NECMET

Instruction Manual

Model EC-450L (*Conductivity/Salinity/Temp Meter*)

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ISO
Certified
9001

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TABLE OF CONTENTS

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Chapter I. Instruction

istek's desktop **Conductivity/Salinity/Temp Meter** (*Model EC-450L*), the latest- model is operated by AC/DC adaptor(DC 9V), a high performance model controlled by **microprocessor** for all measurement needs. This desktop meter make a feature of a wide & clear backlit color graphic LCD display, simultaneously display of various measured data¡s and a built-in printer can be installed (This is an optional) and simplified user¡s instruction manual is stored in the meter for user¡s convenience.
This high-performance meter, EC-450L has a single channels system for measuring conductivity, and Salinity. At the very moment also can be controlled each functions. It is displaying conductivity (¥S/cm, mS/cm), Salinity (ppt), (mg/L), Resistivity(ohm, kohm, Mohm) and Temp(℃)

The model EC-450L is capable of storing up-to 500 points in its memory box and storing by control of the time interval of Data-Logging automatically. And also, by using RS232C cable, it can be remotely controlled and transmitted the measured information to the printer or computer by 1 second interval.

EC-450L (Conductivity/Salinity/Temp Meter)

If an EC value is stable, a world ¡Stable" is displaying on the screen, therefore a user can measure the sample accurately. And it features Auto/Manual calibration (each 5 Points) And displaying Conductivity (¥S/cm, mS/cm), Salinity (ppt), (mg/L), Resistivity (ohm, Kohm, Mohm) and temp (℃)

EC   Indicates Conductivity of Solution. (Unit is µS/cm, mS/cm)

            Indicates by converting the measured conductivity into concentration of the total dissolved solid present solution from. (Unit is mg/L)

Salinity   Indicates by converting the measured conductivity into salinity of solution (Unit is ppt)

ATC   Indicates Automatic Temp Compensation, a temperature probe supplied by istek must be used. Temperature Compensation is automatically performed Indicates present temp and in case of it is unconnected with the meter, it displayed 25℃.

Chapter II. General Functions

2.1 Instrument Setup

Rear Panel (EC-450L)

Power Source
Connect the supplied AC/DC adaptor to Power Jack of the meter.
istek supplies AC/DC adaptor(DC 9V) adjusting to 220V.

Electrode Connection
Attach electrode by sliding the BNC connector onto the sensor input then push down and turn clockwise to lock into position.

ATC Probe Connection
Attach the ATC probe to the ATC jack by sliding the connector straight on until firmly in place.

Printer and RS232C interface cable Connection
Insert printer and RS232C cable into the RS232C jack.
Use interface cable supplied by istek.

2.2 Key Functions *EC-450L (Conductivity/Salinity/Temp Meter)*

NeoMet   *pH-250L*

(Power)   (Ready Measur)   (Memo-ry/ Out)   (Mode)   (Move)   (⋏)

(Printer)   (Enter)   (Resolu tion)   (⋎)

Key   Description

Power   Used to turn ON/OFF.

Ready / Measure   Used to change condition of meter, i.e. measure or ready.
                         This is used for changing from ready to measure condition or
                         reversing.

Memory / Out   Used to store data in meters memory while measuring
                         In the ready condition, use to search a memorized data.
                         Used to exit from Condition of Memory(Data Mode).

Mode   Used to change operating modes, such as pH, ISE or mV.

Move   Used to move each menu.
                         Setup => Cal => Memory => Help

Printer   Used to print a measured data
Enter   Used to set a selected data.

Resolution   Used to change the resolution.
                         For pH mode, can choose 0.1, 0.01 or 0.001.

≫   In setup, calibration and Data (Memory) mode, press to increase value.

≪   In setup, calibration and Data (Memory) mode, press to decrease value.

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2.3 Display Description

The following display is specially specified.
Even some messages are not shown in the below display, describe together below.

Initial display of ▣ EC-450L

Display	Function
EC	Indicates conductivity with range of 0 ˜ 199,999 ¥S/cm
Sal	Indicates salinity presents in solution at a current temp(Unit ppt)
Setup	Indicates to change each selected value per measuring Item
Cal	Indicates that meter is in calibration condition
Memory	Indicates for confirming each saved data per Item
Help	Indicates to check interior simplicity manual which is saved in instruments
Message	When you select each Menu or item, this message is appeared
05/08/24	Indicate of using data of the instrument
15:00:32	Indicate of using time of the instrument

2.4 Electrode Structure

Conductivity Cell Storage & Maintenance

Conductivity Cell Storage
A dirty cell will contaminate the solution and cause conductivity to change. It is best to store cells that are immersed in deionized water. Provided the cell has been stored in condition of drying, should be soaked in distilled water for five to ten minutes before using to keep electrode wet.

Conductivity Cell Maintenance (Cell Cleaning)
Glease, oil, fingerprints, and other contaminants on the sensing elements can cause erroneous measurements and sporadic responses.
If it takes long time to response or a stable data isn't obtained, can be often restored to normal performance by using the following procedures

- Clean cells with detergent and/or dilute nitric acid(1%) by dipping or filling the cell with cleaning solution and agitating for two or three minutes.

- Other diluted acids(e.g. sulfuric, hydrochloric, chromic) may be used for cleaning except for aqua regia.

- When a stronger cleaning solution is required, try concentrated hydrochloric acid mixed into 50% isopropanol

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Chapter III Setup Functions (Clear Memory)

The setup menu is used to identify and change instrument parameters.

3.1 Setup in EC mode

In EC ready condition if pressing **[Setup Key]** the display is shown as follows.
The selected menu shows an emphasized black color in turn by pressing **[Select key]** and the condition of each item is set by pressing **[Enter key].**

<Temp setting >

Initial display of ▣ EC-450L

From above display<initial display>, select <Setup> Menu by using **[Move Key]**
After select <Setup> and press **[Enter Key]**, then below is displayed

From this, select <Common> and press **[Enter Key]**, then you can go next step as a follow.

Please select <Time> and press **[Enter Key]** then you can go to next display, which can be selecting Current Time. You can set a correct current time by using **[Move Key]** and **[≫], [≪] key**. After completing it, Press **[Memory Key]** for saving the time and exiting.

From this initial display, using **[Move Key],** can move to each **[Setup]** item and also could select each item by using **[Enter Key].**

1) **Common**: able to set up ¡Time¡ & ¡RS232¡
2) **Temp**: able to **check ¡Temp¡, check** of Sensor¡s condition and input exact temp.

In case of a temp error between real temp and instrumental temp is large or wrong temp is displayed on a screen, you could settle it to be correct. Input or change a selected value according to message which is near the bottom on the meter.

(1) **Time:** Use this to change ¡Time¡ or ¡Data¡ on the meter.
(2) **RS232**: Used this to input or change ¡Data-Logging¡
(3) **Temp**: Used this to set an exact temp.

9

Setup	Cal	Memory	Help

Common

RS232

Interval		
Min	Sec	
00	00	COM

Message	05/08/24 15:00:32

* Value Setting : [Up] [Down]
* Save & Exit : [Memory]

This display is shown that item of RS232 is changing to item of Data-Logging interval.

3.1.1 Setup in EC Mode (Conductivity)

From the Initial display, select <EC> Item by pressing **[Move Key]**.

After selecting <EC> and press [**Memory/Out**] Key, then below (right one) is displayed.

Setup	Cal	Memory	Help

EC

EC		SAL

Message	05/08/24 15:00:32

Cell = 1.0, TC = 2.1, Tref = 25.0˚C

Setup	Cal	Memory	Help
EC	Ch1		Common

Setup	Temp	Common
	˚C	

Message	05/08/24 15:00:32

* Move : [Move], Select : [Enter]
* Save & Exit : [Out]

From the left display, move <Setup> by using **[Move Key]**. Each single item can be selected by pressing **[Enter Key]**.

(1) Setup: Available to select Cell constant, Tref and TC

(2) Temp: Available to check ATC connecting with the Meter and set a temp.

(3) Common: Available to select Time and RS232C

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3.1.2 Selecting of cell constant, Tref, TC

From EC Setup display, press **[Enter Key]** then below display is shown.

<EC setup display>

<Selecting display of Cell constant>

<Selecting display of Tref>

<Selecting display of TC >

From above displays, you can enter the value by pressing [Up/Down] Key.

(1) Selecting display of Cell Constant: It is available to select proper cell constant by the range which you would like to measure

< EC range per Cell Constant>	
Cell constant	**Range**
0.01	0.055 ~ 20 ¥S/cm
0.1	0.5 ~ 200 ¥S/cm
1.0	0.01 ~ 2 mS/cm
10.0	1 ~ 200 mS/cm

(2) Selecting display of Tref. : Available to select proper compensation temp between 20℃ to 25℃

11

(3) Selecting display of Temperature Coefficient: Available to set proper Temp Coefficient
Unit is %/℃ and it is settled 2.1 %/℃ basically.

Temp Coefficient (Between 25 to 50℃) [Variation of EC¡s % /℃]	
Sample	**%/℃**
Ultrapure Water	4.55
Salt(NaCl)	**2.12**
5% NaOH	1.72
Dilute Ammonia	1.88
10% HCl	1.32
5% Sulfuric Acid	0.96
98% Sulfuric Acid	2.84
Sugar Syrup	5.64

3.1.3 Setting Temp in Setup

From this <Setup>, move to <Temp> mode by pressing [Move] key.

After pressing [Enter] Key then below is displayed.

<ATC Probe is disconnected>   **<ATC Probe is connected>**

If the ATC probe is disconnected with the meter, left display with direction ¡Connect Temp
Sensor ¡is shown. And the ATC is connected with it, you can go to right display directly.

And user is able to put temp manually. If there are quite difference between temp in the Meter
and Real Temp, you can set correct time by the direction appear the bottom of screen.

3.1.4 Setting Common in Setup

From this <Setup>, move to <Common> mode by pressing [Move] key.

After pressing [Enter] Key then below is displayed.

Setup	Cal	Memory	Help
Common			
Time		RS232	
Time		RS232	
Message		05/08/24 15:00:32	
* Move : [Move], Select : [Enter] * Save & Exit : [Out]			

By itemize, it is available to input or change a value following as the message from the bottom of LCD

(1) Time: Available to change <temp> and <date>, which is displayed on the LCD

(2) RS232: Available to input or change a time Interval of <Data-Logging>.

Setup Cal Memory Help Item
Common
Time
05 / 08 / 24   15 : 00
Message   05/08/24 15:00:32
* Value setting : [Up] / [Down] * Save & Exit : [Memory]

Setup Cal Memory Help Item
Common
RS232
Interval — Min / Sec — 00 / 00   COM
Message   05/08/24 15:00:32
* Value Setting : [Up] [Down] * Save & Exit : [Memory]

Above is showing Time setting or Interval changing of Data-Logging.

3.2 Calibration in EC Mode (Conductivity)

3.2.1. Calibration in EC Mode

For calibrating of EC Sensor, It needs to select <Proper Probe> and <Standard Solution>

For Calibration of ION Electrode, a preparation is as a follows.

(1) EC Meter

(2) EC sensor / ATC Probe

(3) Standard solution

< Buffer per Cell Constant >	
Cell Constant	**Standard solution**
0.01	No needed
0.1	146.9 ¥S/cm
1.0	1413 ¥S/cm
10.0	6.67 mS/cm or 12.89 mS/cm

 (4) Stirrer, Magnetic Bar, Distilled water for rinsing

Default conditions in setup Mode is as a follows.

☐ Cell Constant: 1.0

☐ Compensating Temp (Tref.): 25.0 ℃

☐ Temperature Coefficient (TC): 2.10 %/℃

On the initial display of EC, press [move] Key to move <Cal>, and press [Enter]Key, then a below is displayed.

Setup   Cal   Memory   Help
EC
EC   SAL
Message   05/08/24 15:00:32
Cell = 1.0, TC = 2.1, Tref = 25.0'C

Setup   Cal   Memory   Help
EC
1413 µS/cm
ATC 25.0'C
Message   05/08/24 15:00:32
* Buffer selecting. * Buffer change = [Move]/[Up]/[Down]

From above display, select a standard solution what you want to use and save it by pressing [Memory/Out] Key. After rinsing the sensor with distilled water carefully and put the sensor in the buffer and press [Measure] Key. Below display is shown.

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Setup	Cal	Memory	Help
EC			

1413 µS/cm

Tref 25.0	ATC 25.0'C
Message	05/08/24 15:00:32
* For starting of calibration : [Measure] * Exit : [Out]	

Setup	Cal	Memory	Help
EC		Buffer 1413 µS/cm	

1395 µS/cm

Tref 25.0	ATC 25.0'C
Message	05/08/24 15:00:32
* For finish of calibration : [Memory]	

When a value is stable, press [Memory/Out] Key for finishing calibration

After this first calibration, it came back to the initial display of EC and calibrated date and buffer¡s detail are displayed on the LCD. (Please refer below drawing)

Setup	Cal	Memory	Help

EC

EC			SAL
Message		05/08/24 15:00:32	
Cell = 1.0, TC = 2.1, Tref = 25.0'C			

After rinsing the sensor again with distilled water carefully and soak it the sample which you want to measure. And press [Measure] Key for measuring. Below is the display what is measuring.

Setup	Cal	Memory	Help
EC			

1395 µS/cm

Tref 25.0	ATC 25.0'C
Message	05/08/24 15:00:32
* In process of measuring.	

3.2.2. Saving memory in EC Mode

On the way of measuring EC, press [Memory] Key for saving the data.

```
Setup    Cal    Memory    Help
EC

         1395 µS/cm

Tref  25.0        | ATC    25.0˚C
Message           | 05/08/24 15:00:32
* Measured data is saved.
```

If you would like to find the measuring data which you¡ve saved, in the initial display of EC, move to <Memory> by pressing [Move] Key twice. And press [Enter] Key to move memories.

```
Setup    Cal    Memory    Help
                    Number [001]

Date & Time : 05/08/24  15:00
EC  1395 µS/cm [25]   Temp 25.0˚C


Message          | 05/08/24 15:00:32
* Number change : [Up] / [Down]
* Exit : [Out]
```

```
Setup    Cal    Memory    Help
Clear

   YES            NO

      16 KByte Memory

Message          | 05/08/24 15:00:32
* Value setting : [Up]/[Down]
* Select  : [Enter]
```

.

It is available to be indicated measured data, time and saved-data. Beside this, you also can search the former dates which were saved by using [Up/Down Key]. And if you would like to <Memory Clear>, press [**Memory /out key]** to move Memory Clear Display. **After memory clear, whole data and selected values in Setup will be deleted completely**. In case of the instrument can¡t sense a connected electrode or wrong time settled or wrong data memories are saved, you can try <Memory Clear>

3.2.3. Help in EC Mode

From initial display of EC, press [Move] Key three times to move <Help>.

After that, press [Enter] Key then, a display is shown as follows.

From above display, select Language by using [Move] Key, after that press [Enter] Key to see the Help Menu. If you selected KOREAN then below display is shown.

From above display, it is available to select proper item which you want to know about by using [Move Key]. After selecting, press [**Enter Key**] then you can see the concerned information. When you select ¡pH Calibration¡ below is displayed.

When you select **EC Calibration,** below display is shown for 5 seconds interval between each.

Setup   Cal   Memory   Help
EC
1413 µS/cm
EC   SAL
Message   05/08/24 15:00:32
* Move : [Move], Select : [Enter] * It enters in a Cal mode.

Setup   Cal   Memory   Help
EC
1413 µS/cm
ATC 25.0'C
Message   05/08/24 15:00:32
* Buffer selecting * Buffer change = [Move]/[Up]/[Down]

Setup   Cal   Memory   Help
EC
1413 µS/cm
Tref 25.0   ATC   25.0'C
Message   05/08/24 15:00:32
* For starting of calibration : [Measure] * Exit : [Out]

Setup   Cal   Memory   Help
EC   Buffer 1413 µS/cm
1413 µS/cm
Tref 25.0   ATC   25.0'C
Message   05/08/24 15:00:32
* For finish of calibration : [Memory]

3.3 Setup in Salinity

3.3.1 Setup in Salinity mode

From the initial display of EC, press [Move] Key twice to move Salinity Mode and press [Enter] Key then below Salinity Setup display is shown.

(1) Common: Able to set up ¡Time¡ and ¡RS232¡

(2) Temp: Available to check the temp sensor¡s condition which is connected with the meter and also able to input new Temp also.

3.3.2 Setting Common in Salinity mode

From the <Salinity>, move to <Common> mode by pressing [Move] key.

After pressing [Enter] Key then below is displayed.

By itemize, it is available to input or change a value following as the message from the bottom of LCD

(1) Time: Available to change <temp> and <date>, which is displayed on the LCD

(2) RS232: Available to input or change a time Interval of <Data-Logging>.

Setup	Cal	Memory	Help

Common

Time

05 / 08 / 24   15 : 00

Message	05/08/24 15:00:32

* Value setting : [Up] / [Down]
* Save & Exit : [Memory]

Setup	Cal	Memory	Help

Common

RS232

Interval	
Min	Sec
00	00

COM

Message	05/08/24 15:00:32

* Value Setting : [Up] [Down]
* Save & Exit : [Memory]

Above is showing Time setting or Interval changing of Data-Logging.

3.3.3 Setting Temp in Salinity mode

From this <Salinity>, move to <Temp> mode by pressing [Move] key.

After pressing [Enter] Key then below is displayed.

Setup	Cal	Memory	Help

Channel 1

ch1 ch2 ch3   **Rear View**

Connect Temp. Sensor

Message	05/08/24 15:00:32

* Move : [Move], Select : [Enter]
* Save & Exit : [Out]

Setup	Cal	Memory	Help

Channel 1

25.0 'C

Message	05/08/24 15:00:32

* Value setting : [Up] / [Down]
* Save & Exit : [Memory]

<ATC Probe is disconnected>   **<ATC Probe is connected>**

If the ATC probe is disconnected with the meter, left display with direction ¡Connect Temp Sensor¡ is shown. And the ATC is connected with it; you can go to right display directly.

And user is able to put temp manually. If there are quite difference between temp in the Meter and Real Temp, you can set correct time by the direction appear the bottom of screen.

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3.4. Calibration in Salinity Mode

Just use the value in EC Mode. You do not need calculate in Salinity Mode specially.

When you press [Enter] Key by pressing [Move] Key from the Initial display, below is displayed.

```
 Setup    Cal    Memory    Help
 SAL

         ┌─────────────────────┐
         │                     │
         │   No Calibration    │
         │                     │
         └─────────────────────┘


 Message          05/08/24 15:00:32

 * Can measure without calibration.
```

3.5. Saving memory in Salinity Mode

On the way of measuring Salinity, press [Memory/Out] Key for saving the data.

```
 Setup    Cal    Memory    Help
 SAL


          2.0  ppt


                  ATC     25.0'C
 Message          05/08/24 15:00:32

 * Measured data is saved.
```

If you would like to find the measuring data which you¡ve saved, in the initial display of Salinity, move to <Memory> by pressing **Move** Key twice. And press **Enter** Key to move memories.

```
 Setup    Cal    Memory    Help
                  Number [001]

 Date & Time  :  05/08/24  15:00
 SAL  2.0 ppt          Temp 25.0'C



 Message          05/08/24 15:00:32

 * Number change : [Up] / [Down]
 * Exit : [Out]
```

It is available to be indicated measured data, time and saved-data. Beside this, you also can search the former dates which were saved by using [Up/Down Key]. And if you would like to <Memory Clear>, press [**Memory /out key]** to move Memory Clear Display. **After memory clear, whole data and selected values in Setup will be deleted completely**. In case of the instrument can¡t sense a connected electrode or wrong time settled or wrong data memories are saved, you can try <Memory Clear>

```
 Setup    Cal    Memory    Help
 Clear

 ┌──────────┐      ┌──────────┐
 │   YES    │      │   NO     │
 └──────────┘      └──────────┘

        16 KByte Memory

 Message        │  05/08/24 15:00:32
 * Value setting : [Up]/[Down]
 * Select  : [Enter]
```

3.6. Help in Salinity Mode

From initial display of Salinity, Press [Move] Key three times to move <Help>.

After that, press [Enter] Key then, a display is shown as the EC Mode.

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Chapter IV Data-Logging

4.1 Data-Logging

The measured data is stored by pressing **Memory** key manually.
If the data stored in meter is required to print, it is available to output by using printer supplied by *istek*. After searching data stored in instrument by using **Select** key, press **Out** key to print data.

<<Data save in EC Mode>>   **<<Data save in Salinity Mode>>**

Setup	Cal	Memory	Help
		Number [001]	
Date & Time : 05/08/24 15:00			
EC 1395 µS/cm [25] Temp 25.0˚C			
Message		05/08/24 15:00:32	
* Number change : [Up] / [Down] * Exit : [Out]			

Setup	Cal	Memory	Help
		Number [001]	
Date & Time : 05/08/24 15:00			
SAL 2.0 ppt Temp 25.0˚C			
Message		05/08/24 15:00:32	
* Number change : [Up] / [Down] * Exit : [Out]			

It is available to search former data by using [**Up/Down Key]**, it is also available to print by using built-in printer. Press [Printer Key] to print the data

```
                     Number [001]
  Date & Time    05/08/24    15:00:32
  EC     1395 ¥S/cm       Temp 25.0
  SAL    2.0ppt            Temp   25.0
```

4.2 Data-Logging in Printer

From each Mode, it is move like [Setup Menu] -> [Common Menu]->[RS232 Menu] one after the other and below display is shown. .

Setup	Cal	Memory	Help
Common			
RS232			

Interval		PRINT
Min	Sec	Print
00	00	

Message	05/08/24 15:00:32

* Value setting : [Up]/ [Down]
* Save & Exit : [Memory]

By using **[Move Key]**, you can move to ¡Min¡, ¡Sec¡ section of Interval and select ¡Time¡.

And also, move to Data-Logging and select ¡Printer¡

When you select ¡Printer¡, it is available Data-Logging automatically by selected time on Interval. For example) Condition of **Data-Logging:** Interval - 3Sec, subject ? Printer

: In case you select same as a above and measure a data, this data is printed every 3 sec from built-in printer

The following figure is an example of printed paper.

Date & Time	**05/08/24**	**15:00:32**
EC	**1395 ¥S/cm**	**Temp 25.0**
SAL	**2.0ppt**	**Temp 25.0**

4.3 Computer Data-Logging

From each Mode, it is move like [Setup Menu] -> [Common Menu]->[RS232 Menu] one after the other and below display is shown.

By using **[Move]** Key, you can move to ¡Min¡, ¡Sec¡ section of Interval and select ¡Time¡.

And also, move to Data-Logging and select ¡Com¡ When you select ¡com¡, it is available Data-Logging automatically by selected time on Interval. For example) Condition of **Data-Logging:** Interval - 3Sec, subject ? Com

: In case you select same as a above and measure a data, this data is came out every 3 sec via Computer/

IT is necessary to buy SDIS software and connect cable (RS232C cable) for Data-Logging in computer.

Chapter V Troubleshooting & Error Description

MALFUNCTION	POSSIBLE CAUSE	REMEDY
No display	No power to meter	Press Power key.
Can not read the data exactly or found error in the display.	The Electrode is not connected well.	Check the EC Cell and ATC is connected with Meter well
	The Electrode has been polluted.	Rinsing the sensor clearly
	The Buffer Solution has been polluted.	Change buffer solution as a new one.
	The cell in electrode has been broken.	Change to another cell.
	There is an air bubble on the surface of the electrode.	Remove the air bubble by stirring up and down.

If the cause cannot be found, clear memories (data) for eliminating all data.
Refer to Clear Memory (data) of Setup Functions.

* When using Ion Selective Electrodes, refer to ISE manual.

※ If the problem persists, please contact istek, Inc Product Service Department.
   (Tel: 82-2-2108-8400, E-mail: istek@istek.co.kr)

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Chapter VI. Specifications.

Model		EC-450L
Temperature	**Range** **Resolution** **Relative Accuracy**	-10 to 110℃ 0.1℃ ¡ 0.4℃
Conductivity	**Range** **Resolution** **Relative Accuracy**	0 to 199,999¥S/cm 0.01/0.1 ¡ 0.5%
Salinity	**Range** **Resolution** **Relative Accuracy**	0.0 to 80.0 ppt 0.1 ¡ 0.1
Data Logging		500 Points
Temperature Compensation		Auto
Calibration		Auto
Input		BNC, ATC , Power, RS232C
Output		RS232C (Computer/Printer)
Power		AC/DC Power Adaptor

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Chapter VII. Ordering Information

※ Other items contact istek.
For further information on other accessories, please feel free to contact istek at any time.

A. Standard

* Conductivity Cell (K=1.0) / ATC Probe

* Conductivity Standard Solution (1413 ¥S/cm) 125ml

* AC/DC Power Adaptor

* Luxury Third-Arm Stand

* Instruction Manual

B. Option

* Conductivity cell

* Conductivity Standard Solution

* SDIS Program

* RS232C Interface Cable

* Printer

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CERTIFICATE OF WARRANTY

* We guarantee as following,
1. This product has been passed our strict inspection process.
   (It comes under the meters with the exception of an electrode)

2. Defects occurring within 2years from delivery date shall be remedied free of charge at our works when it has been used in a normal situation. (But we can make a user pay for mending charge in the case of trouble caused by a careless user.)

3. We will repair the good with fee about problems caused by user's mistake even if warranty period has not been over.

4. Please present this form with the good when you want to repair it.

5. Please keep this certificate with care because this sheet will not be reissued.

Product Name	Desktop	Warranty period
Model Name	EC-450L	
Serial Number		2years
Manufacturing Month/Year		

Date.   .   , 2007

Authorized signature

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