

## Safety Notices for Users

Please carefully read this *Operation Manual* before operations. If you do not operate the device according to regulations and methods as stipulated in this manual, safety measures and related protections provided by this device may be damaged or ineffective, life safety hazards may be caused accordingly.



Protective grounding



Any disassembly or change is not allowed, otherwise electric shock or fire may be caused. Any maintenance operations not stated in user manual are prohibited.



Due to biohazards, operators must wear disposable rubber gloves while operation. In case of broken skin, please do not touch the device to avoid virus infection. Sterilization must be carried out before operation or after maintenance.



When removing the plug, please use your finger to support the plug and then unplug it, instead of drawing the power cord. Otherwise, fire may be caused by electric shock or short circuit.

Do not use wet finger to unplug the power cord, otherwise electric shock may be caused.

Do not use damaged electric wires and connection cable, otherwise electric shock or fire may be caused.

Do not use any other electric wires and cables that are not in conformity with the design requirements. If the electric capacity is low, a fire may be caused.

Stop the operation immediately in case of any abnormal state.

Turn off the power and unplug the power cord in case of any burnt smell, peculiar smell or abnormal error.

Power outlet should have good grounding; otherwise electric shock may be caused in case of any electric leakage.

Regulations or guidelines stipulated in the *User Manual* should be carried out.

Do not use chemical reagents (such as turpentine oil or benzene) to clean stains at the

## DG5033A Microplate Reader

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surface of device, as it may cause the alteration of color and shape. Please use soft cloth or wet cloth to clean it. As for the serious stains, please use cleaning agent or 75% alcohol to clean it.

If there is any bolt or metal dropping into the device, stop the operation immediately, and ask the qualified maintenance staff to take out the metal, so as to avoid failures.

Do not put reagent and water onto the device table so as to avoid any damage due to the liquid dropping into the interior of device

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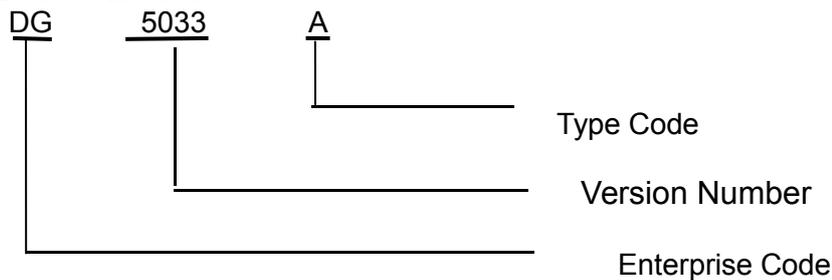
## I. Summary

DG5033A Microplate Reader adopts embedded computer control technology and has 8 optical channels, being provided with the functions of automatic feeding, automatic measuring, automatic data analysis and processing. It can print data as required by the operator. There are four standard spectral filters inside the device. It can carry out the automatic identification of signal or dual-wavelength measurement according to the operator's settings. The device is also provided with large screen LED display and touch screen input.

Applications: various clinical diagnoses, immunology, microbiology, veterinary science, monitor on plant pests and biochemical regulators, environmental organism and food inspection, biochemical genetics, endocrinology, bioscience, criminal prosecution, etc.

## II. Tehnical Data

### 2.1 Device Model



### 2.2 Features of Microplate Reader

2.2.1 Facility Management Type: II

2.2.2 Pollution Level: Level 2

### 2.3 Model and Specification of Fuse: F 1A 250V, $\Phi$ 5x20mm

### 2.4 Input Power: 100VA

### 2.5 Normal Working Conditions:

2.5.1 Power conditions: AC 220V, Frequency 50Hz

2.5.2 Environmental temperature: 5°C ~ 40°C

2.5.3 Relative humidity: when the temperature is lower than 31°C, the max. relative humidity is 80%; when the temperature us 40°C, the relative humidity declines to 50%.

2.5.4 Atmosphere pressure: 86 kPa ~106kPa

2.5.5 Working position: horizontal

2.5.6 Working times: 8 hours continuously

2.5.7 Surrounding environment: indoor, without electromagnetic interference

## 2.6 Transportation and Storage Conditions

2.6.1 Environmental Temperature:  $-20^{\circ}\text{C} \sim 55^{\circ}\text{C}$

2.6.2 Relative humidity:  $\leq 95\%$

2.6.3 Atmosphere pressure:  $86 \text{ kPa} \sim 106 \text{ kPa}$

2.6.4 Under such transportation and storage conditions, before electric connection and use, the device should be put under the normal working conditions for 24 hours.

## 2.7 Main Technical Data

2.7.1 Scope of readings:  $0.000 \sim 4.000 \text{ A}$

2.7.2 Linear Range:  $0.000 \sim 2.400 \text{ A}$

2.7.3 Repeatability:  $\text{CV} \leq 0.3\%$

2.7.4 Stability: after working for 1 hour, drift  $\leq \pm 0.003 \text{ A}$

2.7.5 Speed of reading plate: signal wavelength  $\leq 6 \text{ s}/96 \text{ hole}$

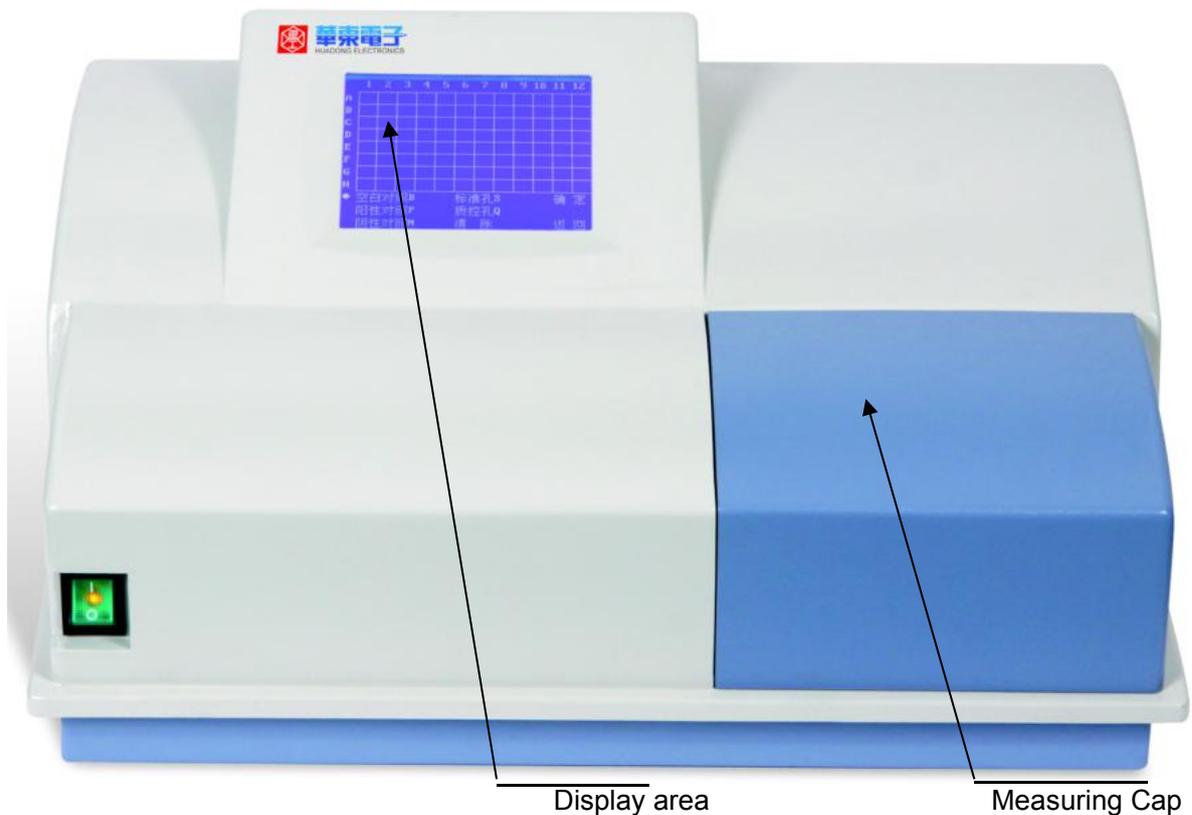
2.7.6 Function of vibration plate: 5 options available for vibration plate strength (from weak to strong), vibration time is adjustable from 0s to 240s.

2.8 Device dimension: about  $468 \times 377 \times 210 \text{ (mm)}$

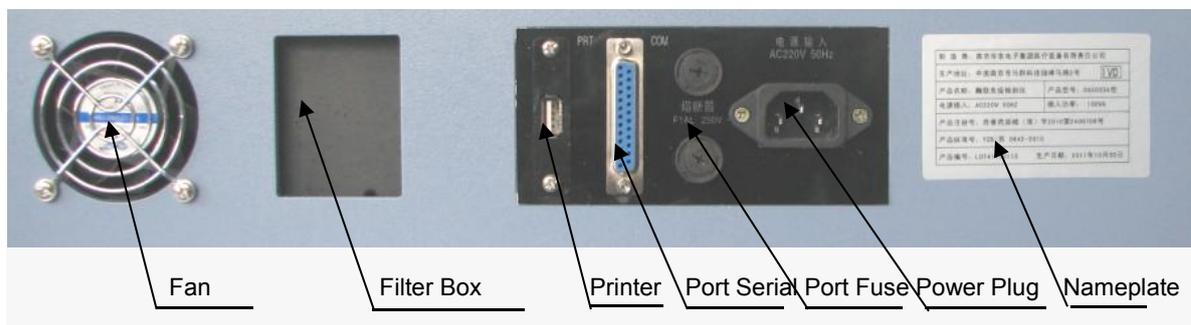
2.9 Device weight: about  $15 \text{ kg}$

2.10 Device Outline Diagram

Front View



### Back View



## III. Instructions for Device Transportation, Installation and Assembly

### 3.1 Transportation

This microplate reader adopts three-layer packaging. Inner packaging is the moisture-proof plastic bag, middle packaging is rigid shockproof foam, and the outer packaging is rigid cardboard box. Packaging provided by the manufacturer should be adopted for the delivery of this microplate reader. The microplate reader with complete packaging can be delivered via common transportation tools. During the delivery, rain, snow and strong shock should be avoided.

### 3.2 Environmental Requirements

The device should be far away from dust, vibration, strong electromagnetic interference and corrosion sites. The device does not any strong electromagnetic interference to network power and other equipment. It should also be far away from direct sunshine, and should not be operated under the conditions with higher humidity or temperature difference. The device must be operated under the normal working conditions stated as above in Clause 2.5.

### 3.3 Installation and Assembly

3.3.1 Put the device onto horizontal working table (the device is about 15Kg, which requires that the load bearing of working table should be more than 50Kg).

At working state mode: connect 25-pin port of serial cable with 25-pin serial port at the back plate of microplate reader, connect 9-pin port and computer serial port (com1 or com2), and install the printer onto the computer. As for the installation of printer and its drive, please refer to the instructions attached to printer.

3.3.2 If the conditions of storage and transportation beyond normal operating conditions, before power connection, the device should be put under normal operating conditions more

than 24 hours, and immediate power connection is prohibited.

3.3.3 If the regulations stated in Clause 3.3.2 are satisfied, the power of microplate reader should be connected to signal phase AC 220V, 50Hz network power.

3.3.4 Protective grounding: the connection of power cord and protective grounding of network power is adopted as the method for protective grounding of this device. So at the time of normal operation, the power cord must be connected to the socket of network power (AC220V, 50Hz) with reliable protective grounding.

3.3.5 It is not good to put the device to be too close to the wall. The space no less than 10cm should be reserved for good ventilation. The space where power plug is connected into the network power (AC 220V, 50Hz) should be reserved sufficiently so as to guarantee that the power plug can be quickly and smoothly removed from the power socket. In case of any problems, maintenance or long-term shutdown, please unplug the power cord.

3.3.6 During the experiment, measuring samples and reagents may be virus infectious and corrosive, and the operators should take efficient protection measures. Waste after experiment should be put into the special waste container under control. IF the sample or reagent drops onto the device during the experiment, microplate reader should be turned off immediately, and take the efficient treatment as stipulated in Clause 5.5. In case of any repair due to problems, the packaging, transportation and maintenance should be carried out after sterilization.

3.3.7 Standard 48-hole or 96-hole microplate reader plate carrier is adopted.

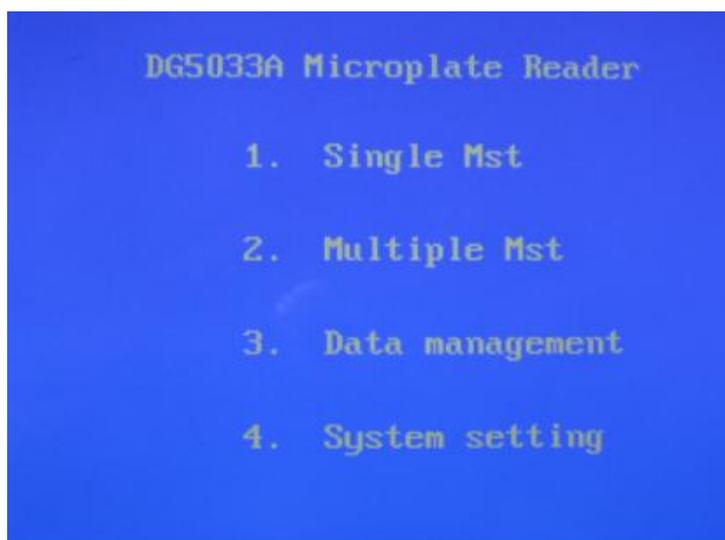
## **IV. Measurement Operation**

### **4.1 Startup**

Open the power switch to check that whether the fan of microplate reader is operated or not and that whether the LED screen can show the main menu (as stated in the following diagram). (In case of any abnormal operation, please refer to “Troubleshooting” for details or contact the manufacturer.)

If there is no abnormal operation, start to measure after preheating for 15-30 minutes. After the operation of device for 1 hour, the device can achieve the best performance.

### **4.2 Main Menu**

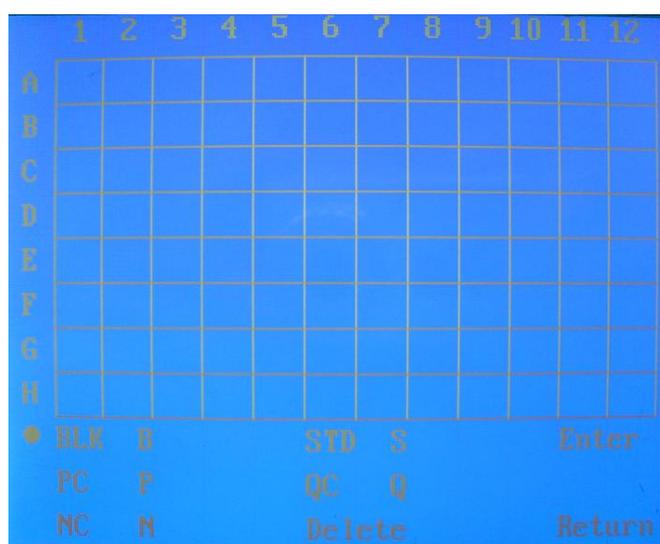


### Menu Functions

- 1、 Single Mst: it covers the functions of single qualitative experiment and quantitative measurement for each plate (such as AIDS, concentration experiment);
- 2、 Multi-proj Mst: it can measure many items at the same time for each plate (e.g. HBVM);
- 3、 Date Management: inquire the measurement records for display or data printing;
- 4、 System setting: set the wavelength of spectral filter at the relevant position, vibration range and time before the measurement.

#### 4.2.1 Single Mst

Press “1. Single Mst” to enter into the interface for single measurement (this device adopts touch screen for input, so during the operation, users only need to press the characters shown at LED screen to select or enter for relevant setting.)



### 1. Qualitative Experiment

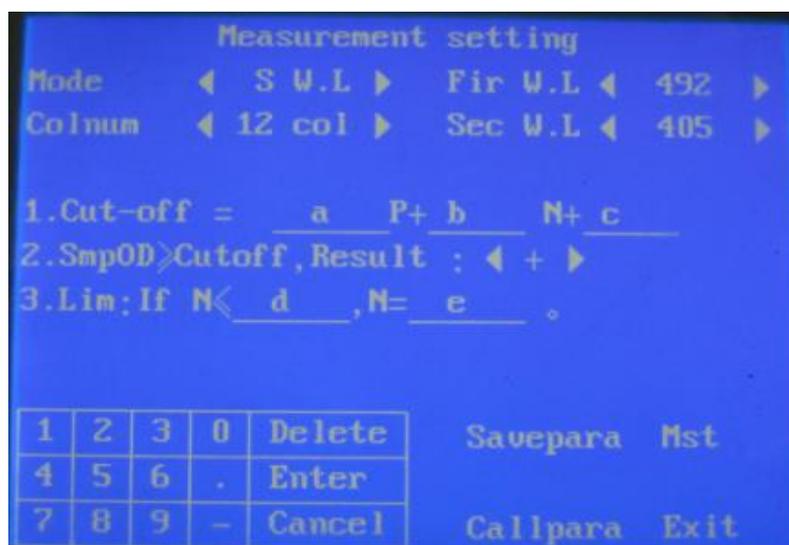
As for the following experiment settings, please carry out it according to the regulations stated in reagent descriptions.

1.1 Select “BLK B”: touch a grid at the touch screen to set the position of relevant blank control hole at the 96-hole plate (for example, touch the square frame at the first column and line A, then A1 hole will be marked with “B”, indicating that A1 hole is the blank control hole). You can set several blank control holes. The device will take the average value of all blank control holes as the final blank control hole for calculation. Press “Delete” to delete the previous blank control hole.

1.2 Select “NC N”: touch a grid at the touch screen to mark the position of negative control hole in the experiment.

1.3 Select “PC P” to mark the position of positive control hole in the experiment.

1.4 After finishing the setting, press “Enter” for the next part.



1.5 Set “Mode” ◀ S W.L ▶ , Press the direction keys to set the mode to Single Wavelength or Dual-Wavelength for reading plate.

1.6 Set Main or Subsidiary Spectral Filter, Fir W.L ◀ 450 ▶ , Users can select suitable spectral filter according to different experiment requirements. The factory configuration has four standard spectral filters of “405, 450, 492, 630nm”. If the reading mode is set to dual-wavelength, the second (subsidiary) spectral filter should be selected.

1.7 Set “Colnum “ ◀ 12 Cols ▶ , Decide the measuring columns according the positions of samples required being tested. In the device, A, B, C...H are called columns and 1, 2, 3...12 are called lines.

1.8 Set limit value, and the calculation formula is  $COV = aP + bN + c$ , in which, a, b

and c are reagent control coefficients, which should be set according to experiment requirements, P is the average value of positive control holes, and N is the average value of negative control holes. COV value= a (input by the user) × P (average OD value of positive control holes) + b (input by the user) × N (average OD value of negative control holes) + c (input by the user)

Click “a” and input the value of “a” from the keypad at lower left corner, and press “Enter” after the input. This is the value being multiplied by the value of “P” (positive control holes). Input the value of “b” from the keypad at the lower left corner, and press “Enter” after the input. This is the value being multiplied by the value of “N” (negative control holes). Click “c” and input the value of “c” from the keypad at the lower left corner, and press “Enter” after the input. This is the value for fine adjustment.

If the calculation of COV value in the reagent instructions does not require P positive comparison or c participation in the operation, it is not necessary to set the values of a and c. The default value of the instrument is zero.

1.9 Results determination (+/-) If it is set to ◀ + ▶ , it means that when the sample absorbance value (OD value) is higher than COV value, the result is positive and shown as “+”; and if the sample absorbance value (OD value) is lower than COV value, the result is negative and shown as “-”. If it is set to ◀ - ▶ , it means that when the sample absorbance value (OD value) is higher than COV value, the result is positive and shown as “-”; and if the sample absorbance value (OD value) is lower than COV value, the result is negative and shown as “+”.

1.10 Limit Set If  $N \leq d$ , “e” is taken for calculation “N” means the average absorbance value of negative control hole. “d” and “e” values can be set according to reagent descriptions (if the negative control value is lower and equal to 0.05, then “d” and “e” values can be modified to 0.050). If there is no limit, users may not modify such values and they will not be calculated for the final result.

1.11 After finishing the settings, put the prepared microplate reader onto the device carrier, cover the device and press “Mst” to measure it.

1.12 After the measurement, the result is shows as follows.

	1	2	3	4	5	6
A	4.621	4.621	4.194	4.943	4.943	4.943
B	3.517	3.615	3.495	3.475	3.564	3.540
C	0.008	0.000	0.000	0.000	0.000	0.000
D	0.000	0.000	0.000	0.000	0.000	0.000
E	0.000	0.000	0.000	0.000	0.000	0.000
F	0.000	0.000	0.000	0.001	0.000	0.000
G	0.000	0.000	0.000	0.000	0.000	0.000
H	0.000	0.000	0.000	0.000	0.000	0.000

● OD Value ● Up Save Print Exit  
+ | - Down

Data of whole 96-hole plate is shown in two pages. You may press “Up” and “Down” to switch it. Press “OD value” and “+/-” to display relevant contents. Press “Print” key to print the results. Press “Save” to save the data of this measurement.

Save Measurement Data

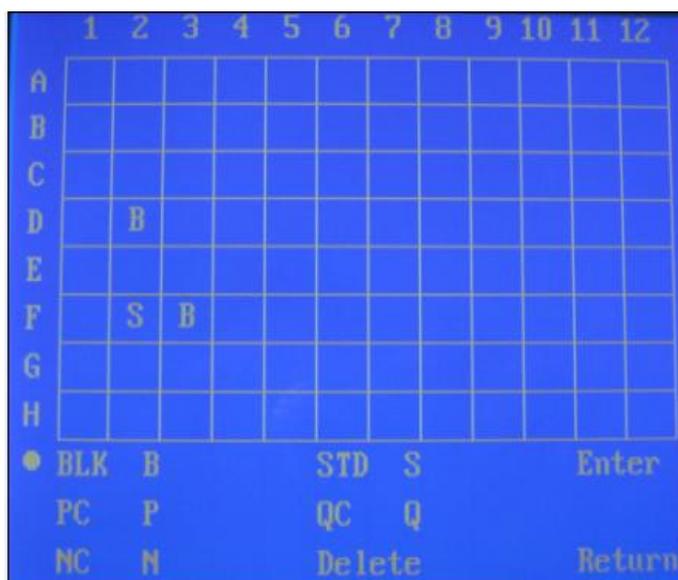
Saveproj: 234DF

0	1	2	3	4	5	6	7	8	Delete	Enter
9	A	B	C	D	E	F	G	H	Enter	
I	J	K	L	M	N	O	P	Q	Cancel	
R	S	T	U	V	W	X	Y	Z	- .	

Press “XXXXXXXXXX” to input the name. It is advised that the name can be formed by project code and data. After the input, press “Enter” to save.

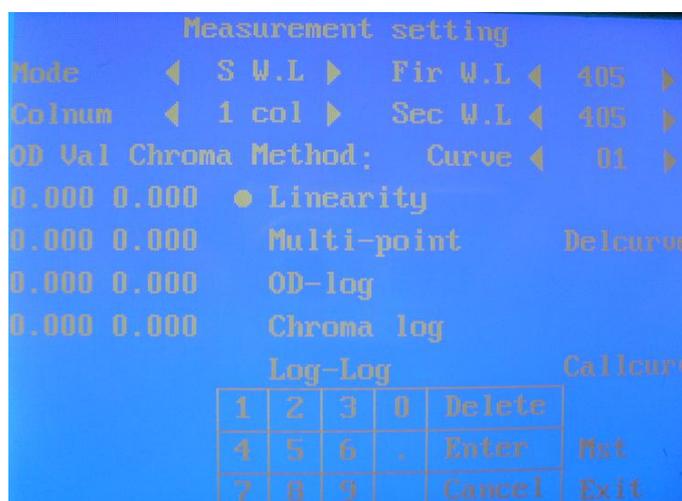
## 2. Quantitative Experiment

2.1 Enter “Single Mst”, set the position of “BLK” and “STD”.



In the experiment, if the standard curve saved before is adopted, you may set “S” at any hole position after setting “B”. Press “Enter” to get into the next interface, and then press “Callcurv” to select the required standard curve.

Press “Enter” after setting to get into the next interface.



2.2 Set the plate reading mode, wavelength, number of columns being measured according to the experiment requirements stated in Clause 1.5, Clause 1.6 and Clause 1.7.

2.3 Input the concentration of standard chemicals at the relevant positions according to the value stated in reagent description. After each input, press “Enter” at keypad for saving.

2.4 Select relevant fitting methods according to experiment requirements.

Linearity: make a linear regression of absorbance and concentration at X-axis and Y-axis for all standard chemicals, and take the absorbance value of samples being measured to equation and calculate relevant concentration value.

Multi-point: make a linear regression of X-axis and Y-axis for two adjacent standard chemicals in the methods of linear fit, and take the absorbance value of samples being measured to equation and calculate relevant concentration value.

OD-log: take the logarithm of absorbance value and then make a linear fit, and the other calculations are carried out in the same way of linear fit.

Chroma logarithm: take the logarithm of concentration value and then make a linear fit, and the other calculations are carried out in the same way of linear fit.

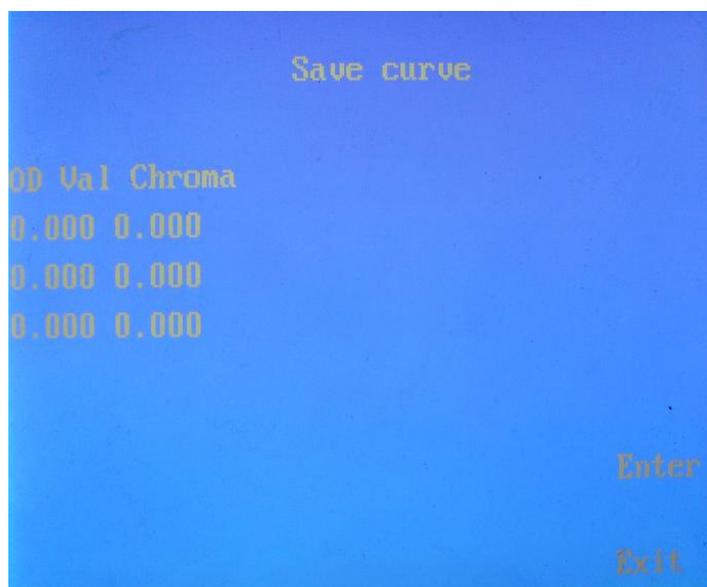
Log-Log: take the logarithm of absorbance and concentration values and then make linear fit, and the other calculations are carried out in the same way of linear fit.

2.5 After the setting, put the prepared microplate reader onto the device carried, cover the device and press "Mst" to measure it.

2.6 Reading, printing and saving the measuring results should be carried out according to the regulations stated in Clause 1.12.

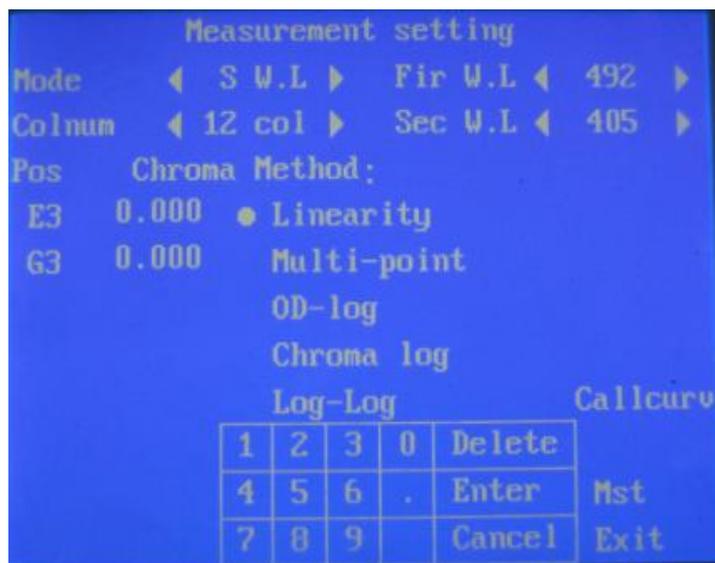
2.7 Save the curve: Press "save" key to save the curve of standard chemicals in this experiment, so that in the next same experiment, the curve can be used directly again.

(Notes: for different reagents, new standard curves should be created.)



Press "Enter" to save curve. In the next same experiment, the curve can be used directly again.

Press "Callcurv" and then press direction keys of curves ◀ 01 ▶ to select the required standard curve for calculating concentration of samples being measured in the experiment.



#### 4.2.2 Multi-proj Mst

Multi-proj Mst refers to measure several projects in the same experiment. This method is only applicable to the experiment of qualitative project.

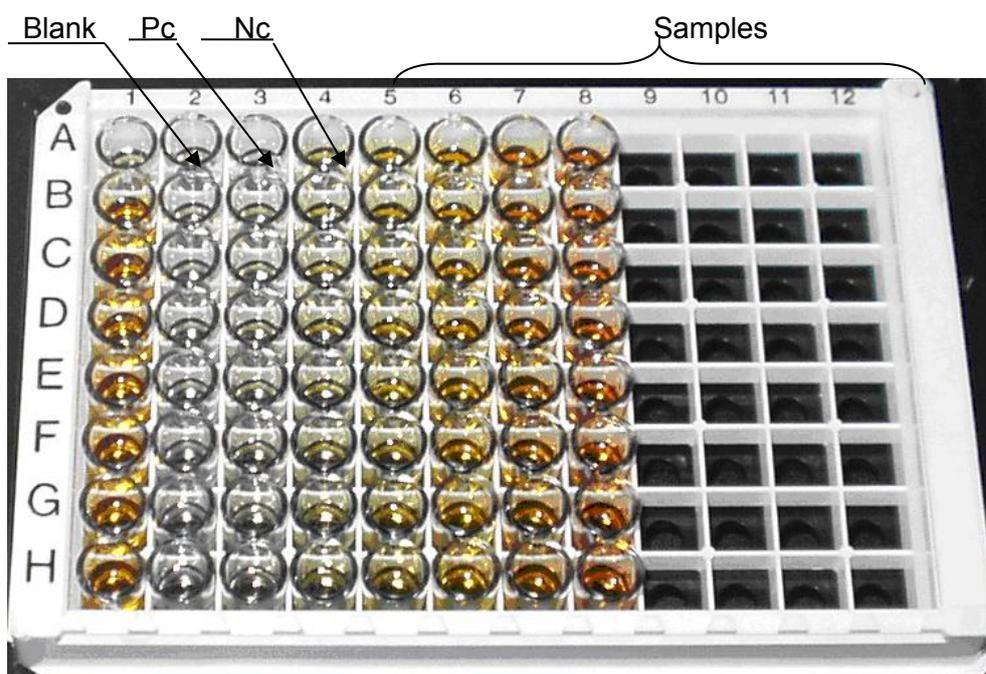
In Multi-proj Mst, it will be divided into (A1-A12) , (B1-B12), (C1-C12) ...(H1-H12). A1, B1, C1...H1 are the blank control holes for relevant items. A2, B2, C2...H2 are the positive control holes for relevant items. A3, B3, C3...H3 are the negative control holes for relevant items. A4-A12, B4-B12, C4-C12...H4-H12 are sample holes to be measured for relevant items. If there is no positive control hole in the experiment, A2, B2, C2...H2 holes should also be blank without any samples.

Blank: blank control hole

Nc: negative control hole

Pc: positive control hole

Samples: patient sample to be measured

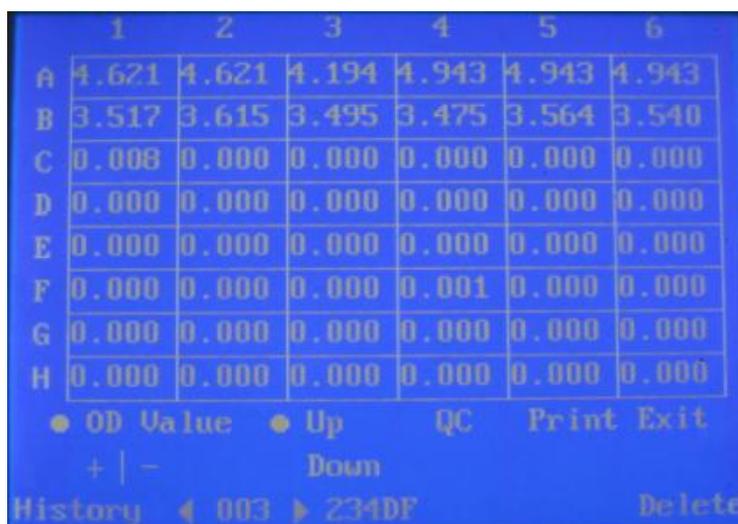


The setting and operations of plate reading mode, main and subsidiary wavelength, measuring columns, COV calculation formula and data saving are as same as that of signal qualitative measurement.

### 4.2.3 Data management

At the main menu, press “3. Data management” to inquire, print and delete the saved previous measuring data.

Press direction keys of History ◀ 01 ▶ to select historical data for inquiry.

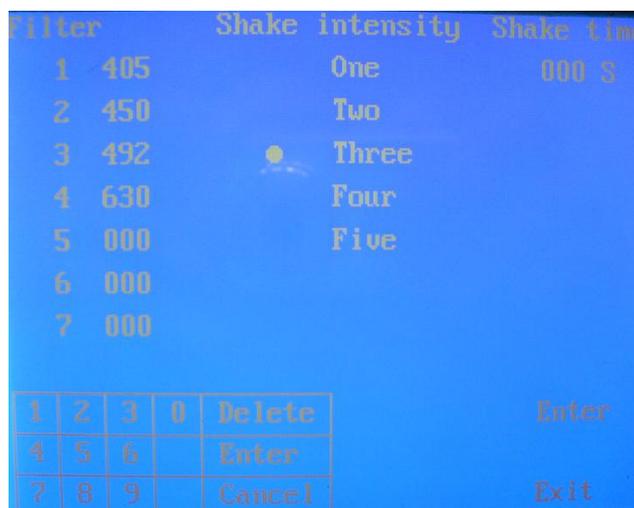


Data display and printing should be carried out according to the instructions stated in

Clause 1.12.

#### 4.2.4 System setting

At the main menu, press “4. System setting” to set spectral filter and vibration plate in the system.



Setting of spectral filter: this device is provided with 4 spectral filters, including 405nm, 450nm, 492nm and 630nm. At the installation of device, they should be put in the position 1, position 2, position 3 and position 4. Moreover, this device is also provided with 3 blank standby positions for spectral filters.

After changing new spectral filters, users should modify the wavelength at the relevant position in system according to the scale position at spectral filter wheel. Click the position required being modified, and input new wavelength on the keypad. After the input, press “Enter” key to save it.

Setting of vibration plate: there are five grades for the strength of vibration plate. Grade 1 is the weakest, Grade 5 is the strongest and Grade 3 is moderate. Time for vibration plate can be set among 0 second to 240 seconds. After the setting, press “Enter” to save it.

## V. Daily Maintenance

### 5.1 Maintenance

5.1.1 In order to protect the continuous stability and accuracy of microplate reader, any interference to any parts of optical system should be avoided. Any random change of optical system may lead inaccurate results of measuring.

5.1.2 In order to keep the optical system to be clean, any liquid into the inside of device should be avoided. Any dust and other damaging substances should be also avoided. Do not use hand or other rigid media to touch the spectral filter, lens surface and optical detection device.

## **5.2 Regular Cleaning of Device**

5.2.1 Turn off the power switch, unplug the power cord of microplate reader to guarantee the disconnection of device and network power.

5.2.2 Wear disposable gloves and use disposable wipe to clean the surface of device via water or mild detergent.

## **5.3 Cleaning of Optical System**

5.3.1 Turn off the power switch, unplug the power cord of microplate reader to guarantee the disconnection of device and network power.

5.3.1 Unscrew the screw fixed on the upper cover of device, lightly open the upper cover, unplug the cable wire connected with the bottom plate, and put the upper cover at the table top in a stable status. Notes: Please do not use hand or tool to touch the circuit plate, especially 8 potentiometers fixed at the measuring signal board.

5.3.2 Use disposable soft cloth in water or mild detergent or 75% alcohol to clean the focusing lens at the head of 8 fiber optic. If it is the 96% alcohol, you should use lint-free wet cloth to clean again. The 8 upper receiving lens should be cleaned in the same methods for several times.

Notes: Please do not use acetone to clean focusing lens or receiving lenses. The cleaning must be soft. The cloth in water or alcohol should not be too wet to avoid any dropping water or alcohol during the process of cleaning.

5.3.3 If the cover at the side of cassette is well sealed during regular operation, the cleaning of spectral filter is not required. If you want to clean it, you may open the cassette, draw off the spectral filter (in the right position), use lint-free cloth or lens paper to clean it, and then put it back to the original position and seal the cover at the side of cassette. Notes: please do not clean it with any liquid.

5.3.4 After the cleaning, the lens surface may be dry 5-10 minutes later. Plug the cable wire of upper cover back to the original position, lightly seal the upper cover, and tighten the screws at the upper cover.

Notes: Cleaning of optical system should be carried out regularly according to surrounding environment. Generally speaking, it should be carried out about once for each 6-12 months.

## **5.4 Sterilization Methods**

After using dangerous infectious substances, please sterilize the device according to the following methods.

5.4.1 Turn off the power switch, and unplug the power cord of microplate reader.

5.4.2 Wear disposable protection gloves and use disposable wipe to clean the

microplate carrier of device, and inside and outside of door via 75% alcohol or 1% glutaraldehyde. If it is necessary, please clean the whole optical system according to the methods stated in Clause 5.3.

## **5.5 Change of Fuse**

5.5.1 Turn off the power switch, unplug the power cord of microplate reader to guarantee the disconnection of device and network power.

5.5.2 After finishing the work stated in Clause 6.6.1, (if you do not unplug power cord from microplate reader or disconnect the power cord with network power, the fuse may have high voltage with possible personal injuries) lightly open two fuse sockets and use the fuses with the same specifications and models (F1A,250V) to substitute for the burnt fuses.

5.5.3 Install the fuse and tighten the fuse socket to guarantee that there is no looseness, and plug the power cord to start the device.

## **5.6 Change of Spectral Filter**

5.6.1 Turn off the power switch.

5.6.2 Use tool to unscrew cassette cover at the back side of the device.

5.6.3 Take the filter box from the rotary plate of spectral filter from. Please do not touch the surface of spectral filter.

5.6.4 Put new spectral filter into the filter box. If there is any neutral subtractive filter in the original box, put the subtractive filter into the box. Please carry out it lightly and do not damage the subtractive filter.

5.6.5 Lightly put the filter box into the original socket at the lower rotary plate of filter, and remember the position code.

5.6.6 After installing the spectral filter box into the right position, use hand to lightly rotate the plate without any collision and friction, seal the upper cover of cassette and tighten the screw to avoid dust and the leakage of light.

## **5.7 Change of Bulb**

If the bulb is broken or have been used for a long time, please dismantle it according to the following steps.

5.7.1 Turn off the power switch, unplug the power cord, open the upper cover of device, and carefully remove the cable wires connecting upper cover and bottom plate.

5.7.2 Unscrew the screw from the bulb box, take out the bulb and its box together and take the bulb from the socket. Please do not damage the bulb to avoid scratch.

5.7.3 Use the bulb with the same specifications and models to install onto the socket at the original position. Please do not touch the bulb and its inner surface.

5.7.4 Plug the cable wire of upper cover into the original position, seal the upper cover of device, tighten the screw, plug the power cord and open the device.

## VI. Troubleshooting

6.1 Trouble: no display after starting the device, and no response

- Analysis and treatment:
- a. Check that whether the power cord is well connected.
  - b. Check that whether the fuse is burnt out (unplug the power cord first so as to avoid electric shock).
  - c. Please contact the factory

6.2 Trouble: the deviation of test results is large or the value is zero

- Analysis and treatment:
- a. Open the cover of spectral filter cassette at back side of device, and check that whether there is any light after starting the device. If there is no light, the bulb may be broken or the connection may be not good, please refer to the Clause 6.8 for details about changing bulb.
  - b. If the bulb is not broken, after starting the device, check that whether there is any operation at the rotary plate of spectral filter. If there is no operation or it stops after several rotations, please contact the factory.
  - c. If the deviation of test results is large, check that whether the selected position code of spectral filter is accurate. Moreover, the failure may be caused by too long using time or bad environment, which leads inaccurate test results. Please refer to Clause 6.7 for details about changing spectral filter.
  - d. Please contact the factory.

6.3 Trouble: the microplate cannot be moved on while measuring or cannot return after being moved on.

- Analysis and treatment:
- a. Check that whether there is any obstacle around the microplate carrier. If there is no obstacle, move the carrier to the front position about 5~10cm. It can be returned after starting the device.
  - b. Please contact the factory.

6.4 Trouble: the measuring is normal, but it cannot print the test results.

- Analysis and treatment:
- a. Guarantee that the print mode is set to the first option or other options before measuring.
  - b. Please contact the factory.

6.5 Trouble: there are some unexpected long sounds or interrupted short sounds during the process of measuring.

- Analysis and treatment:
- a. Maybe the device cannot detect the position of spectral filter, so it sends the sounds after overtime.
  - b. Maybe the device makes a mistake in data exchange during the process of measuring, or maybe the optical detection components are broken, so it sends the sounds. In case of any conditions as stated above, please turn off the power for several minutes and then start the device for measuring. If try this solution for several times, but there is still long sounds or interrupted short sounds, maybe the optical detection components are broken.
  - c. Please contact the factory.

## VII. Important Notice

7.1 Before operating this device, first, please check that whether the power voltage is accordance with the requirements and whether the power grounding is good. If there is no problem, the device can be started.

7.2 Device case must have reliable grounding. After the connection, use a test pencil to check that whether there is any leakage of electricity under the status of starting and shutdown.

7.3 After shutdown, the device cannot be started within 10 seconds. During the operation of device, its AC voltage shall not be fluctuated (for example, power socket or circuit connection is not good, or the power switch is turned off but turned on soon). If the alternating voltage has a large fluctuation, use AC voltage stabilizer.

7.4 Unplug the power cord at the time of changing fuse or bulb or opening the upper cover of device, so as to avoid electric shock.

7.5 When you put the microplate onto the carrier, please be careful. It should not be tilted. Any leakage of test solution is prohibited. Microplate should be put in the right position and be tightened. While measuring, close the door to avoid leaking of light. If

you do not need to use it, please close the door also to avoid dust.

7.6 Cover of spectral filter cassette at the back side of device should be well installed, and should not be opened or removed to avoid light and dust, so as to avoid inaccurate measuring. Except that it is required to change the spectral filter, then the cover can be opened.

7.7 The optical and electrical circuit of device should be well adjusted before delivery. Only professional staff can change the settings, so as to avoid the influence to normal operation or to avoid the components being damaged. While changing or cleaning device components, we should avoid touching circuit board or components.

7.8 The device should be put in a dry place with good ventilation. Take measures to keep away from moisture. It should be electrified for several times in every month, and each connection should be no less than 2 hours. For each six months, it should be electrified for a long time, about 4-8 hours.

## **VIII. Maintenance Service**

8.1 If the user operates the device according to requirements stipulated by the factory, and the device cannot reach the provided indicators, the factory will be responsible for free maintenance within one year from the date of delivery.

8.2 During the warranty period, users shall not take any unauthorized disassembly of the components not covered in "Daily Maintenance" so as to avoid any bigger problems due to lack of knowledge. Otherwise, the users should be responsible for the expenses even during the warranty period.

8.3 If the user wants to repair the device after warranty period, only qualified technical staff that is familiar with the device structure and principles of circuit can carry out the repair. Our factory will not be responsible for repair quality of device and personal safety of maintenance staff.

8.4 If the user wants to order device components or repair the device, they may contact the factory either in the warranty period or beyond warranty period.

## **IX. Appendices**

Order Information (part of changeable components and materials provided by the manufacturer)

1. Spectral filter (400~750nm): 405, 450, 492, 630nm and other regular wavelength
2. Matched neutral subtractive filter
3. Empty spectral filter box
4. Fuse (F1A 250V,  $\phi$ 5x20mm)
5. Bulb (12V, 20W)

6. Stepping motor
7. Touch screen
8. Operation Manual of Microplate Reader (integrating with Operation Manual and Maintenance Manual)