Desktop Conductivity/TDS/Salinity/ Resistivity/Temp Meter Model 455C

Instruction Manual

istek, Inc.

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Chapter I. Introduction

istek's Desktop Conductivity/TDS/Salinity/Resistivity/Temp Meter(model 455C) is operated by AC/DC(DC 9V) adaptor and is controlled by microprocessor for all measurement needs.

istek's Desktop Conductivity/Salinity/TEMP Meter(model 430C) features a graphic LCD which simultaneously displays various functions along with measurement.

istek's Desktop Conductivity/TDS/Salinity/Resistivity/TEMP Meter(model 455C) features to obtain a reliable data since its program is treated by setting in detail about compensation factor for an accurate measurement.

istek's Desktop Conductivity/TDS/Salinity/Resistivity/Temp Meter(model 455C) contains function which can know the last calibration status for Conductivity, e.g. the last calibration Date/Time, Temperature and Standard solution etc.

The model 455C is capable of storing up to 100 points in memory at once and storing by control of the time interval of data-log automatically, and can be remotely controlled via RS232C interface.

It is available to display unlimited number of each datalogging via Excel Software with graph including GLP documentation by using DAPS.

The model 455C displays Conductivity(µS, mS), TDS(mg/L), Salinity(ppt), Resistivity (ohm, kohm, Mohm) and Temp(°C).

Conductivity indicates conductivity of solution. (unit µS/cm and mS/cm)

TDS indicates by converting the measured conductivity into concentration of the total dissolved solid present solution from. (unit mg/L)

Salinity indicates by converting the measured conductivity into salinity of solution. (unit ppt)

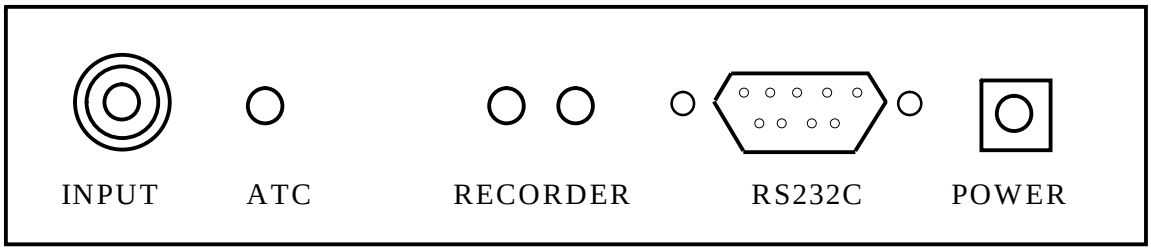
Resistivity indicates resistivity of solution at a current temperature.

Temperature Compensation(Temp)

For automatic temperaure compensation, a temperature probe supplied by *istek* must be used.
Temperature is automatically compensated on the base of Tref adjusted in Setup. Tref can be set with 25.0℃ or 20.0℃ for a basis.

Chapter II. Instrument Setup

Real Panel



Power Source
Connect the supplied adaptor to 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.

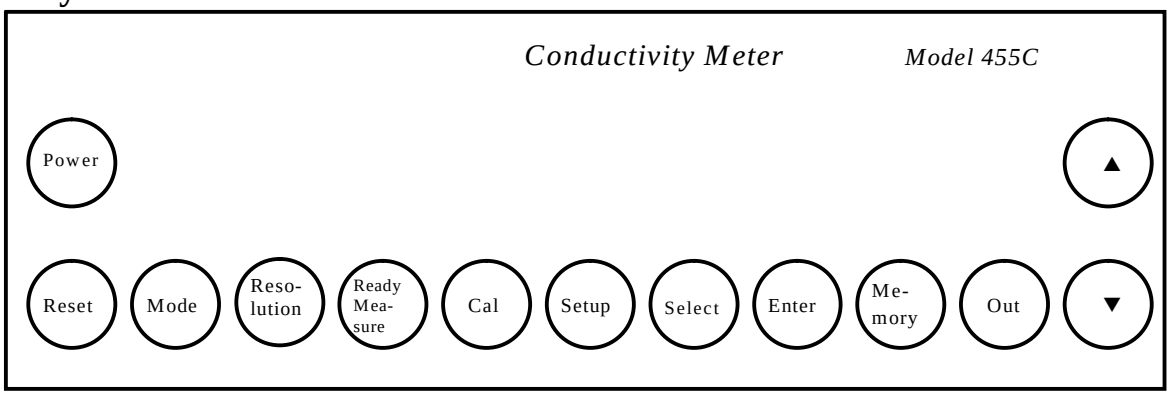
ATC Probe Connection
Attach the ATC probe to the ATC jack by sliding the connector straight on until firmly in place.

Recorder Connection
When the recorder is used, connect the recorder to the meter. Output voltage is -1999.9 ~ +1999.9 mV with impedance of 600 Ω.

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

Chapter III. General Functions

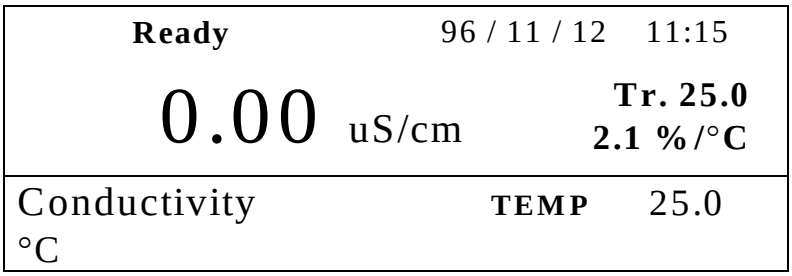
Key Function



Key Name	Description
Power	used to turn ON/OFF.
Reset	used to initiate a system.
Mode	used to change operating modes, such as conductivity, TDS, salinity or resistivity.
Resolution	used to change the resolution while measuring.
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.
Cal	used to start or set calibration. used to confirm the last calibration status.
Setup	used to access the setup menu. This is used for setting instrument parameters. Can set Cell Constant, Temperature Coefficient, Temperature Compensation, Date/Time and Data-Log.
Select	used to move position of cursor. used to measure conductivity without temperature compensation.
Enter	used to set a selected data.
Memory	used to store data in meter¡s memory while measuring. In the ready condition, used to search the memorizeded data.
Out	used to print data. used to exit in Setup mode.
up(▲)	In setup and Data(Memory) mode, press to increase value.
down(▼)	In setup and Data(Memory) mode, press to decrease value.

Display Description

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



Display	Function
Conductivity	indicates conductivity with range of 0 ~199,999 µS/cm.
TDS	indicates the amount of total dissolved solids presents in solution (unit mg/L).
Salinity	indicates salinity presents in solution at a current temperature. (unit ppt)
Resistivity	indicates resistivity of solution at a current temperature.
Temp(°C)	displays when a temperature probe is attached, and indicates automatic temperature compensation.
Ready	indicates that meter is in ready condition.
Measure	indicates that meter is in measure condition.
96/11/12 11:15	indicates a current date and time.
Tr. 25.0	indicates that compensation of temperature is performed at 25.0 °C.
Tr. 20.0	indicates that compensation of temperature is performed at 20.0 °C.
-------	indicates no temperature compensation.
2.10 %/℃	indicates to compensate temperature with the temperature coefficient, 2.10 %/°C.
Error	displays when it is not available to correctly measure because something is wrong in the meter or buffer while calibrating or measuring.

Electrode 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.

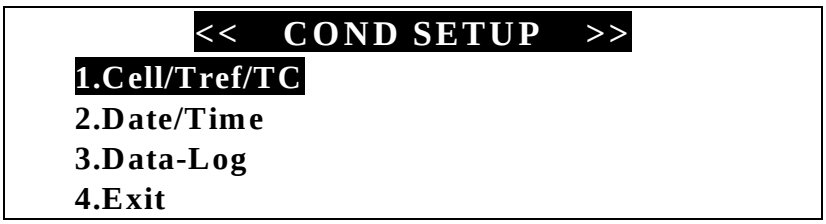
Conductivity Cell Maintenance (Cell Cleaning)

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.

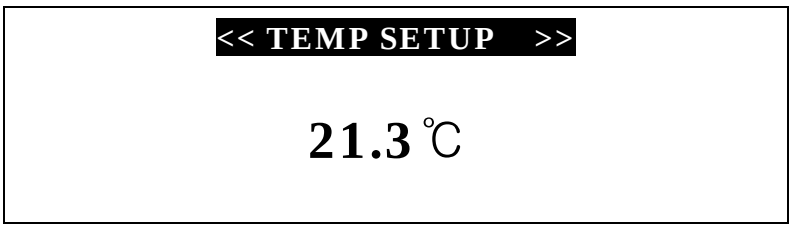
Chapter IV. Setup Functions

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

Temperature Setting
If temperature on display differs from a real temperature, set a real temperature according to the following procedure.
Press **Setup** and then the display is shown as follows.

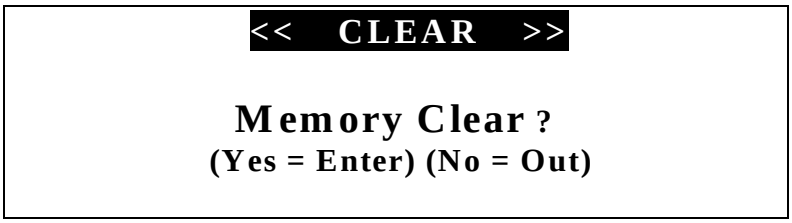


Press **Mode** key.



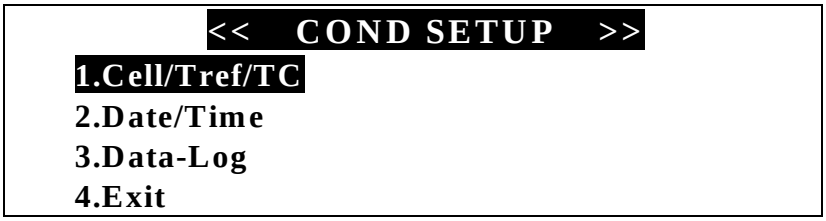
Set temperature by using ▲ or ▼ key and exit by pressing **Out** key.

Clear data(Memory)
If clearing the stored data, press **Mode** key to enter Salinity mode. The display is shown as follows. And then press **Enter** to clear. Therefore all data, which set at setup, are changed to a basic value.



(1) Conductivity Mode

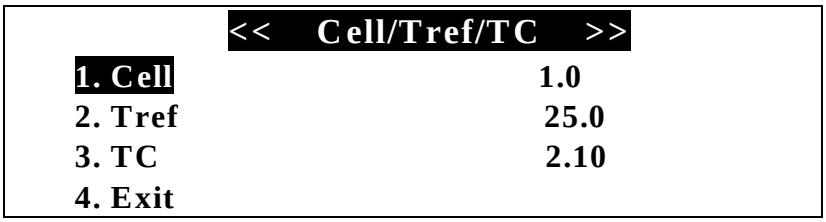
In the conductivity ready condition press **Setup** key to enter setup and then the message is shown as follows.



The selected menu shows an emphasized black color in turn with pressing **Select** key and the condition of each item is set with pressing **Enter** key.
After finishing setup, press **Out** key or select a displayed **Exit** to exit.

Cell/Tref/TC

In the initial display of Conductivity Setup, after selecting **1.Cell/Tref/TC** by using **Select** key, press **Enter** key and then the display is shown as follows.

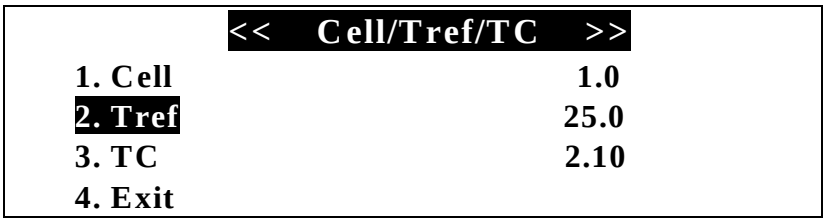


1) Cell

1. Cell has function to set cell constant. For conductivity measurement of a solution, can accurately measure by adjusting cell constant. Cell constants consist of 0.01, 0.1, 1.0, 10 and 100, and set by using ▲ or ▼ key.

2) Tref

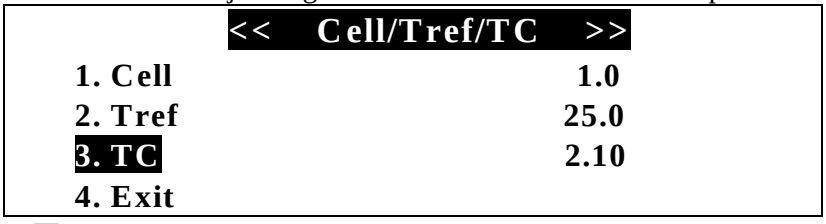
2. Tref has function to set compensation temperature(25.0 °C or 20.0 °C).



Press ▲ or ▼ key to change 25.0 or 20.0. The conductivity of a solution exhibits at 25.0°C or 20.0 °C.

3) TC

3. TC is used to set temperature coefficient. The conductivity of solution with a specific electrolyte concentration will change in accordance with the change of temperature. Each conductive ion has a different temperature coefficient.
All *istek*'s meters allow adjusting coefficient for the advanced performance.



Press ▲ or ▼ key until the desired value is displayed.

The following table is a typical temperature coefficients(percentage of change of conductivity per °C).

Solution	**%/°C**
Ultrapure Water	4.55
Salt(NaCl)	2.12
5% NaOH	1.72
Dilute Ammonia	1.88

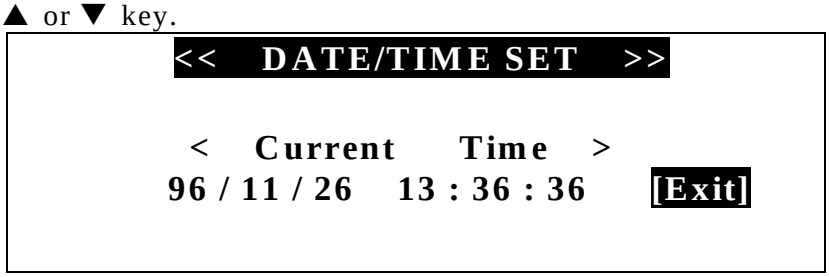
Solution	**%/°C**
10% HCl	1.32
5% Sulfuric Acid	0.96
98% Sulfuric Acid	2.84

4) Exit

If finishing setup or exiting setup in the middle of setting, select **Exit** and press **Enter** key. **Out** key has the same function.

Date/Time

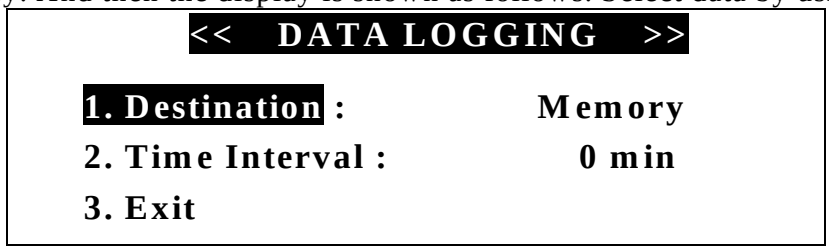
In the initial display of setup, after selecting **2. Date/Time** by using **Select** key, press **Enter** key. Select data(year, month, day and time etc.) with **Select** key and adjust data by using ▲ or ▼ key.



If finishing setup, press **Out** key or select a displayed **Exit** to exit Date/Time setup.

Data-Log

In the initial display of setup, After selecting **3. Data-Log** by using **Select** key, press **Enter** key. And then the display is shown as follows. Select data by using **Select** key.



1) **1.Destination** is a place to store memory type, such as memory, printer or Excel etc., by using ▲ or ▼ key.
If pressing **Enter** key in **1.Destination**, display is shown as follows.

Baud	Data	Stop	Parity
9600	8	1	No
			[Exit]

Select communication data by using **select** key, and set Baudrate, Data Bit, Stop Bit and Parity Bit by using ▲ or ▼ key.

· Baud : adjust communication rate between computer and meter by using ▲ or ▼ key.
· Data : adjust Data Bit between computer and meter by using ▲ or ▼ key.
· Stop : adjust Stop Bit between computer and meter by using ▲ or ▼ key.
· Parity : adjust Parity Bit between computer and meter by using ▲ or ▼ key.

If finishing setup press **Out** key or a displayed **Exit** to exit RS232C setup.

2) Time Interval

In order to store data to any Destination with certain, select a desired time interval(minutes or seconds) by using ▲ or ▼ key.

<< DATA LOGGING >>	
1. Destination :	Memory
2. Time Interval :	0 min
3. Exit	

Unit of time interval, such as minutes and seconds, is changed by pressing **Enter** key.

Adjust time interval by using ▲ or ▼ key.

<< DATA LOGGING >>	
1. Destination :	Memory
2. Time Interval :	0 sec
3. Exit	

Time interval ranges from 1 second to 23 hours 59 minutes 59 seconds.

3) Exit

If finishing setup, press either **Out** key or a displayed **Exit** key to exit Data-Log setup.

Exit

If finishing setup or exiting setup in the middle of setting, select a displayed **Exit** and press **Enter** key. **Out** key has the same function as **Exit** key.

(2) TDS Mode

In the TDS ready condition if pressing **Setup** key, the display is shown as follows.

TDS factor adjusts by using ▲ or ▼ key and is basically adjusted to 0.7.

If finishing setup, press either **Out** key to exit setup.

Chapter V. Calibration and Measurement

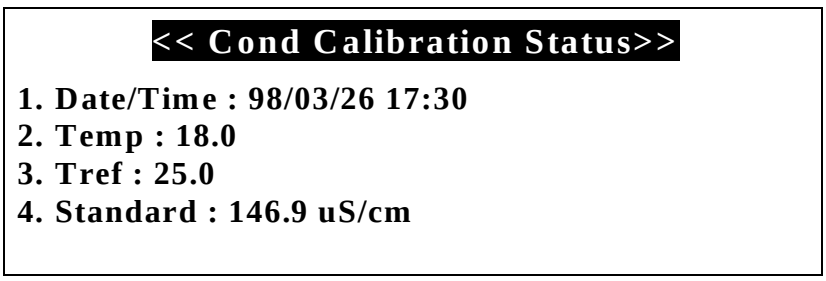
The basic condition is as follows.

- ¡ Cell Constant (Cell) : 1.0
- ¡ Compensation Temperature (Tref) : 25.0
- ¡ Temperature Coefficient(TC) : 2.10 %/°C
- ¡ Data-Log : memory

This meter contains function to confirm the last calibration status of conductivity.

(1) Conductivity Calibration Status

In conductivity ready condition press **Setup** key and **Cal** key or in measurement condition press **Cal** key to enter ¡Cond Calibration Status¡.



Confirm Date/Time, temperature(Temp) and compensation temperature(Tref) and standard solution used for the last calibration. If pressing **Out** key, return to an initial display.
If clearing data, can¡t confirm the last Calibration Status, and the display is shown as follows.

1. Date/Time : 00/00/00 00:00 **2. Temp : 0.0** **3. Tref : 0.0** **4. Standard :** **No Data**

(2) Preparation

Connect meter with cell and ATC jack.
Prepare a required buffer for measurement and magnetic stirrer.
Clearly rinse cell with the distilled water and blot dry.

(3) Calibration

In conductivity ready condition, press **Cal** key to enter calibration mode.
The display is shown as follows, and select standard solution by using **Select** key.

[Cal] Ready 0.00 uS/cm	146.9 uS
	1413 uS
	6.67 mS
	12.89 mS
TEMP : 18.0 Tr : 25.0	111.9 mS

Put cell into the selected standard solution and press **Measure** key.
Put cell into standard solution and press **Measure** key.

[Cal] Measure 143.6 uS/cm	146.9 uS
	1413 uS
	6.67 mS
	12.89 mS
TEMP : 18.0 Tr : 25.0	111.9 mS

After the reading is stable, press **Cal** key and then Cal-OK message is displayed and returns to an initial mode.

[Cal] Cal-OK 146.9	146.9 uS
	1413 uS

	6.67 mS
	12.89 mS
TEMP : 18.0 Tr : 25.0	111.9 mS

If using standard solution that not showing on screen, adjust conductivity by using ▲ or ▼ key .

[Cal] Ready	158.7 uS
0.00 uS/cm	1413 uS
	6.67 mS
	12.89 mS
TEMP:18.0 Tr:25.0	111.9 mS

The following table is shown correlation conductivity with concentration of KCl solution.

KCl solution(M)	**Conductivity**
0.001	146.9 µS/cm
0.01	1413.0 µS/cm
0.05	6.67 mS/cm
0.1	12.89 mS/cm
1	111.9 mS/cm

(4) Measurement

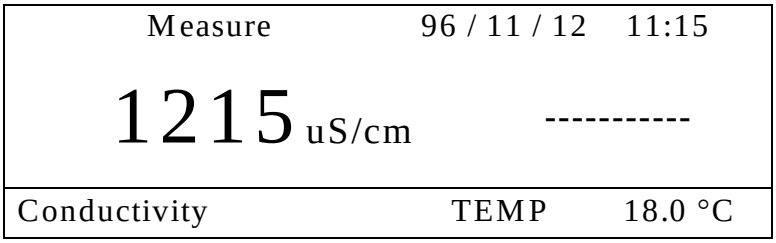
1) Conductivity Measurement

In the calibration, TC(i.e. Temperature Compensation Coefficient) is automatically selected by standard solutions and measuring temperature. KCl solution have a lower temperature coefficient (app. 1.9%/°C) of conductivity than typical potable water. Sodium chloride(NaCl) has a temperature coefficient (2.12%/°C) that closely approximates that found in most waters from wells and surface sources.

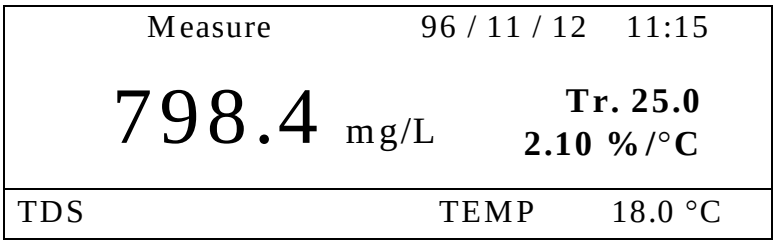
Press **Measure** key to measure the conductivity of solution. The display is shown as follows.

Measure 96 / 11 / 12 11:15	
1413 uS/cm	**Tr. 25.0** **2.10 %/°C** ℃
Conductivity TEMP 18.0 °C	

After the reading is stable, store or record it. If measuring conductivity without compensation of temperature, press **Select** key to measure conductivity at measuring temperature without compensation of temperature.

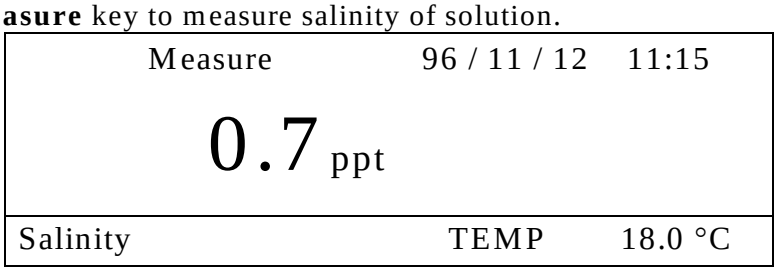


2) TDS Measurement
The preparation for TDS is the same as for conductivity.
Press **Mode** key to enter TDS mode.
Press **Measure** key to measure TDS of solution.



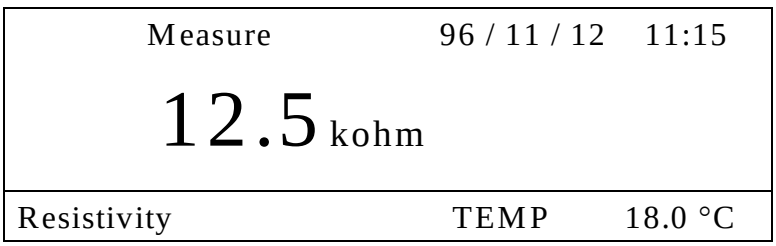
While measuring conductivity, can measure TDS by pressing **Mode** key.

3) Salinity Measurement
The preparation for salinity is the same as for conductivity.
Press **Mode** key to change salinity mode.
Press **Measure** key to measure salinity of solution.



While measuring conductivity or TDS, can measure salinity by pressing **Mode** key

4) Resistivity Measurement
The preparation for resistivity is the same as for conductivity.
Press **Mode** key to change resistivity mode.
Press **Measure** key to measure resistivity of solution.



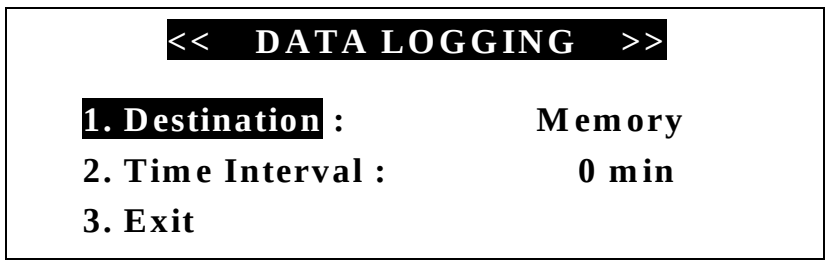
While measuring conductivity, TDS or salinity, can measure resistivity by pressing **Mode** key

Chapter VI. Data -Log

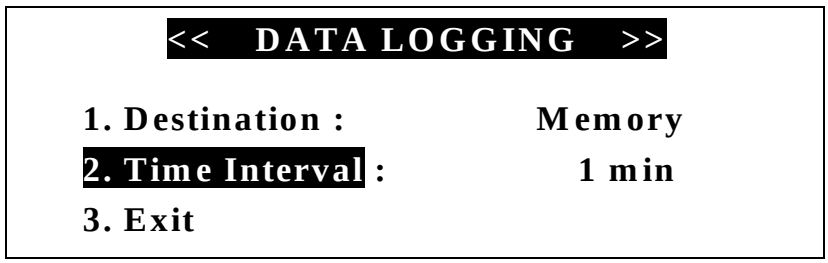
Model 455C can transmit information to printer or computer via RS232 interface. Data-Log consists of memory, excel and printer etc.

(1) Memory Data - Log

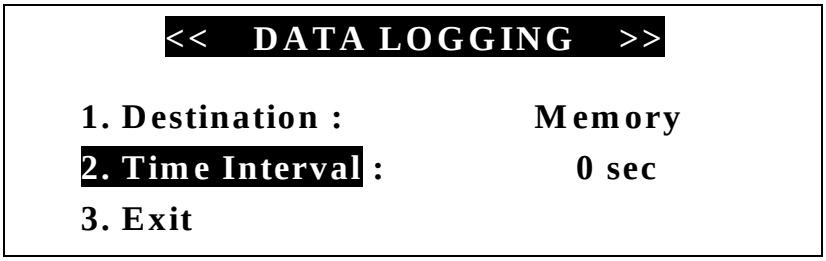
The basic condition of Data-Log is set as follows.



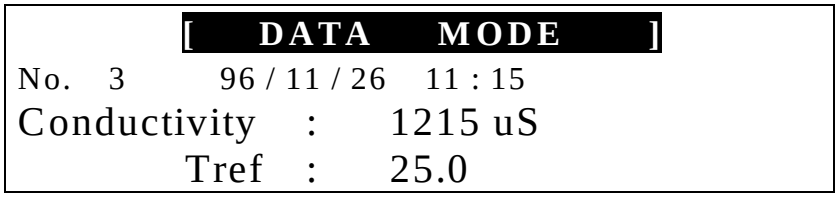
The measured data is stored in meter by pressing **Memory** key manually.
If the condition of Data-Log is set as follows(refer to Setup), the measured data is automatically stored with time interval of one minute in meter.



Unit of time interval, such as minutes and seconds, is changed by pressing **Enter** key.

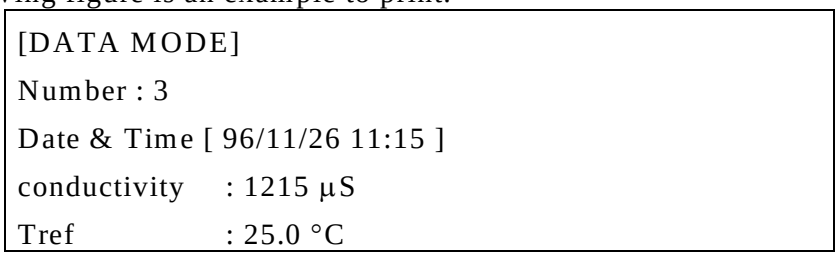


Up to 100 points are stored in memory at once.



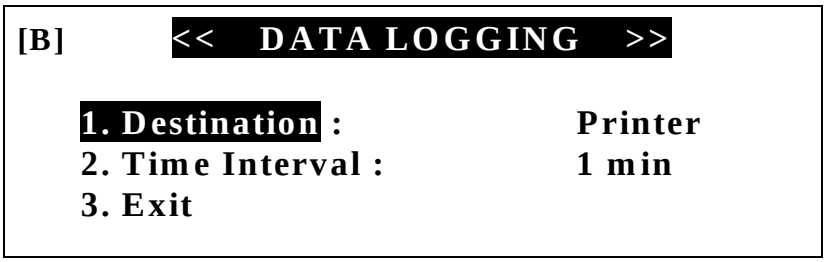
If setting Destination as ¡None¡, data isn't stored. If needing to print the stored data in meter, it is available to output by using printer supplied by *istek*. In ready or measure condition, enter Data(Memory) Mode by **Memory** key, search the stored data in meter by using **Select** key and press **Out** key to print data.

The following figure is an example to print.

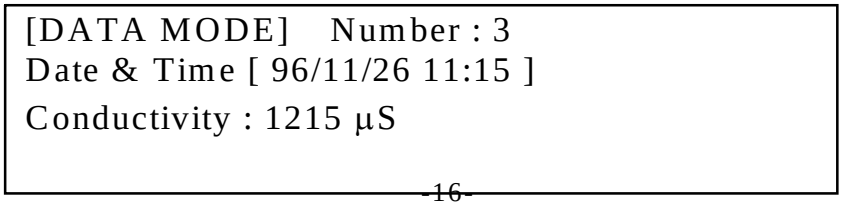


(3) Printer Data-Log

Connect meter to printer via RS232C interface cable supplied by *istek*.
If condition of Data-Log is set as follows, the measured data is automatically printed every one minute.



In case of the direct output by printer, must use printer supplied by *istek*.
The following figure is an example to print.



Tref : 25.0°C

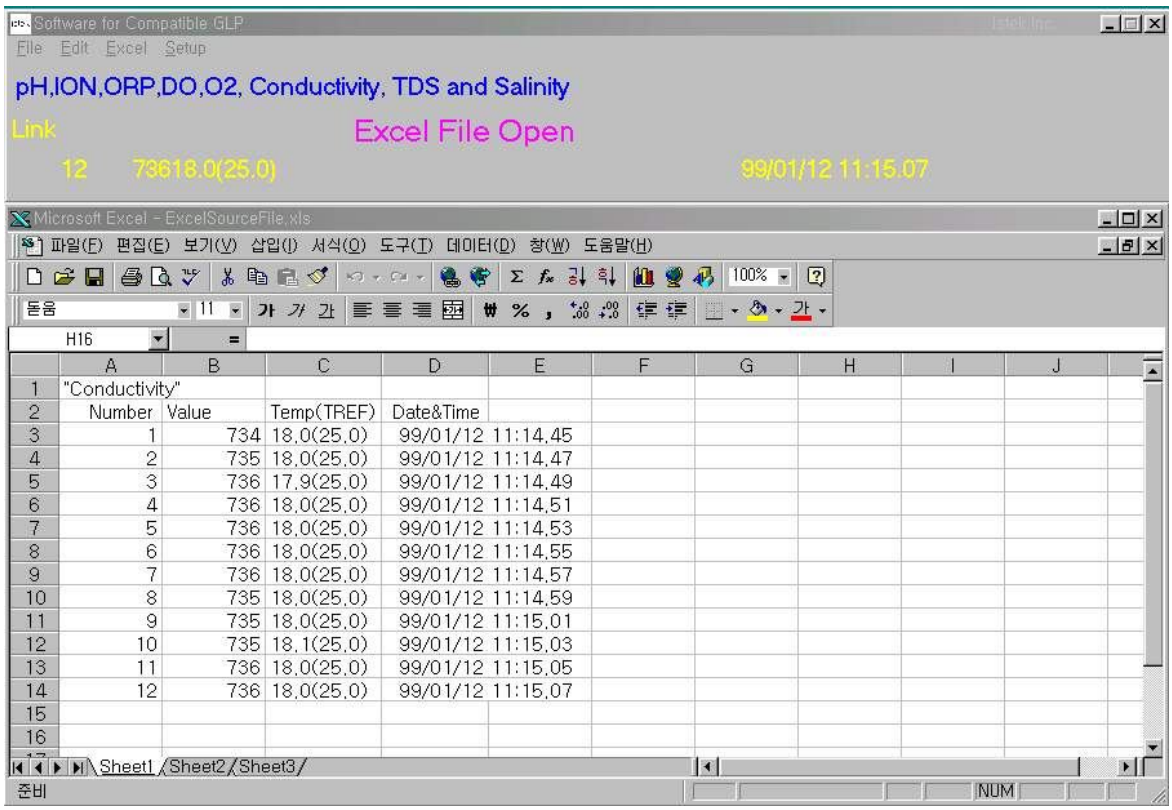
(3) Excel Data-Log

Connect meter to PC via RS232C interface cable supplied by *istek*.
It is available to store data in PC while measuring by pressing **Memory** key regardless of time. If the condition of Data-Log is set as follows, the measured data is automatically stored in PC with excel form every one minute.

<< DATA LOGGING >>

1. Destination : Excel
2. Time Interval : 1 min
3. Exit

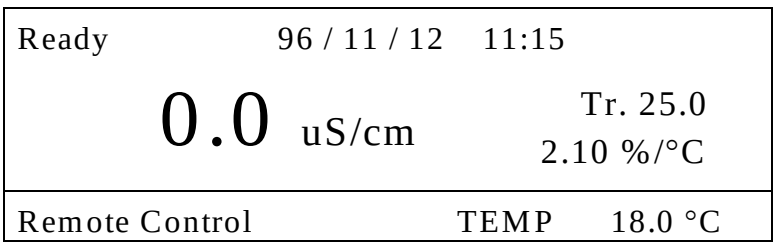
If DAPS(Data Acquisition and Processing Software) is performed, the display of monitor as follows. The installation method of DAPS refer to DAPS manual.



	A	B	C	D	E	F	G	H	I	J
1	"Conductivity"									
2	Number	Value	Temp(TREF)	Date&Time						
3	1	734	18.0(25.0)	99/01/12 11:14.45						
4	2	735	18.0(25.0)	99/01/12 11:14.47						
5	3	736	17.9(25.0)	99/01/12 11:14.49						
6	4	736	18.0(25.0)	99/01/12 11:14.51						
7	5	736	18.0(25.0)	99/01/12 11:14.53						
8	6	736	18.0(25.0)	99/01/12 11:14.55						
9	7	736	18.0(25.0)	99/01/12 11:14.57						
10	8	735	18.0(25.0)	99/01/12 11:14.59						
11	9	735	18.0(25.0)	99/01/12 11:15.01						
12	10	735	18.1(25.0)	99/01/12 11:15.03						
13	11	736	18.0(25.0)	99/01/12 11:15.05						
14	12	736	18.0(25.0)	99/01/12 11:15.07						
15										
16										

Chapter VII. Remote Control

The meter can be remotely controlled by PC.
After connecting your meter to PC by RS232C interface cable and performing communication program of computer, if pressing **Enter** key of PC keyboard, remotely controlled and key button of meter doesn't work.



When Remote control is started, message ¡ Conductivity Remote Control Mode¡ is displayed on the monitor of computer.

```
ISTEK>Conductivity Remote Control Mode
ISTEK>
```

If inputting help while performing communication program, the remote control commands are displayed on the monitor of computer.
ISTEK>help ↵
The following messages are the remote control commands.

```
: ---------- Command List -------------:

1. exit      : Exit Remote Control
2. cond      : Read Conductivity
3. tds       : Read TDS
4. sal       : Read Salinity
5. r         : Read Resistivity.
6. temp      : Read Reference Temperature
7. data      : Read the stored data in meter
8. help      : Command Help Message
```

The following message is to read a conductivity.

```
ISTEK>cond
conductivity  :   1413 µS
```

In case of reading the data stored in meter if inputting data, message "Data Reading No :" is displayed

```
ISTEK>Remote Control Mode
ISTEK>data
Data Reading No:
```

If inputting Data Number the data stored in meter is displayed as follows. This is also used by storing in "screen capture" or recording.

```
[DATA MODE]   Number : 3
Date & Time :      [ 96/11/26 11:15 ]
conductivity :    1413 µS
Tref          :    25.0 'C
```


Chapter VIII.
Troubleshooting & Error Description

Symptom	Possible cause	Remedy
Erratic reading	Faulty connection between meter and sensor	Tighten connection
	Broken cable	Replace cable
	Air trapped in conductivity Cell	Agitate cell up and down to expel trapped air
	Change of water temperature	Measure in situ
	Broken conductivity cell	Replace cell

When calibrating, for standard solution conductivity is very high or low.	Standards may be old or contaminated	Use fresh standards
	Electrodes dirty	Clean with a detergent solution. Refer to 3. General Functions
	Temperature compensation incorrect	Check temperature.
	Cell constant incorrect	Replace cell

If the cause can¡t know, clear memory(data) to eliminate all data.
Refer to Clear Memory(data) of Setup Functions.

If the problem persists, please contact ***istek*** **Product Service Department**.

Chapter IX. Specifications

Model	***455C***
Conductivity	
Range	*0 to 199,999 µS/cm*
Resolution	*0.01/0.1*
Relative Accuracy	*±0.5%*
TDS	
Range	*0 to 1999 mg/L*
Resolution	*1 mg/L*
Relativie Accuracy	*±2%*
Salinity	
Range	*0.0 to 70.0 ppt*
Resolution	*0.1*
Relative Accuracy	*±.0.1*
Resistivity	*5 ohm·cm to 100 Mohm·cm*
Temperature Compensation	*Auto*
Data-Log	*100 points*
Print Capability	*Yes*

Display	*Graphic LCD*
Inputs	*BNC, ATC, Power, RS232C*
Outputs	*Recorder, RS-232C(Computer/Printer)*
Power	*AC/DC Adaptor*

Chapter X. 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)
* AC/DC Adaptor
* Instruction Manual
* DAPS (Data Acqusition and Processing Software)

B. Option

* Luxury Third-Arm Stand
* Conductivity Standard Solutions

* RS232C Interface Cable

Chapter X Ordering Information