Notice：The cross doesn't move after pressing it, Please try it again.

Please click anywhere in the panel, system will save new setting and come back system setting windows.

9.2 Information

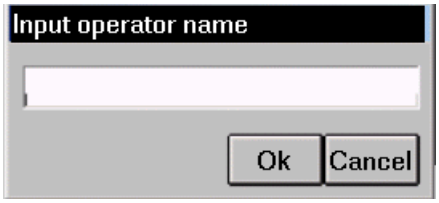
Press "information " button in System windows, come to the following windows:



MICROPLATE READER has an operator database and department database. You can add or delete operators/department in those database. MICROPLATE READER can store 100 records in those two databases.

Select operator or department. For example operator database:

1) add record : press "add" button, input operator name in windows :



Press "OK" button, operator's name add to list. If this operator's name already exists, system will display windows:

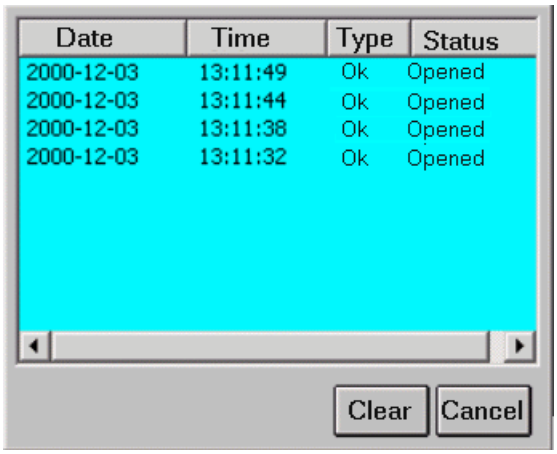
If database reach high range, system will report, "operator's records is over."

2) Deltree record：Select one operator in operators listing, press "Delete" button:

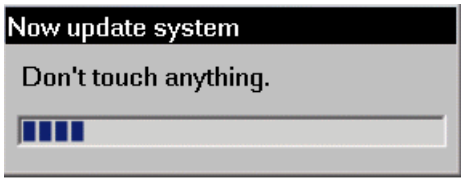
Press "Yes" button to deltree that record, press "No" button to cancel.

9.3 System log

Press "sys. log" button in System windows, you can view history log:



System log contain date, time, type and event status. MICROPLATE READER can record max 2500 events. Last event arrange firstly. You can press "Clear" button to deltree all event records. Press "Cancel" button to come back main menu.



9.4 Communication to PC

MICROPLATE READER can connect to pc then send data to pc. With external software,

you can store patient lists, see curves, print reports, and then collect QC data.

For more information regarding pc software, contact your dealer.

1) Turn MICROPLATE READER and pc, connect serial cable to MICROPLATE READER, and plug another end in pc COM1.

Warning: MICROPLATE READER and PC don't open when connecting serial port, otherwise hardware will be wrong.

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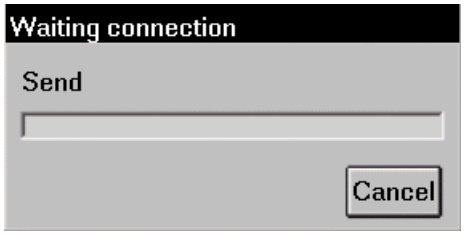
2) Run PC external software in your PC.

3) Press "Data send" button in main manual，come to next windows, Waitting



4) Sending data finished, press "Cancel" button to come back main menu.

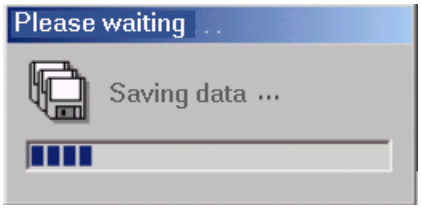
10. POWER OFF

Press "Power off" button in main menu, display such windows:

Press "yes" button, instrument will be turned off. Press "no" button, exit to main menu.

Notice：If don't turn off instrument normally, results and parameters edit in this time will not be save.

System will display such windows:



Warning：Please keep power when turn instrument off. The instrument may fail to operate normally if the power is interrupted.

When data saved, such windows will display:

Now you can turn the power switch off safely.

Notice：Turn MICROPLATE READER off for at least 30 seconds and turn it on again.

11. INSTRUMENT SERVICE

11.1 Maintenance

MICROPLATE READER is designed to be a maintenance free instrument. To insure optimum trouble free performance, the instrument should be kept dry and operated in an area free from excessive dust.

11.2 Cleaning The Instrument

- Keep working environment clean
- Use a slightly damp soft cloth to remove dirt or spills. For decontamination, 70% isopropanol is recommended.
- Use soft cloth to remove dirt or spills in LCD.

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notice：Use other chemicals or abrasive cleaners are not recommended.

11.3 Changing Part Of Instrument

11.3.1 Changing the fuses

1) Disconnect power cord from mains supply before replacing fuses.
2) Open fuses box left in power, change fuses, close fuse box.

   Fuse specification：250V/3.15A.

3) Turn the instrument on.

Notice： Use the same fuse for replacing.

11.3.2 Changing the lamp

1) Turn the instrument off , open instrument cover by unscrewing the one screw on the front of the instrument.
2) Remove four screws of the optical assembly cover. Remove the cover.
3) Lift up the lamp with the terminal socket. Pull the terminal socket from the lamp contacts.
4) Refit the terminal socket to the contacts of the new lamp(OSRAM64607 ,8V/50W).Place the new lamp in its place.
5) Close the optical assembly cover. Replace the screws.
6) Close the instrument cover. Turn MICROPLATE READER on again.

11.4 Troubleshooting

Symptom	Causes and Remedies

MICROPLATE READER does not Turn on	Check power supply cord Check fuses Check power voltage Turn MICROPLATE READER off for 30 seconds and turn it back on.
Lamp does not light	Check lamp Voltage Lamp is bad Change lamp
RAM check error	Turn MICROPLATE READER off for 30 seconds and turn it back on. Firstly turn MICROPLATE READER on and secondly turn printer on. Cable connect error, turn MICROPLATE READER off, open instrument cover, and reconnect cable between two pcb.
Lamp is too high	Filters install in wrong place.
Lamp is too low	Lamp is bad and changes it.
Motor does not work	Motor is bad Open the cover of the instrument, check motor.
Chopper wheel run faster	Chopper driver motor error Open the cover of the instrument,check chopper driver motor .
Filter does not come back zero place	Filter wheel error. Open the cover of the instrument, check sensor.
Plate does not come back original place	The plate may be does not place in right place. Check it.
Plate don't move	Driver Motor error, open cover, checks driver motor work or not.
Open COM port error	Maybe use serial mouse. Turn MICROPLATE READER off. Disconnect the mouse from instrument and turn on it again.
Printer don't work	Printer power works error. Check power is ok. Check ON/OFF button in printer. Check printer type in system setting right or not. Firstly turn MICROPLATE READER on then turn printer on. Check printer cable connect MICROPLATE READER right or not.
The printing is dim or incomplete	Change ink box, clean printer head. (See printer user manual)
The printing is jam	See printer user manual
Other printer error	See printer user manual

Notice：For more information regarding service, contact you dealer.