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*1,600 point data logger, RS232, AC/DC adapter  
2,000  $\mu$ S 20 mS, 100 mS, auto range, auto calibration*

# CONDUCTIVITY METER

Model : CD-4322



Your purchase of this CONDUCTIVITY METER marks a step forward for you into the field of precision measurement. Although this METER is 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**

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# 1. FEATURES

- \* \* 3 measurement range, 2,000 uS, 20 mS, 100 mS with auto range.
- \* Function : Conductivity, TDS.
- \* Separate probe, easy for operation of different measurement environment.
- \* Automatic temperature compensation range : 0 to 50 °C .
- \* Carbon rod electrode for long life.
- \* Innovative feature with built-in automatic temperature compensation factor adjustable between 0 to 5.0% per °C .
- \* Selecting " 0% per °C " of Temp. Coefficient Adjust, allows you to take uncompensated conductivity readings ( absolute conductivity measurement ) .
- \* Microprocessor circuit assures high accuracy and provides special functions and features.
- \* Multi-display, show Conductivity and Temp. value at the same time.
- \* Data hold function for freezing the desired value.
- \* Records max. and min. value with recall.
- \* Build in temperature °C , °F measurement with default.
- \* Manual and auto data logger, with flexible sampling time selection, can save max. 1,600 reading data.
- \* Power function can default to auto off or manual off.
- \* Build in the input socket for DC 9V power adapter.
- \* Use the durable, long-lasting components, including a heavy duty & compact ABS-plastic housing case.
- \* RS232/USB PC serial interface.
- \* Applications for Aquarium, Medical research, Agriculture, Fish hatcheries, Laboratory, Water conditioning, Mining industry, Schools & Colleges, Quality control... industry, quality control, school & college, water conditioning.

## 2. SPECIFICATIONS

Display	LCD size : 44 mm x 29 mm. Dual function LCD	
Circuit	Custom one-chip of microprocessor LSI circuit.	
Function :	Conductivity, TDS.	
Ranges and Resolution	<i>Conductivity range :</i> 2000 uS/20.00 mS/100 mS.	
* <i>three ranges</i>	<i>Conductivity resolution :</i> 1 uS/0.01 mS/0.1 mS.	
* <i>auto range</i>	<i>TDS range :</i> 1200 ppm/12,000 ppm/66,000 ppm.	
	<i>TDS resolution :</i> 1 ppm/10 ppm/100 ppm.	
Accuracy * $23 \pm 5 \text{ }^{\circ}\text{C}$	$\pm (2\% \text{ FS} + 1 \text{ d})$ * <i>FS : full scale</i>	
Temperature Compensation	Automatic from 0 to 50 °C (32 - 122 °F), with temperature compensation factor variable between 0 to 5.0% per C.	
Conductivity Probe Structure	Carbon rod electrode for long life.	
Memory Recall	Records Maximum, Minimum readings with recall.	
Power off	Auto power off saves battery life, or manual off by push button. * <i>Auto power off :</i> <i>Power will off automatically after 10 min., if no button be pressed.</i>	
Data Output	RS 232 PC serial interface.	
Sampling Time of Data Logger	Manual	Push the data logger button once will save data one time. * <i>Set sampling time to 0 second.</i>
	Auto	1, 2, 5, 10, 30, 60, 600, 1800, 3600 seconds.
Data Logger number	Max. 1,600-point Data logger	

Data Hold	Freeze the display reading.
Sampling Time of display	Approx. 1 second.
Data Output	RS 232/USB PC serial 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 °C .
Operating Humidity	Less than 80% RH.
Power Supply	006P DC 9V battery ( Alkaline or Heavy duty type ) or DC 9V adapter input. <i>* AC/DC power adapter is optional.</i>
Power Current	Approx. DC 5.7 mA.
Weight	295 g/0.65 LB. <i>* Include probe and battery.</i>
Dimension	<i>Main instrument :</i> 135 x 60 x 33 mm. <i>Conductivity Probe :</i> Round, 22 mm Dia. x 120 mm length.
Accessories Included	Conductivity probe..... 1 PC. Operation manual..... 1 PC.
Optional Accessories	* 1.413 mS Conductivity Standard Solution..... CD-14 * RS232 cable..... UPCB-02 * USB cable..... USB-01 * Data Acquisition software..... SW-U801-WIN * Data logger software..... SW-DL2005 * Hard carrying case..... CA-06 * Soft carrying case..... CA-05A * AC to DC 9V adapter

### 3. FRONT PANEL DESCRIPTION

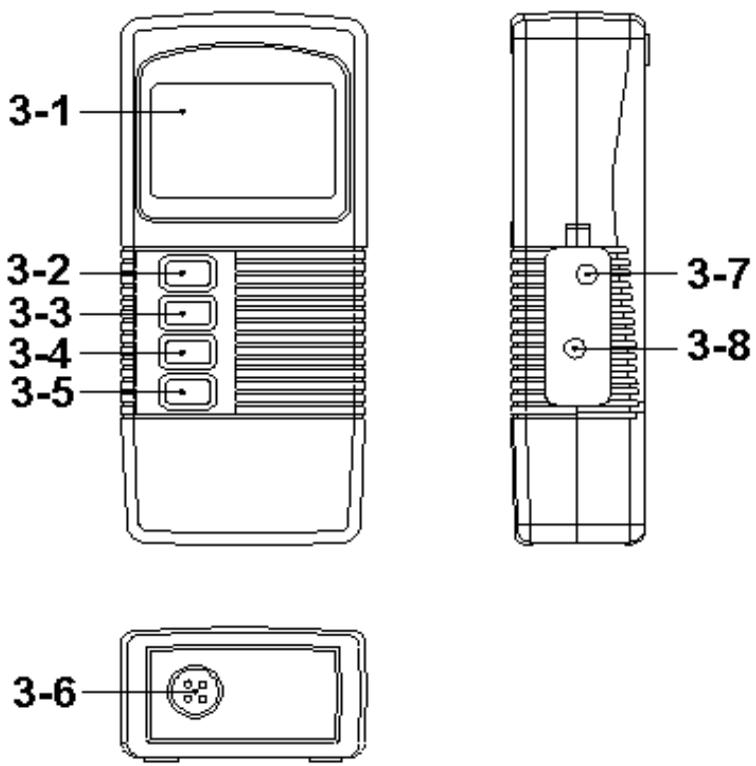


Fig. 1

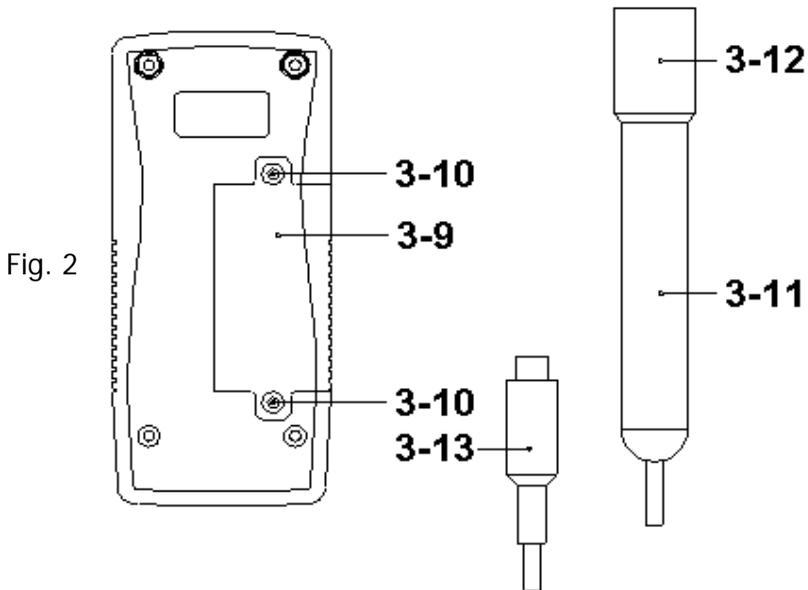


Fig. 2

- 3-1 Display
- 3-2 Power/ESC/Send button
- 3-3 FUNC/Hold button ( Send quit/▲ button )
- 3-4 REC/Enter button
- 3-5 Setting/Logger button ( ▼ button )
- 3-6 Probe input socket
- 3-7 DC 9V adapter socket
- 3-8 RS-232 output terminal
- 3-9 Battery compartment/Cover
- 3-10 Battery cover screws
- 3-11 Probe Handle
- 3-12 Sensing Electrode
- 3-13 Probe Plug

## 4. MEASURING PROCEDURE

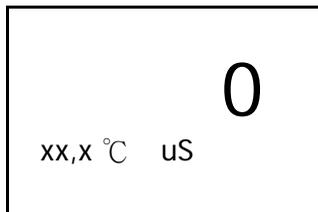
### 4-1 Conductivity measurement

1) Turn on the meter by pressing the " Power Button " ( 3-2, Fig. 1 ) momentarily.

*\* Press the " Power Button " ( 3-2, Fig. 1 ) momentarily again will turn off the meter.*

Connect the " Probe Plug " ( 3-13, Fig. 2 ) into the " Probe input socket " ( 3-6, Fig. 1 ).

The " Display " ( 3-1, Fig. 1 ) will show the unit as :

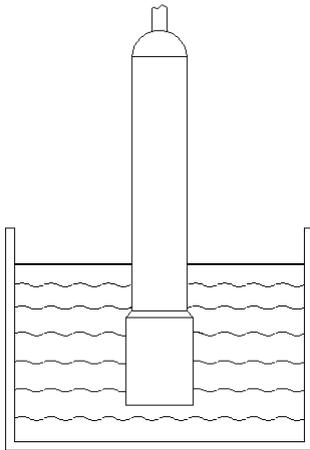


Now the meter is ready for the conductivity measurement.

2) Hold the " Probe Handle " ( 3-11, Fig. 2 ) by hand and immerse the " Sensing Electrode " ( 3-12, Fig. 2 ) immersed wholly into the measured solution. Shake the " Sensing Electrode " to let the electrode's internal air bubble drift out from the sensing Electrode.

" Display " ( 3-1, Fig. 1 ) will show the conductivity mS ( uS ) values, at the same time the left bottom display will show the Temp. value of the measured solution.

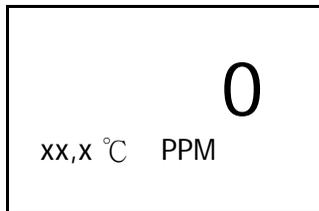
*\* The method to change the Temp. unit from " °C " to " °F " or " °F " to " °C ", please refer to : Chapter 5-2 Change the Temp °C, °F unit, page 11.*



When make the measurement should immerse the " Sensing Electrode " immersed wholly into the measured solution.

#### **4-2 TDS measurement**

1) During the above 4-1 Conductivity measurement, if press the " Hold button " ( 3-3, Fig. 1 ) continuously at least two seconds will enter into the function of TDS measurement with default, the display will show as :



Other TDS measurement procedures are similar as Conductivity measurement

2) During the TDS measurement, if press the " Hold button " ( 3-3, Fig. 1 ) continuously at least two seconds again will enter into the function of Conductivity measurement with default, refer section 4-1.

### **4-3 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.*

### **4-4 Data Record ( Max., Min. reading )**

\* 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.

\* 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.

If intend to delete the maximum value, press the " Hold button " ( 3-3, Fig. 1 ) once, the display will show the " REC " symbol only & execute the memory function continuously.

b) Press the " REC button " ( 3-4, Fig. 1 ) again, the " REC MIN. " symbol along with the minimum value will appear on the display.

If intend to delete the minimum value, press the " Hold button " ( 3-3, Fig. 1 ) once, then the display will show the " REC " symbol only & execute the memory function continuously.

c) To exit the memory record function, just press the " REC " button for 2 seconds at least. The display will revert to the current reading.

### **4-5 Data Logger**

The data logger function can save 1,600-point measuring data.

The data logger procedures are following :

- a) 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.
- b) Auto Data Logger ( Sampling time should select to 1, 2, 5, 10, 30, 60, 600, 1800 or 3600 seconds )**  
Press the " Logger button " ( 3-5, Fig. 1 ) once to start the Data Logger function. The " REC " symbol will flash per 1.5 second and the beeper will sound when save the data into the memory. Now the Data Logger function is executed.

**Manual Data Logger ( Sampling time should set to 0 second )**

Press the " Logger button " ( 3-5, Fig. 1 ) once will save the data one time into the memory, at the same time the symbol " REC " will flash once and the beeper will sound.

**Memory full**

When execute the data logger function, if the upper display show " FULL " with flashing, it indicate the memory data already over 1,600 no. and the memory is full.

- c) During the Data Logger function is executed, press the " Logger button " ( 3-5, Fig. 1 ) once will stop the data logger function, the " REC " symbol will stop to flash.  
If press the " Logger button " ( 3-5, Fig. 1 ) once again will continuous the Data Logger function.

*Note :*

- 1) If intend to change the data logger sampling time, please refer to chapter 5-4, page 12.*
- 2) If intend to know the space of balance data numbers into the memory IC, please refer to chapter 5-5, page 12.*
- 3) If intend to clear the saving data from the memory please refer section 5-6, page 13.*

## 5. ADVANCED SETTING PROCEDURES

Before executing Advanced Setting Procedures, exit the " Hold function " and the " Record " function first.

- \* **Press " Setting button " continuously at least 5 seconds to enter the setting function.**
  - \* After already set the desiring value ( function ), press the " Enter button " to save with default.
  - \* Press the " Esc button " to escape the setting procedures.
- a. Hold the " Setting button " ( 3-5, Fig. 1 ) at least five seconds will enter the Advanced Setting Procedures.
- b. One by one to press the " Setting button " ( 3-5, Fig. 1 ) once a while to select the main setting function in sequence and show on the text the lower display as :
- SEt**.....Temp. Compensation Factor Default Setting.  
**°C**.....Change the Temp °C, °F unit  
**OFF**.....Auto power ON/OFF management  
**SP-t**..... Change the data logger sampling time  
**SPACE**...To show the balance data numbers in the memory  
**CLr**.....Clear the existing saving data from the memory  
**Code**.....Code entering for the further calibration usage

### **5-1 Temp. compensation factor Setting.**

( Lower display show " SEt " )

After the low display show " SEt ", press the " Enter button " ( 3-4, Fig. 1 ) once. the " SEt " symbol will flash, the up display will show the " Temp. compensation factor ".

Use " ▲ button " ( 3-3, Fig. 1 ) and " ▼ button " ( 3-5, Fig. 1 ) to adjust the up display value until it same as the desiring Temp. Compensation Factor value ( unit is % per °C ) exactly.

After select the desiring value, press the " Enter button " ( 3-4, Fig. 1 ) to save the data.

#### **Remark :**

*\* The " Temp. Compensation Factor " only can adjust from 0.00 to 5.00 % per °C.*

*\* After power off and on again, the original setting value will be cleared and return to 2.00 % per °C ( default value ).*

### **5-2 Change the Temp °C, °F unit**

( Lower display show " °C " )

- a. Use " ▲ button " ( 3-3, Fig. 1 ) to select " °C " or " °F ".
- b. After select the desiring value ( °C or °F ), press the " Enter button " ( 3-4, Fig. 1 ) to save the data with default.

### **5-3 Auto power On/Off**

( Lower display show " OFF " )

- a. Use " ▲ button " ( 3-3, Fig. 1 ) to select " YES " or " no ".
  - \* *YES : Auto power off.*
  - \* *no : Auto power disable, it is the manual power off.*
- b. After select the desiring function ( YES or no ), press the " Enter button " ( 3-4, Fig. 1 ) to save the function with default.

### **5-4 Change the data logger sampling time**

( Lower display show " SP-t " )

- a. Use " ▲ button " ( 3-3, Fig. 1 ) to select data logger sampling time to  
**0, 1, 2, 5, 10, 30, 60, 600, 1800, 3600 seconds**
- b. After the sampling time value is determined, press the Enter button " ( 3-4, Fig. 1 ) to save the sampling time with default.

#### **Note :**

***Set the sampling time to 0 second is used for the manual Data Logger function.***

### **5-5 To show the balance data numbers in the memory**

( Lower display show " SPACE " )

The display will show the balance data no. that exist into the memory ( allow memorize data no. ).

### ***5-6 Clear the existing saving data from the memory***

( Lower display show " CLr " )

- a. Use " ▲ button " ( 3-3, Fig. 1 ) to select " YES " or " no " .
  - \* *YES : It will execute the memory clear function.*
  - \* *no : It will be not to clear the memory.*
- b. If select " YES ", press the " Enter button " ( 3-4, Fig. 1 ) the beeper will sound three sounds for warning, if really intend to clear the memory, then press the " Enter button " again.

### ***5-7 Code entering for the further calibration usage***

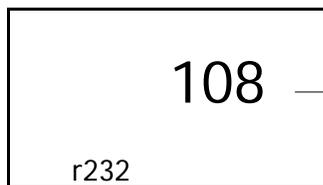
( Lower display show " CodE" )

The upper display will show 0.

The code setting is used for the further technician service usage, it do not enter any new code, just press the " Enter button " ( 3-4, Fig. 1 ) will finish the Advanced Setting Procedure.

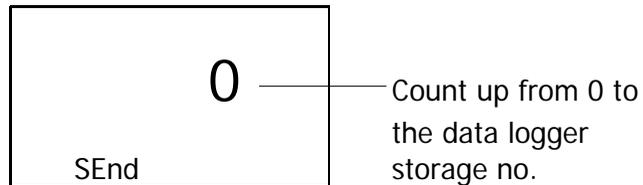
## **6. SEND THE DATA OUT**

- 1) To send the data out from the meter, exit the " Hold function " and the " Record function " at first.
- 2) Press the " Send button " ( 3-2, Fig. 1 ) at least 5 seconds until the lower display show " r232 ", then release the button.



— The total data logger no. that saved into the memory.

- 3) Push the " Send button " ( 3-2, Fig. 1 ) once, the lower display will show " SEnd ", the upper no. will count up until reach the data logger storage no., at the same the storage data logger data will send out the meter from the " RS-232 output terminal " ( 3-8, Fig. 1 ).



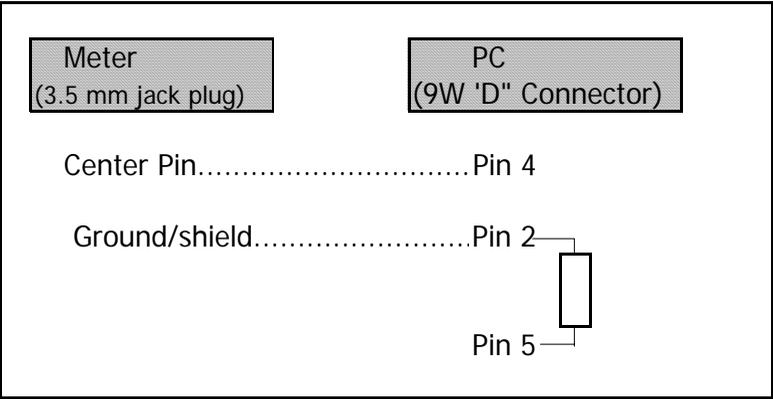
- 4)If intend up load the data to the computer, then should connect the optional RS232 cable/UPCB-01 or USB cable/USB-01 and cooperate the Data Logger software ( optional, Model : SW-DL2005 ).**
- 5) Press the " Send quit button " ( 3-3, Fig. 1 ) will escape the data sending function.

# 7. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-8, 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.



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 :**

D15	Start Word		
D14	4		
D13	When send the upper display data = 1 When send the lower display data = 2		
D12 & D11	Annunciator for Display		
	°C = 01	°F = 02	
	uS = 13	mS = 14	
D10	Polarity 0 = Positive 1 = Negative		
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP		
D8 to D1	Display reading, D8 = MSD, D1 = LSD. For example : If the display reading is 1234, then D8 to D1 is : 00001234		
D0	End Word		

### **RS232 setting**

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

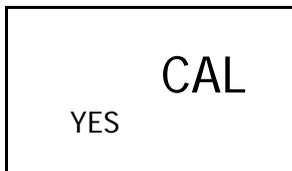
## 8. BATTERY REPLACEMENT

- 1) When the upper 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) Open the " Battery Cover " ( 3-9, Fig. 2 ) away from the instrument by loosening the " Battery cover screws " ( 3-10, Fig. 2 ) and remove the battery.
- 3) Replace with 9V battery ( Alkaline or Heavy duty type ) and reinstate the cover.
- 4) Make sure the battery cover is secured after changing the battery.

## 9. CALIBRATION

- 1) Connect the " Probe Plug " ( 3-13, Fig. 1 ) into the " Probe input socket " ( 3-6, Fig. 1 ).  
Turn on the meter by pressing the " Power Button " ( 3-2, Fig. 1 ) momentarily.
- 2) Prepare a " Conductivity Standard Solution ", for example the optional " 1.413 Conductivity Standard Solution, CD-14 ".
- 3) Hold the " Probe Handle " ( 3-11, Fig. 2 ) by hand and immerse the " Sensing Electrode " ( 3-12, Fig. 1 ) wholly into the " Standard solution ". Shake the " Sensing Electrode " to let the electrode's internal air bubble drift out from the sensing Electrode.

- 4) a. Press the " Hold button " ( 3-3, Fig. 1 ) once, the " Display " ( 3-1, Fig. 1 ) will show the " Hold " indicator, then following press the " REC button " ( 3-4, Fig. 1 ) once, the Display will show :



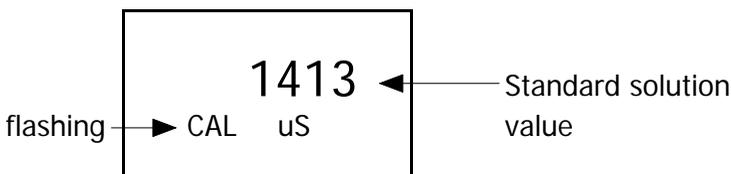
- b. If intend to make the calibration, then press the " Enter button " ( 3-4, Fig. 1 ) to confirm.

The Display will show as example :



The upper value will show the measuring value  
The lower display will show the text " CAL ", then after a while the text " CAL " will be flashed.

- c. During the text " CAL " is flashed, can use the buttons :  
" ▲ button " ( 3-3, Fig. 1 )  
" ▼ button " ( 3-5, Fig. 1 )  
to adjust the upper display reading same as the value of " Conductivity Standard Solution ", for example 1413 uS for CD-14 standard solution.



- 5) After the upper display already adjust to the value of " Conductivity Standard Solution ", release the fingers from the buttons.  
 After a while the upper display will show the text " SAVE " and " End " then return to normal display.  
 The calibration procedures are finished, the calibration value will save into the memory circuit.

## 10. OPTIONAL ACCESSORIES

<p>Carrying case CA-06</p>	<p>Hard carrying case. ( 280 x 195 x 65 mm )</p> 
<p>Carrying case CA-05A</p>	<p>Soft carrying case with sash ( 260 x 110 x 55 mm )</p> 

<p>1.413 mS Conductivity Standard Solution CD-14</p>	
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<p>RS232 cable UPCB-02</p>	<p>* Isolated RS232 cable. * Used to connect the meter to the computer</p>
<p>RS232 cable USB-01</p>	<p>* USB Computer interface cable. * Isolated USB cable.</p>
<p>Data Logger software SW-DL2005</p>	<p>* Software the used to download the data logger ( data recorder ) from the meter to computer.</p>
<p>Data Acquisition software SW-U801-WIN</p>	<p>* The SW-U801-WIN is a multi displays ( 1/2/4/6/8 displays ) powerful application software, provides the functions of data logging system, text display, angular display, chart display, data recorder high/low limit, data query, text report, chart report.. .xxx.mdb data file can be retrieved for EXCEL, ACCESS..., wide intelligent applications.</p>
<p>Power adapter</p>	<p>AC 110V to DC 9V, USA plug. AC 220V/230V to DC 9V. Germany plug.</p>

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