Bench type, SD card real time data recorder

Watter quality METER

DISSOLVED OXYGEN METER

Model : BDO-5513SD

Your purchase of this DISSOLVED OXYGEN METER with micro SD CARD DATA LOGGER marks a step forward for you into the field of precision measurement. Although this meter a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed.Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* One meter for multi purpose operation :
  Dissolved Oxygen,measurement.
* Dissolved oxygen : 0 to 20.0 mg/L.
* Dissolved oxygen meter use the polar graphic type oxygen probe with temperature sensor, high precision measurement for Dissolved Oxygen (DO) and temperature measurement.
* Heavy duty dissolved oxygen probe, probe head can connect with BOD bottle.
* DO use the automatic Temp. compensation.
* DO meter build in " % SALT " & " Mountain Height " compensation value adjustment.
* Separate probe, easy for operation of different measurement environment.
* Wide applications: water conditioning, aquariums, beverage, fish hatcheries, food processing, photography, laboratory, paper industry, plating industry, quality control, school & college, water conditioning.
* LCD with green light backlight, easy reading.
* Can default auto power off or manual power off.
* Data hold, record max. and min. reading.
* Microcomputer circuit, high accuracy.
* Power by DC 9 V (UM-3 1.5V X 6 PCS) batteries or DC 9V adapter.
* RS232/USB PC COMPUTER interface.

2. SPECIFICATIONS

2-1 General Specifications

Circuit	Custom one-chip of microprocessor LSI circuit.
Display	LCD size : 55 mm x 96 mm LCD with green backlight (ON/OFF).
Measurement Function	Dissolved Oxygen
Advanced setting	* Auto power OFF management * Set beep Sound ON/OFF * Set temperature unit to ℃ or ℉ * Set DO salt% compensation value * Set DO height (meter) compensation value * Set DO height (feet) compensation value
Data Hold	Freeze the display reading.
Memory Recall	Maximum & Minimum value.
Sampling Time of Display	Approx. 1 second.
Data Output	RS 232/USB PC computer interface. * *Connect the optional RS232 cable UPCB-02 will get the RS232 plug.* * *Connect the optional USB cable USB-01 will get the USB plug.*
Operating Temperature	0 to 50 ℃.
Operating Humidity	Less than 85% R.H.

Power Supply	Alkaline or heavy duty DC 9 V (UM-3 1,5V X 6 PCS) battery or equivalent.
	DC 9V adapter input. (AC/DC power adapter is optional).
Power Current	Normal operation (w/o SD card and LCD Backlight is OFF) : Approx. DC 11 mA.
	When SD card save the data and LCD Backlight is OFF) : Approx. DC 31 mA.
	If LCD backlight on, the power consumption will increase approx. 16 mA.
Weight	1400 g/3.08 LB.
Dimension	290 x 220 x 90 mm (11.5 x 8.7x 3.6 inch)
Accessories Included	* Instruction manual..... 1 PC * Oxygen probe(OXPB-11)..... 1 PC * Spare Probe head with Diaphragm set ..... OXHD-04 * Probe-filling Electrolyte..... OXEL-03
Optional Accessories	AC to DC 9V adapter. USB cable, USB-01. RS232 cable, UPCB-02. Data Acquisition software,SW-U811-WIN. SD memory card (4G)..... 1 PC

2-2 Electrical Specifications (23±5 ℃)

Dissolved oxygen

Oxygen Probe	Optional, OXPB-11 The polarographic type oxygen probe with	
Measurement & Range	Dissolved Oxygen	0 to 20.0 mg/L (liter).
	Oxygen in Air	0 to 100.0 %.
	Temperature	0 to 50 ℃.
Resolution	Dissolved Oxygen	0.1 mg/L.
	Oxygen in Air	0.1 % O2 .
	Temperature	0.1 ℃.
Accuracy (23±5 ℃)	Dissolved Oxygen	±0.4 mg/L.
	Oxygen in Air	±0.7% O2.
	Temperature	±0.8 ℃/1.5 ℉.
Probe Compensation & Adj.	Temperature	0 to 50 ℃, Automatic
	Salt	0 to 50 % Salt
	Height (M. T.)	0 to 8900 meter
Probe Weight	335 g/0.74 LB (batteries & probe included)	
Probe Size	190 mm x 28 mm Dia. (7.5" x 1.1" Dia.)	
Optional Accessories	* Oxygen probe..... OXPB-11	
	* Spare Probe head with Diaphragm set OXHD-04	
	* Probe-filling Electrolyte..... OXEL-03	

@ *Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.*

3. FRONT PANEL DESCRIPTION

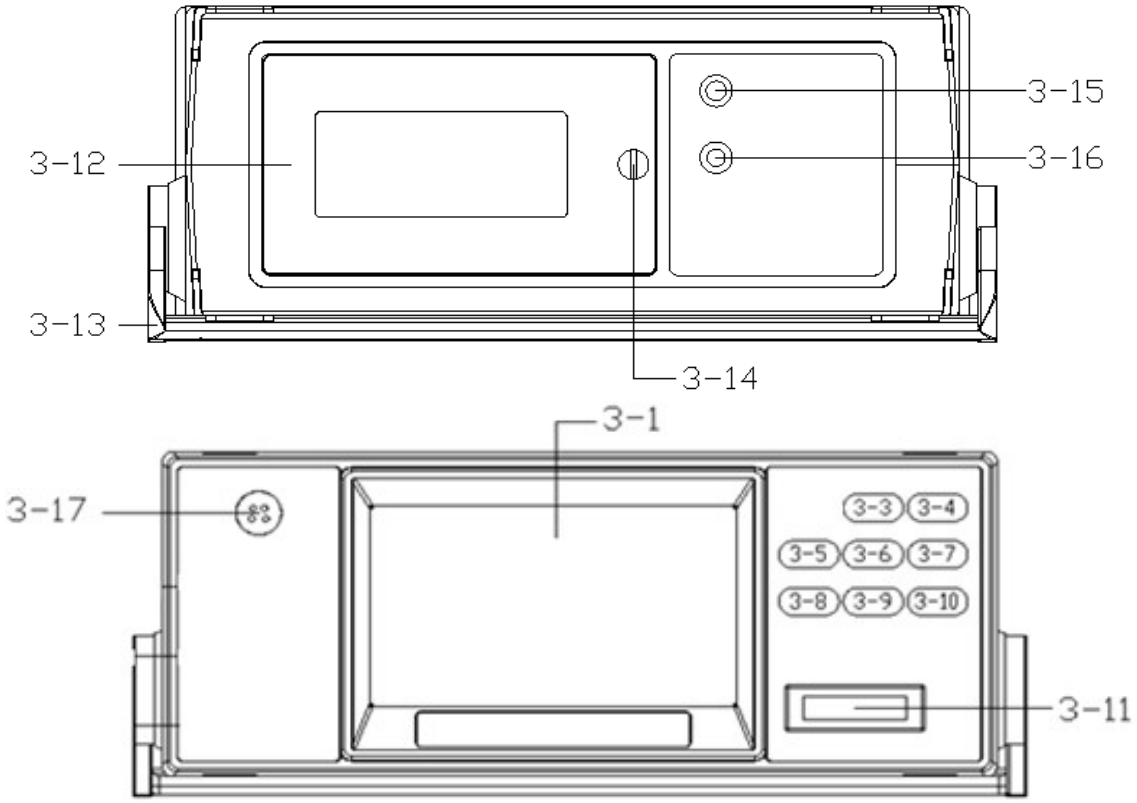


Fig. 1

3-1 LCD Display
3-3 HOLD
3-4 REC
3-5 FUNCTION Button
3-6 ▲ Button
3-7 ▼ Button
3-8 TIME/SET Button
3-9 POWER/Backlight Button
3-10 ENTER/Log Button
3-11 SD card Socket
3-12 Battery Compartment/Cover
3-13 Stand
3-14 Battery Cover Screws
3-15 RS-232 Output Terminal
3-16 DC 9V Power Adapter Input Socket
3-17 DO Socket

4. FUNCTION SELECTION

1) Turn on the meter by pressing the " Power Button " (3-9, Fig. 1) momentarily.

   * *Pressing the " Power Button " (3-9, Fig. 1) continuously and > 2 seconds again will turn off the meter.*

2) The meter can select 2 kind Function as :

   a. Dissolved Oxygen measurement
   b. Air Oxygen measurement

Use the " Function Button " (3-5, Fig. 1) Key to select intent test function. Display will show the following text in sequence :

do	**Dissolved Oxygen measurement**
O2	**Air Oxygen measurement**

Until the Display show the desired mode the meter will execute this Function with default.

5. DO (Dissolved Oxygen) MEASURING and CALIBRATION PROCEDURE

5-1 Dissolved Oxygen measurement

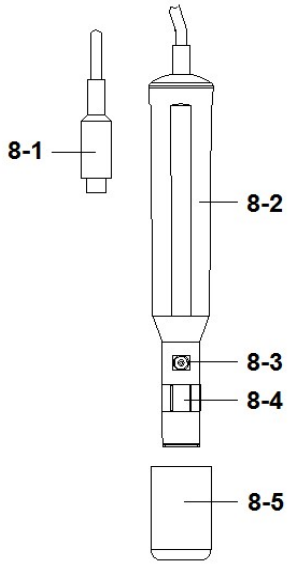


Fig. 5

1) Prepare the Oxygen Probe (optional, DOPB-11),install the " Probe Plug " (8-1, Fig. 5) into the " DO Socket " (3-17, Fig. 1).
2) Power on the meter by pressing " Power Button "(3-9, Fig. 1) once.
   Select the Meter's Function to " do " (Dissolved Oxygen " measurement, refer to chapter 4, page 6.

Calibration at first !

If it is the first time to use the Dissolved Oxygen meter or after a certain period to use the meter again, then it should to execute the calibration procedures at the first. For the measurement precisely consideration, it recommend to make the calibration before each measurement.Calibration procedure, refer to chapter 5-2,page 9.

4) a. Immersed the probe to a depth at least 10 cm of the measured liquid in order for the probe to be influenced by the temperature & automatic temperature compensation to take place.
   b. As for the thermal equilibrium to occur between the probe & the measurement sample must be allowed to pass, which usually amounts to a few minutes if the Temp. difference between the two is only several Celsius degrees.
5) a. In order to measure the dissolved oxygen content in any given liquid, it is sufficient to immerse the tip of the probe in the solution, making sure that velocity of the liquid coming into contact with the probe is at least 0.2 - 0.3 m/s or to shake the probe.
   b. During laboratory measurements, the use of a magnetic agitator to ensure a certain velocity in the fluid is recommended. In this way, errors due to the diffusion of the oxygen present in the air in the solution are reduced to a minimum.
6) Display will show the Dissolved Oxygen values (mg/L) at the same time the bottom display will show the Temp. value of the measured solution.
7) Rinsed the probe accurately with normal tap water after each series of measurement.

Oxygen in the air

Use the " Function Button " (3-5, Fig. 1) Key, select to O2 measurement Function.
the Display unit will show " %O2 ",and show the air Oxygen value for reference.

Change the Temp. unit to ℉

If intend to change the Temp. unit from ℃ to ℉, please refer to chapter 7-7, apge 16.

"% Salt" compensation value adjustment

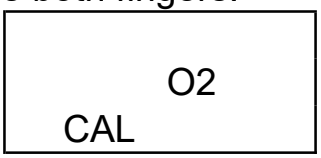
If intend to change the % Salt compensation value,
refer chapter 7-8, page 17.

"Height" compensation value adjustment

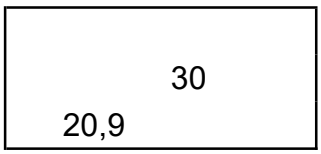
If intend to change the Height compensation value,
refer to chapter 7-9, 7-10, page 17 page 18.

5-2 Calibration

1) Install the " Probe Plug " (8-1, Fig. 5) into the " DO Socket " (3-17, Fig. 1).
2) Power on the meter by pressing " Power Button " (3-9, Fig. 1) > 2 sec..
   * Select the Meter's Function to " O2 " (Air Oxygen) measurement.
3) **Wait for approx. 5 minutes at least until the display reading values become stable & no fluctuation.**
4) Use the two fingers to press the " ▲ Button " (3-6, Fig 1) and ▼ Button " (3-7, Fig. 1) continuously at least 2 seconds , the display will show the following screen A. then release the both fingers.



screen A



screen B

5) Press the " Enter Button " , the display will show the following screen B, the upper Display value will count from 30 to 0, then return to normal measuring screen and finish the calibration procedures. The complete calibration procedures will take 30 seconds approximately.

Use the " Function Button " (3-5, Fig. 1) Key select to " dO" test Function , Display unit will show " mg/L ".

Calibration Consideration :

a. As the oxygen in air is 20.9 % typically, so use the environment air 02 value for quick & precise calibration.

b. Please process calibration procedures under wide and ventilating environment for best effect.

5-3. Probe maintenance

User first time to use the meter

Intend to let the DO probe keep the best condition, when user receive the Oxygen Probe, it should fill the Probe's Electrolyte at first.

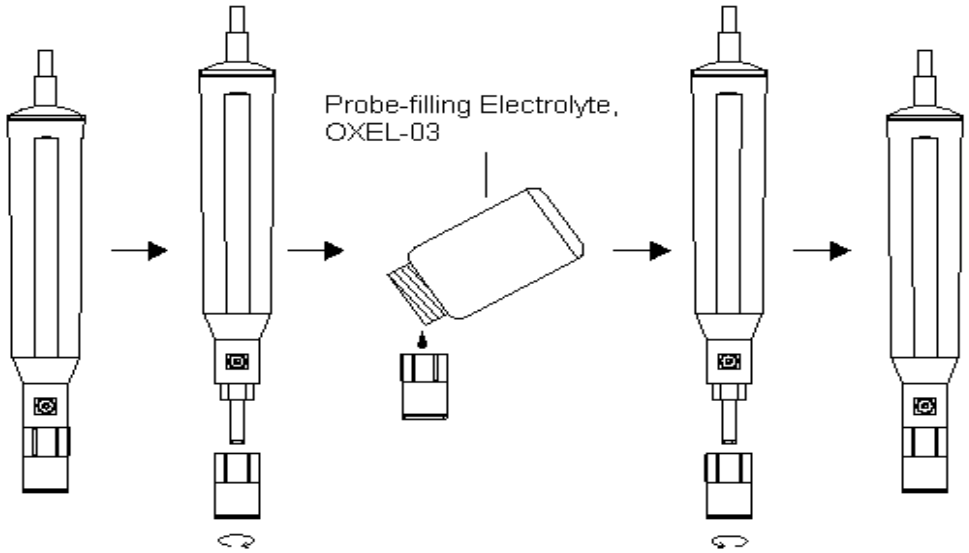
User already use the probe for a certain period :

Whenever user can not calibrate the meter properly or the meter's reading value is not stable,please check the oxygen probe to see if the electrolyte in the probe head container is run out or the diaphragm (probe head with diaphragm set) exist problem (dirty). If yes, please fill the electrolyte or change the " Probe head with diaphragm set " and make the new calibration.

The consideration of Diaphragm (probe head with diaphragm set

The oxygen probe component is the thin Teflon diaphragm housed in the tip of the probe. The diaphragm is permeable by the oxygen molecules but not by the considerably larger molecules contained in the electrolyte. Due to this characteristic, the oxygen may diffuse

throughout the electrolyte solution contained in the probe, and its concentration may be quantified by the measurement circuit.



1) Unscrew the " Probe head " (9-3, Fig 6).
2) Pour out the old Electrolyte from the container of the " Probe head ".
3) Fill the new Electrolyte (OXEL-03) into the container of the " Probe head " .
4) Screw the " Probe head " (9-3, Fig 6) into the probe body.
5) **When not use the probe, should insert the " Probe head " into the " Probe protection cover " (8-5, Fig. 5)**

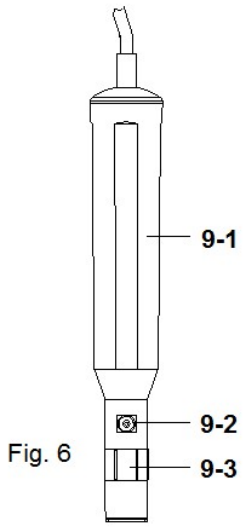


Fig. 6

9-1 Probe handle
9-2 Temp. sensing metal
9-3 Probe head

6. OTHER FUNCTION

6-1 Data Hold

During the measurement, press the " Hold Button " (3-3, Fig. 1) once will hold the measured value & the LCD will display a " HOLD " symbol. Press the " Hold Button " once again will release the data hold function.

6-2 Data Record (Max., Min. reading)

1) The data record function records the maximum and minimum readings. Press the " REC Button " (3-4, Fig.1) once to start the Data Record function and there will be a " REC. " symbol on the display.
2) With the " REC. " symbol on the display :
   a) Press the " REC Button " (3-4, Fig. 1) once,the " REC. MAX. " symbol along with the maximum value will appear on the display.
   b) Press the " REC Button " (3-4, Fig. 1) again, the " REC. MIN. " symbol along with the minimum value will appear on the display.
   c) Press the " REC Button " (3-4, Fig. 1) again, *the display will show the " REC. " symbol only & execute the memory function continuously.*
   d) To exit the memory record function, just press the " REC " button for 2 seconds at least. The display will revert to the current reading.

6-3 LCD Backlight ON/OFF

After power ON, the " LCD Backlight " will light automatically. During the measurement, press the " Backlight Button " (3-9, Fig. 1) once will turn OFF the " LCD Backlight ". Press the " Backlight Button " once again will turn ON the " LCD Backlight " again.

7. ADVANCED SETTING

press the " SET Button " (3-8, Fig. 1) continuously at least two seconds will enter the " Advanced Setting " mode.
then press the " SET Button " (3-8, Fig. 1) once a while in sequence to select the eight main function, the display will show :

Sd F.....	SD memory card Format
dAtE.....	Set clock time (Year/Month/Date,Hour/Minute/Second)
SP-t.....	Set sampling time (Hour/Minute/Second)
PoFF.....	Auto power OFF management
bEEP.....	Set beeper sound ON/OFF
dEC.....	Set SD card Decimal character
t-CF.....	Select the Temp. unit to ℃ or ℉
SALt.....	*Set DO salt% compensation, DO only*
High-.....	*Set DO height (meter) compensation, DO only*
Highf.....	*Set DO height (feet) compensation, DO only*
ESC.....	Escape from the advanced setting

Remark :

a. DO - Dissolved oxygen Mode

b. During execute the " Advanced Setting " function, if press " ESC Button " (3-3, Fig. 1) will exit the " Advanced Setting " function, the LCD will return to normal screen.

7-1 SD memory card Format

When the lower display show " Sd F "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to " yES " or " no ".

   yES - Intend to format the SD memory card
   no - Not execute the SD memory card format

2) If select the upper to " yES ", press the " Enter Button " (3-10, Fig. 1) once again, the Display will show text " YES Ent " to confirm again, if make sure to do the SD memory card format, then press " Enter Button " once will format the SD memory clear all the existing data that already saving into the SD card.

7-2 Set clock time (Year/Month/Date,Hour/Minute/ Second)

When the lower display show " dAtE "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to adjust the value (Setting start from Year value). After the desired value is set, press the " Enter Button " (3-10, Fig. 1) once will going to next value adjustment (for example, first setting value is Year then next to adjust Month, Date, Hour, Minute, Second value).
2) After set all the time value (Year, Month, Date, Hour, Minute, Second), press the " ENETER Button " (3-20, Fig. 1) once will save the time value.

   Remark :
   After the time value is setting, the internal clock will run precisely even Power off if the battery is under normal condition (No low battery power).

7-3 Set sampling time (Seconds)

When the lower display show " SP-t "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to adjust the value (0, 1, 2, 5, 10, 30,60, 120, 300, 600, 1800,3600 seconds).
2) After the Sampling value is selected, press the " Enter Button " (3-10, Fig. 1) will save the setting function with default.

7-4 Auto power OFF management

When the lower display show " PoFF "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to " yES " or " no ".

   yES - Auto Power Off management will enable.
   no - Auto Power Off management will disable.

2) After select the upper text to " yES " or " no ", press the " Enter Button " (3-10, Fig. 1) will save the setting function with default.

7-5 Set beeper sound ON/OFF

When the lower display show " bEEP "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to " yES " or " no ".

yES - Meter's beep sound will be ON with default.
no - Meter's beep sound will be OFF with default.
is power ON.

2) After select the upper text to " yES " or " no ", press the " Enter Button " (3-10, Fig. 1) will save the setting function with default.

7-6 Decimal point of SD card setting

The numerical data structure of SD card is default used the " . " as the decimal, for example "20.6" "1000.53" .But in certain countries (Europe ..) is used the " , " as the decimal point, for example " 20,6 " "1000,53". Under such situation, it should change the Decimal character at first.

When the lower display show " dEC "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper text to " USA " or " Euro ".

USA - Use " . " as the Decimal point with default.
Euro - Use " , " as the Decimal point with default.

2) After select the upper text to " USA " or " Euro ", press the " ENTER Button " (3-10, Fig. 1) will save the setting function with default.

7-7 Select the Temp. unit to ℃ or ℉

When the lower display show " t-CF "

1) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper Display text to " C " or " F ".

C - Temperature unit is ℃
F - Temperature unit is ℉

2) After Display unit is selected to " C " or " F ", press the " Enter Button " (3-10, Fig. 1) will save the setting function with default.

7-8 Set DO salt% compensation value

When the lower display show " SALt "

1) This function only for the DO (Disolved oxygen) Function of adjusting the probe's salt% compensation value. The default value is 0% salt.
2) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to the desired salt% compensation value, then press the " Enter Button " (3-10, Fig. 1) will save the setting value temporally.

7-9 Set DO height (meter) compensation value

When the lower display show " High- "

1) This function only for the DO (Disolved oxygen) Function of adjusting the probe's height compensation value in meter unit. The default value is 0 meter.

2) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to the desired height compensation value (meter), then press the " Enter Button " (3-10, Fig. 1) will save the setting value temporally.

7-10 Set DO height (feet) compensation value

When the lower display show " Highf "

1) This function only for the DO (Disolved oxygen) Function of adjusting the probe's height compensation value in feet unit. The default value is 0 FEET.
2) Use the " ▲ Button " (3-6, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to the desired height compensation value (feet), then press the " Enter Button " (3-10, Fig. 1) will save the setting value temporally.

7-11 ESC

When the display show " ESC "

When the Display show the text " ESC ", then press the " ESC Button " (3-3, Fig. 1) will finish the Advanced Setting procedures and return to the normal measuring screen.

Remark :

During execute the " Advanced Setting " function, if press " ESC Button " (3-3, Fig. 1) will exit the " Advanced Setting " function, the LCD will return to normal screen.

8. DATALOGGER

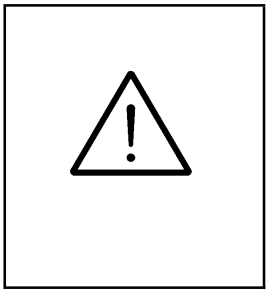
8-1 Preparation before execute datalogger function

a. Insert the SD card
Prepare a " SD memory card " (1 G to 16 G, optional), insert the SD card into the " SD card socket " (3-11, Fig. 1).The front panel of the SD card should face against the the down case.

b. SD card Format
If SD card just the first time use into the meter, it recommend to make the " SD card Format " at first. please refer chapter 7-1 (page 14).

c. Time setting
If the meter is used at first time, it should to adjust the clock time exactly, please refer chapter 7-2 (page 14).

d. Decimal format setting



The numerical data structure of SD card is default used the " . " as the decimal, for example "20.6" "1000.53" . But in certain countries (Europe ...) is used the " , " as the decimal point, for example " 20, 6 " "1000,53". Under such situation, it should change the Decimal character at first, details of setting the Decimal point, refer to Chapter 7-6, page 16.

8-2 Auto Datalogger (Set sampling time ≧ 1 second)

a. Start the datalogger

Press the " LOG Button (3-10, Fig. 1) > 3 seconds continuously, the lower LCD will show the text of " Log "then " REC " symbol will flashing per sampling time, at the same time the measuring data along the time information will be saved into the memory circuit.

Remark :

* *How to set the sampling time, refer to Chapter 7-3, page 15.*
* *How to set the beeper sound is enable, refer to Chapter 7-5, page 15.*

b. Pause the datalogger

During execute the Datalogger function, if press the " LOG Button " (3-10, Fig. 1) once will pause the Datalogger function (stop to save the measuring data into the memory circuit temporally). In the same time the the " Logger " symbol will stop flashing, the lower LCD will show the text of " Log ".

Remark :

If press the " LOG Button " (3-10, Fig. 1) once again will execute the Datalogger again, the " Logger " symbol will flashing.

c.. Finish the Datalogger

During execute the Datalogger function, press the " LOG Button (3-10, Fig. 1) > 3 seconds continuously again will finish the Datalooger function, the " Log " text will be disappeared and finish the Datalogger.

8-3 Manual Datalogger (Set sampling time = 0 second)

a. Set sampling time is to 0 second

Press the " LOG Button (3-10, Fig. 1) > 3 second , the lower LCD will show the " Position no. " , then press the " LOG Button " (3-10, Fig. 1) once, the " Logger " symbol will flashing once and Beeper will sound once, at the same time the measuring data along the time information will be saved into the memory circuit.

Remark :
During execute the Manual Datalogger, it can use the " ◢ Button " (3-6, Fig. 1) or " ◤ Button " (3-7, Fig. 1) to set the measuring position (1 to 99, for example room 1to room 99) to identify the measurement location , the lower Display will show P x (x = 1 to 99). (x = 1 to 99).

b. Finish the Datalogger

During execute the Datalogger function, press the " LOG Button (3-10, Fig. 1) > 3 seconds continuously again will finish the Datalooger function, the Position no. " PXX " will be disappeared and finish the Datalogger. function.

8-4 Check time information

During the normal measurement (not execute the Datalogger), If press " TIME Button " (3-8, Fig. 1) once , the lower LCD display will present the time information of Year/Month, Date/Hour, Minute/Second and the Sampling time information in sequence.

8-5 SD Card Data structure

1) When the first time, the SD card is used into the meter, the SD card will generate a folder :

   DOB01

2) If the first time to execute the Datalogger,under the route DOB01\, will generate a new file name DOB01001.XLS.After exist the Datalogger, then execute again, the data will save to the DOB01001.XLS until Data column reach to 30,000 columns, then will generate a new file, for example DOB01002.XLS
3) Under the folder DOB01\, if the total files more than 99 files, will generate anew route, such as DOB02\ .....
4) The file's route structure :

DOB01\	DOB01001.XLS
	DOB01002.XLS
	.....
	DOB01099.XLS
DOB02\	DOB02001.XLS
	DOB02002.XLS
	.....
	DOB02099.XLS
DOBXX\	.....

Remark :
XX : Max. value is 10.

9. Saving data from the SD card to the computer (EXCEL software)

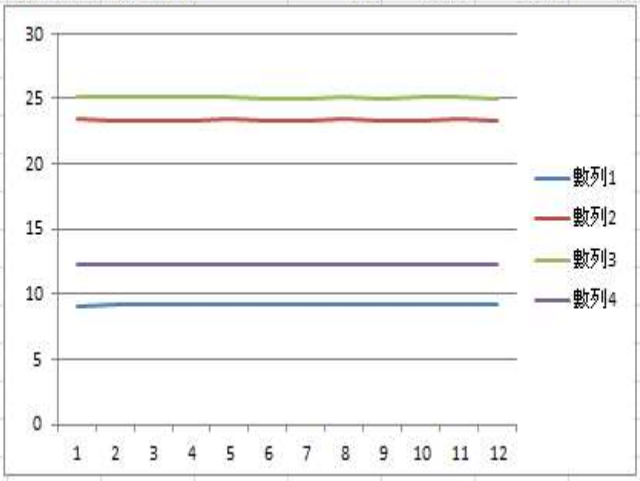
1) After execute the Data Logger function, take away the SD card out from the " SD card socket " (3-11, Fig. 1).

2) Plug in the SD card into the Computer's SD card slot (if your computer build in this installation) or insert the SD card into the " SD card socket ". then connect the " SD card socket " into the computer.

3) Power ON the computer and run the " EXCEL software ".Down load the saving data file (for example the file name : DOB01001.XLS, DOB01002.XLS) from the SD card to the computer. The saving data will present into the EXCEL software screen (for example as following EXCEL data screens) , then user canuse those EXCEL data to make the further Data or Graphic analysis usefully.

EXCEL graphic screen (for example)

	A	B	C	D	E	F	G	H	I	J	K	L
1	Position	Date	Time		Ch5_DO	Ch5_unit	Ch6_CO2	Ch6_unit	Ch7_T(CE	Ch7_unit	Ch8_CD	Ch8_unit
2	1	2017/3/7	06:46:31		9	mg/L	23.4	%O2	25.1	Degree C	12.27	mS
3	2	2017/3/7	08:34:04		9.2	mg/L	23.3	%O2	25.1	Degree C	12.26	mS
4	3	2017/3/7	08:34:24		9.2	mg/L	23.3	%O2	25.1	Degree C	12.27	mS
5	4	2017/3/7	08:34:44		9.2	mg/L	23.3	%O2	25.1	Degree C	12.27	mS
6	5	2017/3/7	08:35:04		9.2	mg/L	23.4	%O2	25.1	Degree C	12.27	mS
7	6	2017/3/7	08:35:24		9.2	mg/L	23.3	%O2	25.0	Degree C	12.27	mS
8	7	2017/3/7	08:35:44		9.2	mg/L	23.3	%O2	25.0	Degree C	12.28	mS
9	8	2017/3/7	08:36:04		9.2	mg/L	23.4	%O2	25.1	Degree C	12.28	mS
10	9	2017/3/7	08:36:24		9.2	mg/L	23.3	%O2	25.0	Degree C	12.28	mS
11	10	2017/3/7	08:36:44		9.2	mg/L	23.3	%O2	25.1	Degree C	12.26	mS
12	11	2017/3/7	08:37:04		9.2	mg/L	23.4	%O2	25.2	Degree C	12.28	mS
13	12	2017/3/7	08:37:24		9.2	mg/L	23.3	%O2	25.0	Degree C	12.28	mS



10. POWER SUPPLY from DC ADAPTER

The meter also can supply the power supply from the DC 9V Power Adapter (optional). Insert the plug of Power Adapter into " DC 9V Power Adapter Input Socket " (3-16, Fig. 1).

11. BATTERY REPLACEMENT

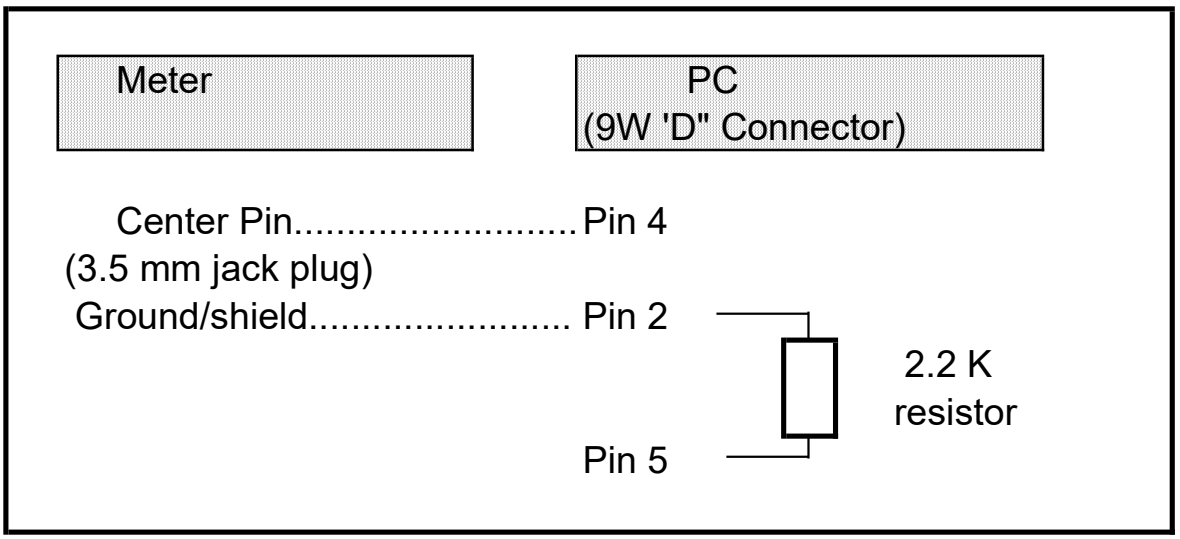
1) When the left corner of LCD display show "  ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
2) Loose the screws of the " Battery Cover Screws " (3-14, Fig. 1) and take away the " Battery Cover " (3-12, Fig. 1) from the instrument and remove the battery.
3) Replace with DC 1.5 V battery (UM3, AA, Alkaline/heavy duty) x 6 PCs, and reinstate the cover.
4) Make sure the battery cover is secured after changing the battery.

12. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal (3-15, Fig. 1).

The data output is a 16 digit stream which can be utilized for user's specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.



RS232 FORMAT : 9600, N, 8, 1

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

The 16 digits data stream will be displayed in the following format :

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Each digit indicates the following status :

D0	End Word
D1 & D8	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = Positive 1 = Negative

D11 & D12	Annunciator for Display			
	℃ = 01	℉ = 02		
			O2 = 06	mg/L = 07
D13	When send the upper display data = 1 When send the lower display data = 2			
D14	4			
D15	Start Word			

13. PATENT

The meter (SD card structure) already get patent or patent pending in following countries :

Germany	Nr. 20 2008 016 337.4
JAPAN	3151214
TAIWAN	M 456490
CHINA	ZL 2008 2 0189918.5
	ZL 2008 2 0189917.0