Desktop pH/ISE/DO/Conductivity /Temp Meter Model 915PDC <u>Instruction Manual</u>

istek, Inc.



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Chapter I. Introduction

istek's Desktop pH/ISE/DO/Conductivity/TEMP Meter(model 915PDC) is operated by AC/DC adaptor and is controlled by microprocessor for all measurement needs.

istek's instrument is high-performance for accurate measurement of wastewater and use at laboratory and its operation is simply designed in the position of user.

istek's Desktop pH/ISE/DO/Conductivity/TEMP Meter(model 915PDC) features a triple channel type which simultaneously measure (pH/ISE), DO and Conductivity with triple electrode inputs, and selectable single/divided screen display mode.

istek's Desktop pH/ISE/DO/Conductivity/TEMP Meter(model 915PDC) contains function which can know the last calibration status for pH, ISE, DO and Conductivity, e.g. the last calibration Date/Time, Temperature and Buffer etc.

While measuring pH, if pH reading is stable, ¡Stable; is displayed in the lower field. Therefore can measure accurately since user can know easily a stable value.

istek's Desktop pH/ISE/DO/Conductivity/TEMP Meter(model 915PDC) features to obtain a reliable data since its program is treated in accordance with the specific character of a selected ion for a accurate measurement.

The model 915PDC is capable of storing up to 100 points(totally 300 points) in memory at once for each channel and storing by control of the time interval of data-log automatically.

The model 915PDC can be remotely controlled via RS232C interface and transmit information to a printer or computer.

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

The model 915PDC displays pH, ISE(mg/L), mV, ORP(relative millivolt), DO(mg/L), $O_2(\%)$, Air(%), $pO_2(mmHg)$, Conductivity(μ S, mS), TDS(mg/L), Salinity(ppt), Resistivity (ohm, kohm, Mohm) and ATC(Temp °C).

pН	indicates power of hydrogen(H ⁺).(unit pH)
	$pH = -\log_{10}[H^+]$

- mV indicates electromotive force of each ion.(unit mV)
- ISE indicates concentration of any given ion.(unit mg/L) To measure an ion must use electrodes which according to the type of ion, selectively response to only any given ion.
- ORP indicates a relative potential.(unit mV)
- DO indicates concentration of oxygen presents in the water. (unit mg/L)

O ₂	indicates percentage of oxygen as compared to the amount of oxygen presents in the air. (unit %)		
Air	ndicates percentage of DO or O_2 concentration. (unit %)		
pO ₂	indicates by converting concentration of the measured oxygen into partial pressure of $oxygen(pO_2)$. (unit mmHg)		
Conductivity	indicates conductivity of solution. (unit μ S/cm and mS/cm)		
TDS	indicates by converting the measured conductivity into concentration of the total dissolved solid present solution. (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.		
ATC(Temper	ature Compensation)		
	For automatic temperature compensation, a temperature probe supplied		
	by <i>istek</i> must be used.		
	Temperature compensation is automatically performed while measuring.		

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. where conductivity is channel[A], pH/ISE is channel[B] and dissolved oxygen is channel[C].

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 $-1999.9 \sim +1999.9 \text{ mV}$ 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.		
Display	used to simultaneously display the measuring data(pH/ISE, DO and Conductivity) with divided screen. That is to say simultaneously display Channel [A], [B] and [C] all together. If pressing again, return to single screen.		
Channel	Control is conversed $[A] \rightarrow [B] \rightarrow [C]$ or $[C] \rightarrow [B] \rightarrow [A]$.		
Reset	used to initiate a system.		
Mode	used to change operating modes. The operating modes are Conductivity, TDS, Salinity and Resistivity in channel [A], pH, mV and ISE in channel [B], and DO, O_2 Air and pO_2 in channel[C].		
Resolution	used to change the resolution. For pH mode can choose 0.1, 0.01 or 0.001. For DO mode can choose 0.1 or 0.01.		
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 in Channel[A]. Can set Buffer, ISE, Date/Time, Data-Log, High and Low Alarm in Channel[B]. Can set Salinity, Altitude, Date/Time, Alarm and Data-Log in Channel[C].		

Chapter III General Functions

pH/ISE/DO/Conductivity Meter

Key Name	Description		
Select	used to move position of cursor.		
Enter	used to set a selected data.		
Rel-mV	used to measure a relative millivolts. used to display slope.		
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 pH calibration(manual), press to increase value. used to adjust Cell, Tref, TC, Date/Time, Data-Log and RS232C Setup in Channel [A]. used to adjust Date/Time, Alarm, Data-Log and RS232C Setup in Channel[B]. used to adjust Salinity, Altitude, Date/Time, Alarm, Data-Log and RS232C Setup in Channel[C]. 		
down(♥)	In setup and pH calibration(manual), press to decrease value. used to adjust Cell, Tref, TC, Date/Time, Data-Log and RS232C Setup in Channel[A]. used to adjust Date/Time, Alarm, Data-Log and RS232C Setup in Channel[B]. used to adjust Salinity, Altitude, Date/Time, Alarm, Data-Log and RS232C Setup in Channel[C].		

pH/ISE/DO/Conductivity Meter

Display Description

The following display is specially specified.

Even some messages are not shown in the below display, describe together below.

	[A]	Ready	96	/ 11 / 12	11:15	
		0.0	0 uS/cm	T 2.1	r. 25.0 %/°C	
	Con	ductivity		2	25.0 °C	
	[B]	Ready	96	/ 11 / 12	11:15	
		7.	00_{pH}	ATC	25.0 °C	
	Stab	ole				
	[C]	Ready	96	/ 11 / 12	11:15	
		0.	0 mg/L	ATC	25.0 °C	
	DC)				
	СН	Mode	Status	Valu	e	
	Α	COND	Ready		0.00 uS	
	В	pН	Ready		7.00 pH	
	С	DO	Ready	0	0.00 mg/L	
			TEMP		25.0°C	
Display		Function	1			
[A]		indicates In divide	Channel[A]. d screen, <mark>A</mark> indic	cates that C	hannel[A] i	s controlled.
[B]		indicates In divide	Channel[B]. d screen, <mark>B</mark> indic	ates that C	hannel[B] i	s controlled.

[C]

Channel[A]

In divided screen, **C** indicates that Channel[C] is controlled.

indicates Channel[C].

Conductivity indicates conductivity with range of 0 ~199,999 μ S/cm.

Chapter III General Functions

pH/ISE/DO/Conductivity Meter

Display	Function		
TDS	indicates the amount of total dissolved solids presenting in solution (unit mg/L).		
Salinity	indicates salinity presenting in solution at a current temperature. (unit ppt)		
Resistivity	indicates resistivity of solution at a current temperature.		
ATC(°C)	displays when a temperature probe is attached, and indicates automatic temperature compensation. 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.		
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 %/°C	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.		
Channel[B]			
pH	displays power of hydrogen ion in range of ?2.000 to 19.999pH.		
mV	indicates electromotive force of each ion.		
ISE	displays concentration of current ion in range of 0 to 99,999 mg/L.		
ATC(°C)	displays when a temperature probe is attached, and indicates automatic temperature compensation.		
Stable	when pH reading is stable, ; Stable; is displayed in the lower field.		
Measure	indicates that meter is in measure condition.		
Ready	indicates that meter is in ready condition.		
Cal	indicates that meter is in calibration condition.		
Cal-OK	indicates whenever finish each calibration.		
96/11/12 11:15	indicates a current date and time.		

Chapter III General Functions

pH/ISE/DO/Conductivity Meter

Display	Function		
Slope	indicates slope value.		
ORP	indicates a relative potential.		
Select Ion Please	. message to select ion. When measuring without selection of ion.		
Select Buffer Plea	se message to select buffer(standard solution) while calibrating ion.		
Error	displays when it is not available to correctly measure because something is wrong in the meter or buffer while calibrating or measuring.		
Channel [C]			
DO	displays concentration of dissolved oxygen with range of 0.00 to 19.99 mg/L.		
O ₂	indicates percentage of oxygen as compared to the amount of oxygen present in the air.		
Air	indicates percentage of DO concentration.		
pO ₂	indicates by converting concentration of the measured oxygen into partial pressure of $oxygen(pO_2)$.		
ATC(°C)	When a temperature probe is attached, displays a current temperature and indicates that automatic temperature compensation is performed.		
Ready	indicates that meter is in ready condition.		
Measure	indicates that meter is in measure condition.		
Cal	indicates that meter is in calibration condition.		
Cal-OK	indicates whenever finish each calibration.		
96/11/12 11:15	indicates a current date and time.		
Error	displays when it is not available to correctly measure because something is wrong in the meter or buffer while calibrating or measuring.		

pH/ISE/DO/Conductivity Meter

Electrode Structure

General pH Combination Electrode



- 1. Reference Filling Hole ; injection hole of the filling solution
- 2. Ag/AgCl or calomel ; Reference Electrode
- 3. pH mono electrode ; indicator electrode
- 4. Temperature sensor
- 5. Reference Filling Solution ; Saturated KCl Solution
- Glass Membrane ; membrane selectively responding hydrogen ion

DO Polarographic Probe



- 1. Electrode Body
- 2. Stainless Steel Ring
- 3. Screw
- 4. Sensor; position of response to oxygen
- 5. Membrane Cover ; containing with the filling Solution
- 6. Membrane Protector & Holder
- 7. Membrane

Electrode Storage & Maintenance

pH Electrode Storage

Electrodes are stored in the cap storage solution supplied by *istek*.

Membrane must be kept wet. If there is no storage solution, pH 4 buffer is best for the single glass electrode and saturated KCl is preferred for a calomel and Ag/AgCl reference electrode. Saturated KCl is the preferred solution for a combination electrode. Electrodes are sometimes stored in distilled water, but this method causes electrode life to decrease.

pH Electrode Maintenance (Electrode Cleaning)

If it takes long time to response or a stable data isn't obtained, can be often restored to normal performance by one of the following procedures;

Glass electrodes fail because of scratches, deterioration or accumulation of debris on the glass surface.

- Salt deposits	Recover electrode by alternately immersing it three times each in 0.1N HCl and 0.1N NaOH for approx. five minutes. If this fails, immerse tip in KCl solution for 30s. After recovery, soak in pH 7.00 buffer overnight. Rinse and soak in pH 7.00 buffer. Rinse again with distilled water before use.
- Oil/Grease films	Remove oil/Grease films with detergent, and then rinse electrode with distilled water.
- Clogged Reference Junction	Heat a diluted KCl solution to about 60~80°C. The electrode must be stored in this solution for approx. ten minutes, then cool electrode in not heated KCl solution.
- Protein removal	Protain coatings can be removed by soaking glass electrode in a 10% pepsin solution adjusted to pH 1 to 2.

* In case of Ion Selective Electrode, refer to ISE manual.

DO Probe Storage

For longer storage, cover the membrane tip with a cap originally supplied by *istek*.

DO Probe Maintenance (Probe Cleaning)

If it takes long time to response or a stable data isn't obtained, check membrane. If air bubble is occurred on membrane, remove air bubble.

Check membrane for damage(i.e. holes and leak, etc.). If membrane gets damage, replace membrane.

pH/ISE/DO/Conductivity Meter

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.

pH/ISE/DO/Conductivity Meter

Chapter IV. Setup Functions

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

Conductivity, Channel[A]

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.

[A]	<<	COND SETUP	>>
1.Cel	ll/Tref/T	' C	
2.Dat	te/Time		
3.Dat	ta-Log		
4.Exi	it		

Press Mode key.



Set temperature by using \blacktriangle or \triangledown key and exit by pressing **Out** key.

Clear data(Memory)

If clearing the stored data in Channel[A], press **Mode** key to enter Salinity mode and press **Setup** key. 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.

[A]	<<	COND SETUP	>>	
1.Cell	/Tref/T(
2.Dat	e/Time			
3.Dat	a-Log			
4.Exi	t			

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

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.

<u>Cell/Tref/TC</u>

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.

[A]	<<	Cell/Tref/TC >>
1. Cell		1.0
2. Tref		25.0
3. TC		2.10
4. Exit		

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 \blacktriangle or \triangledown key.

<u>2) Tref</u>

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

[A]	<<	Cell/Tref/TC	>>	
1. Cell			1.0	
2. Tref			25.0	
3. TC			2.10	
4. Exit				

Press \blacktriangle or \blacktriangledown key to change 25.0 or 20.0.

The conductivity of a solution exhibits at 25.0°C or 20.0 °C.

<u>3) TC</u>

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.

[A]	<<	Cell/Tref/TC	>>	
1. Cell			1.0	
2. Tref			25.0	
3. TC			2.10	
4. Exit				

Press \blacktriangle or \triangledown key until the desired value is displayed.

The following table is a typical temperature coefficients (percentage of change of conductivity per $^{\circ}$ C).

Solution	% / °C
Ultrapure Water	4.55
Salt(NaCl)	2.12
5% NaOH	1.72
Dilute Ammonia	1.88
10% HC1	1.32
5% Sulfuric Acid	0.96
98% Sulfuric Acid	2.84

Chapter IV Setup Functions *pH/ISE/DO/Conductivity Meter*

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 \blacktriangle or \checkmark 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.

[A]	<< DATA I	LOGGING >>
1. D	Destination :	Memory
2. Time Interval :		0 min
3. E	Exit	

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.

[A] << RS232C SETUP >>

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 \blacktriangle or \triangledown key.

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

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

[A]	<<	DATA	LOGGING	>>
1. De	estina	tion :	M e	mory
2. Time Interval :		() min	
3. Ex	kit			

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

Adjust time interval by using \blacktriangle or \blacktriangledown key.

[A]] << 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.

<u>Exit</u>

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 \blacktriangle or \blacktriangledown key and is basically adjusted to 0.7.

[A] << TDS FACTOR INPUT >>

0.70

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

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter pH/ISE, Channel[B]

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.

[B] <<	pH SETUP >>
1.Cal/Auto	2.Buffer
3.Date/Time	4.Alarm
5.Data-Log	6.Exit

Press Mode key.

[B]	<< TEMP SETUP >>	
	21.3 °C	

Set temperature by using \blacktriangle or \triangledown key and exit by pressing **Out** key.

Clear data(memory)

If clearing all the stored data in Channel[B], press **Mode** key to enter mV mode and press **Setup** key. The displays will show the messages, "Memory Clear?" And then press **Enter** key to clear. Therefore all data, which set at setup, are changed to a basic value.



(1) pH Mode

In pH ready condition if pressing **Setup** key to enter the setup, 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.

[B] <<	pH SETUP >>
1.Cal/Auto	2.Buffer
3.Date/Time	4.Alarm
5.Data-Log	6.Exit

After finishing setup, press **Out** key or select a displayed **Exit** key to exit setup.

Cal/Auto & Cal/Manual

In the initial display of pH setup, after selecting **1.Cal/Auto** by using **Select** key, press **Enter** key. The message, such as Cal/Auto(auto calibration) or Cal/Manual(manual calibration), is alternately shown, so it is available to select either auto or manual calibration.

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

<u>Buffer</u>

In the initial display of pH setup, after selecting **2.Buffer** by using **Select** key, press **Enter** key to enter the buffer option mode but the buffer shall be selected only in case of Cal/Auto. Press **Select** key to move into a desired buffer, and then press **Enter** key to select a buffer. The buffer shall be selected up to 5 points, and while calibrating the selected buffers are displayed in the right field. If finishing setup, choose **Exit** or press **Out** key to exit buffer setup.

[B]	<<	pH B	UFFER S	ET >>
Cal/A	ut <u>o</u> B	uffer	Selection	
2.00	4.00	7.00	10.00	12.00
Select	ed Valu	e		[Exit]
4.00				

When Cal/Manual is selected, calibrate with a desired buffer pressing . Refer to manual calibration.

Date/Time

In the initial display of pH setup, after selecting **3.Date/Time** by using **Select** key, press **Enter** key and then the display is shown as follows. Select data(year, month, day and time etc.) by using **Select** key and set data by using \blacktriangle or \checkmark key.



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

<u>Alarm</u>

In the initial display of pH setup, after selecting **4.Alarm** by using **Select** key, the display is shown as follows. Select high and low values respectively by using **Select** key and set data by using \blacktriangle or \checkmark key.

[B] <<	pH ALARM SET >>
1. High 2. Low 3. [Exit]	: 20.00 : 0.00

If the measured pH value is not within this range, the alarm rings. After finishing setup, press **Out** key or select a displayed **Exit** to exit Alarm setup.

<u>Data-Log</u>

In the initial display of pH setup, after selecting **5.Data-Log** by using **Select** key, press **Enter** key. And then the display is shown as follows. Select data by using **Select** key.



pH/ISE/DO/Conductivity Meter

[B]	<<	DATA LOO	GGING >>	
1.	Destina	ation :	Memory	
2. Time Interval :			0 min	
3.	Exit			

1) Destination

1.Destination is a place to store memory type, such as memory, printer or Excel etc., by using \blacktriangle or \triangledown key. Refer to Data-Log.

If pressing **Enter** key in **1.Destination**, the display is shown as follows.

[B]	<<	RS232(C SETUP	>>
Bau 9600	d)	Data 8	Stop 1	Parity No [Exit]

Select communication data by using **Select** key, and set Baudrate, Data Bit, Stop Bit and Parity Bit by using \blacktriangle or \triangledown key.

Baud : adjust communication rate between computer and meter by using ▲ or ▼ key.

· Data : adjust Data Bit between computer and meter by using \blacktriangle or \triangledown key.

· Stop : adjust Stop Bit between computer and meter by using \blacktriangle or \triangledown key.

• Parity : adjust Parity Bit between computer and meter by using \blacktriangle or \triangledown key.

If finishing setup press **Out** key or select 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 \blacktriangle or \triangledown key.



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

Adjust time interval by using \blacktriangle or \blacktriangledown key.



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

Memory

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

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

3) Exit

If finishing the setting of Destination and Time Interval, press **Out** key or select a displayed **Exit** key to exit Data Logging setup.

Exit

After finishing setup or exiting setup mode in the middle of setting, select a displayed Exit and press Enter key.

The **Out** key has the same function as **Exit** key.

(2) ISE Mode

Press Mode key to enter ISE mode and then ISE mode indicator is displayed in the lower field.

In ISE 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. After finishing setup, press either a displayed **Exit** key or **Out** key to exit setup.

Select Ion

In the initial display of ISE setup, after selecting 1. Select Ion by using Select key, press **Enter** key. And then the display is shown as follows.

NH ₃	$\mathbf{NH_4}^+$	Br	$\mathbf{C}\mathbf{d}^{+2}$	C a ⁺²	CO_2 K ⁺
Cl	Cu^{+2}	CN ⁻	F ⁻	BF ₄ ⁻	Ag^{+}/S^{-2}
I.	\mathbf{Pb}^{+2}	Li^+	NO ₃ ⁻	NO _X	ClO ₄ ⁻
Na^+	Ca^{+2}/M	g^{+2}	Other	s	[Exit]

Select ion by using Select key and set the selected ion by pressing Enter key. If it is not necessary to select ion, press **Out** key or select a displayed **Exit** to return to the initial mode.

Buffer

In the initial display of ISE setup, after selecting 2. Buffer by using Select key, press Enter key to enter buffer option mode and then the display is shown as follows.

[B]	<< I	ONI	BUFF	ER SET	>>
0.01	0.1	1	10	100	1000
Selected Value[mg/L] [Exit]					
100					

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

The buffer shall be selected up to 5 points and the selected buffers are displayed in the lower field. While calibrating the selected buffers are displayed in the right field. If finishing setup, press **Out** key or select a displayed **Exit** to exit Ion Buffer setup.

<u>Exit</u>

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.

Dissolved Oxygen, Channel[C]

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.

[C] <<	DO/O2 SETUP >>
1.Salinity	2.Altitude
3.Date/Time	4.Alarm
5.Data-Log	6.Exit

Press Mode key.



Set temperature by using \blacktriangle or \triangledown key and exit by pressing **Out** key.

Clear data(memory)

If clearing all the stored data in Channel[C], press **Mode** key to enter pO_2 mode and press **Setup** key. The display will show the messages, "Memory Clear?; And then press **Enter** key to clear. Therefore all data, which set at setup, are changed to a basic value.



(1) Dissolved Oxygen Mode

In DO ready condition if pressing **Setup** key to enter the setup, the display is shown as follows. The selected menu shows an emphasized black color in turn by pressing **Select** key and condition of each item is set by pressing **Enter** key.

Chapter IV	Setup Functions
Chapterry	betup I unetions

pH/ISE/DO/Conductivity Meter

[C] <<	DO/O2 SETUP >>
1.Salinity	2.Altitude
3.Date/Time	4.Alarm
5.Data-Log	6.Exit

After finishing setup, press **Out** key or select a displayed **Exit** key to exit setup.

<u>Salinity</u>

In the initial display of DO setup, after selecting **1.Salinity** by **Select** key, press **Enter** key. And then the display is shown as follows.



Adjust salinity with \blacktriangle or \triangledown key. The salinity is automatically compensated while measuring.

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

<u>Altitude</u>

In the initial display of DO setup, after selecting **2.Altitude** by **Select** key, press **Enter** key. And then the display is shown as follows.



Adjust Altitude with \blacktriangle or \triangledown key. The set altitude is automatically compensated. If finishing altitude setup, press **Out** key to exit.

Date/Time

In the initial display of DO setup, if selecting **3.Date/Time** by **Select** key, press **Enter** key, the display is shown as follows. Select data(year, month, day and time etc.) with **Select** key and adjust data by using \blacktriangle or \checkmark key.





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

<u>Alarm</u>

In the initial display of DO setup, after selecting **4.A larm** by using **Select** key, press **Enter** key. Select high and low value, and set data by using \blacktriangle or \triangledown key.

Chapter IV Setup Functions

[C]	<< D	O AL	A]	RM SET	>>
	1. High		•	60.00	
	2. Low		:	0.00	
	3. [Exit]				

If finishing Setup, select **Exit** or press **Out** key to exit. If the DO value is not within this range, the alarm rings.

<u>Data-Log</u>

In the initial display of DO setup, select **5.Data-Log** by using **Select** key, press **Enter** key. And then the display is shown as follows. Select data(Destination or Time Interval) by using **Select** key.

[C]	<<	DATA	LOGGING	>>
1. Destination :			Me	mory
2. Time Interval :			0	min
3. Exit				

1) Destination

1.Destination is a place to store memory type, such as memory, printer or Excel etc., by using \blacktriangle or \triangledown key. Refer to Data-Log.

If pressing **Enter** key in **1.Destination**, the display is shown as follows.

[C] <<	RS2320	C SETUP	>>
Baud 9600	Data 8	Stop 1	Parity No [Exit]

Select communication data by using **Select** key, and set Baudrate, Data Bit, Stop Bit and Parity Bit by using \blacktriangle or \blacktriangledown key.

- Baud : adjust communication rate between computer and meter by using ▲ or ▼ key.
- · Data : adjust Data Bit between computer and meter by using \blacktriangle or \triangledown key.
- · Stop : adjust Stop Bit between computer and meter by using \blacktriangle or \triangledown key.
- Parity : adjust Parity Bit between computer and meter by using \blacktriangle or \triangledown key.
- If finishing setup press **Out** key or select 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 \blacktriangle or \triangledown key.

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



pH/ISE/DO/Conductivity Meter

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

Adjust time interval by using \blacktriangle or \blacktriangledown key.

[C] <<	DATA LO	GGING >>
1. Destir	ation :	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 the setting of Destination and Time Interval, press **Out** key or select a displayed **Exit** key to exit Data Logging setup.

<u>Exit</u>

If finishing setup or exiting setup mode while setting, select a displayed **Exit** and press **Enter** key. The **Out** key has the same function as **Exit** key.

(2) O_2 Mode

In O_2 ready condition if pressing **Setup** key, the display is shown as follows.

[C]	<< Altitude SETUP >>				
	0 meter				

Altitude factor is basically adjusted to 0 meter as shown. If pressing \blacktriangle or \triangledown key, increased or decreased in unit of 50 meters. If finishing setup, press **Out** key to exit.

Chapter IV Setup Functions

pH/ISE/DO/Conductivity Meter

Chapter V. Calibration and Measurement

Caution: Don;t use only one solution for simultaneous measuring of pH, DO and conductivity. Please note that when simultaneously measuring, each electrode of pH, DO and conductivity must be put into three solutions respectively.

Conductivity, Channel [A]

The basic condition is as follows.

- i Cell Constant (Cell) : 1.0
- i Compensation Temperature (Tref) : 25.0
- j Temperature Coefficient(TC) : 2.10 %/°C
- j 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.

<< Cond Calibration Status>>
1. Date/Time : 00/00/00 00:00
2. Temp : 0.0
3. Tref : 0.0
4. Standard :
No Data

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

(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	146.9 uS
	1413 uS
0.00 us	/cm 6.67 mS
	12.89 mS
TEMP: 18.0 Tr: 25	5.0 111.9 mS

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

[Cal]	Mea	asure	146.9 uS
		•	1413 uS
	14	3.6 us/cm	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 uS
		_	1413 uS
	14	6.9 uS/cm	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 \blacktriangle or \blacktriangledown key.

[Cal] Ready	158.7 uS
	1413 uS
$0.00 \mathrm{uS/cm}$	6.67 mS
	12.89 mS
TEMP:18.0 Tr:25.0	111.9 mS

Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

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. $1.9\%/^{\circ}C$) of conductivity than typical potable water. Sodium chloride(NaCl) has a temperature coefficient ($2.12\%/^{\circ}C$) 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.

[A]	Measure	96 / 11 / 12	11:15
	$1413\mathrm{uS/cm}$	Tr. 2.10 %	25.0 %/°C
Cond	luctivity	1	8.0 °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.



Conductivity	18.0 °C
--------------	---------

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.

[A]	Measure	96,	/ 11 / 12	11:15
	798.4	mg/L	Tr 2.10	. 25.0 %/°C
TDS				18.0 °C

Chapter V	Calibration & Measurement
H/ISE/DO/Conductivity Meter	

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 V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

pH/ISE, Channel[B]

The basic condition is as follows.

- j pH Calibration Method : Auto Calibration (buffer : 4.00, 7.00, 10.00)
- i Alarm ? high : 20.00

low : 0.00

j Data-Log : memory

This meter contains function that can confirm the last calibration status of pH and ISE.

pH Calibration Status

In pH ready condition press **Setup** key and **Cal** key or in pH measure condition press **Cal** key to enter pH Calibration Status.

<< pH Calibration Status>>	
1.Date/Time : 98/03/26 17:30	
2.Temp : 25.0	
3.Buffer :	
2.00 4.00 7.00 10.00	

Through pH Calibration Status, can confirm Date/Time, Temp and Buffer solution 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.

<< pH Calibration Status>>

- 1. Date/Time : 00/00/00 00:00
- 2. Temp : 0.0
- 3. Buffer :
- No Data

Ion Calibration Status

In ISE ready condition press **Setup** key and **Cal** key or in ISE measure condition press **Cal** key to enter Ion Calibration Status.

<< Ion Calibration Status>>
1.Date/Time : 98/03/26 17:30
2.Temp : 25.0
3.Buffer : Ammonia(mg/L)
0.01 0.1 1 10

Through Ion Calibration Status, can confirm Date/Time, Temp and Buffer solution for the last calibration. If pressing **Out** key return to an initial mode.

If clearing data, can;t confirm the last Calibration Status, and the display is the same pH.

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

pH Calibration and Measurement

(1) Preparation

Connect meter with electrode and ATC.

Prepare a calibration buffer and magnetic stirrer.

Confirm all parameters(calibration method, buffer and other selection) are properly set as desired.

Perform calibration every two hours to compensation for electrode drift. There are two ways of calibrations; auto calibration or manual calibration.

If calibrating by selecting buffer of pH 2.00, 4.00, 7.00, 10.00, 12.00, select buffer in Setup.

In case of manual calibration, refer to Setup Functions.

Please note that it is not available to calibrate just only 1 point. If try to exit after calibrating only 1 point, error message is displayed. In this case, press **Reset** key or continue calibration.

(2) Calibration

Auto Calibration

1) Calibration of CAL1(Buffer 1)

In the pH ready condition, press **Cal** key and then the selected buffer solution are displayed as follows. In case of selecting buffer of pH 2.00 and pH 12.00, refer to Setup.

[B]	Ready	CAL 1 :	4.00
		CAL 2 :	7.00
	$7 00_{\text{pH}}$	CAL 3 :	10.00
		CAL 4 :	0.00
ATC	25.0 °C	CAL 5 :	0.00

Before use, remove electrode from storage solution, rinse with distilled water, blot dry

[B]	Measure	CAL 1 :	4.00
		CAL 2 :	7.00
	424_{nH}	CAL 3 :	10.00
	• • • • • • • • • • • • • • • • • • •	CAL 4 :	0.00
ATC	25.0 °C	CAL 5 :	0.00

and put into the first buffer. With constant, but not violent, stirring for an accurate measurement, press **Measure** key.

If pH reading is stable, ¡Stable; is displayed in the lower field.

Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

[B]	Measure	CAL 1 :	4.00
		CAL 2 :	7.00
	4.24 pH	CAL 3 :	10.00
	•• — • pm	CAL 4 :	0.00
Stable	25.0 °C	CAL 5 :	0.00

Press Cal key and then Cal-OK message is displayed in the upper field.

[B]	Cal-OK	CAL 1 :	4.00
		CAL 2 :	7.00
	4.04 _{pH}	CAL 3 :	10.00
	···· · pii	CAL 4 :	0.00
ATC	25.0 °C	CAL 5 :	0.00

This indicates the end of CAL1 calibration.

2) Calibration CAL2 to CAL5(Buffer2 to Buffer5)

[B]	Ready	CAL 1 :	4.00
		CAL 2 :	7.00
	4.00 pH	CAL 3 :	10.00
	I O O ph	CAL 4 :	0.00
ATC	25.0 °C	CAL 5 :	0.00

Clearly rinse electrode with distilled water, blot dry and put into the second buffer. The calibration method of CAL2~CAL5 is the same as done in CAL1. It is available to calibrate up to the number of buffer which is set at Setup (Max.5 points), if finishing calibration completely, changed to the initial display automatically. If pressing **Cal** key after calibrating 2, 3 or 4 points, change to initial mode.

<u>Manual Calibration</u>

1) Calibration of CAL1(Buffer 1)

Clearly rinse electrode with distilled water, blot dry and put into the first buffer. With constant stirring the solution by using magnetic stirrer, press the **Measure** key.

[B]	Measure	CAL 1 :	0.00
		CAL 2 :	0.00
	4.24 pH	CAL 3 :	0.00
		CAL 4 :	0.00
ATC	25.0 °C	CAL 5 :	0.00

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

If pH reading is stable, ; Stable; is displayed in the lower field. Adjust value to the measuring buffer by pressing the \blacktriangle or \blacktriangledown key. Press **Cal** key to set pH value, and then Cal-OK message is displayed in the upper field.

[B]	Cal-OK	CAL 1 :	3.98
		CAL 2 :	0.00
	398 _{nH}	CAL 3 :	0.00
		CAL 4 :	0.00
ATC	25.0°C	CAL 5 :	0.00

2) Calibration CAL2 to CAL5

Rinse electrode, blot dry and put into the second buffer. The calibration method of CAL2~CAL5 is the same as done in CAL1. It is available to calibrate up to 5 points, if calibrating up to 5 points, changed to the initial mode automatically.

If pressing **Cal** key after calibrating 2, 3 or 4 points, change to initial mode.

If finishing calibration completely, put electrode into sample and press Measure key.

[B]	Measure		96 / 11 / 12	11:15
	6.58	pН	ATC 2	5.0 °C
Stable	;			

While measuring pH can also measure mV by pressing Mode key

Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

ISE Calibration and Measurement

(1) Preparation

Connect meter with electrode and ATC.

Prepare solution for measurement and magnetic stirrer.

Set a kind of the measuring ion in Setup.

Set standard solution(buffer) in Setup.

Calibration should be done in order from the lower concentrated solution to the more concentrated solution.

Preparation of Ion electrode refer to electrode manual.

1) Calibration of CAL1

In the ISE ready condition, press **Cal** key and then the selected standard solutions(buffers) are displayed as follows.

[B]	Ready	CAL 1 :	10
		CAL 2 :	100
	0.00 mg/L	CAL 3 :	1000
	0.00 mg/L	CAL 4 :	0.00
NH ₃	25.0 °C	CAL 5 :	0.00

Rinse electrode with distilled water, blot dry and put electrode into the first standard solution(buffer) with stirring solution by using magnetic stirrer and press **Measure** key. And then ion concentration of the selected standard solution is displayed in right field.

If the reading is stable, press the **Cal** key. Then automatically set and Cal-OK message is displayed in the upper field.

[B]	Cal-OK	CAL 1 :	10
	$ imes 10^{1}$	CAL 2 :	100
	1 00	CAL 3 :	1000
	I.UU mg/L	CAL 4 :	0.00
NH ₃	25.0 °C	CAL 5 :	0.00

2) Calibration of CAL2 to CAL5

Clearly rinse electrode with distilled water, blot dry and put into the second standard solution(buffer). The calibration method of $CAL2 \sim CAL5$ is the same as done in CAL1. It is available to calibrate up to the number of buffer which is set at Setup(Max. 5 points), if finishing calibration completely, changed to the initial display automatically.

If pressing **Cal** key after calibrating 2, 3 or 4 points, change to initial display.

If finishing calibration, rinse electrode with distilled water, blot dry and put electrode into sample with stirring solution by using magnetic stirrer and press **Measure** key.

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*



While measuring Ion, can also measure mV by pressing **Mode** key

[B]	Measure	96	/ 11 / 12 11:15
	125.2	mV	ATC 25.0 °C
NH	3		

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

Slope Feature & Functions



Press Rel-mV key to confirm electrode slope after pH and Ion calibration. The slope displays in the lower field and then disappeared.

It makes to estimate time of exchange of electrode since can know error(%) through slope.

For the correct operation, the range of slope must be within $80 \sim 120\%$. If the slope is not within this range, prefer newly calibrating in order to prevent the higher error. If the slope is not within 80-120% for pH or Ion measurement, must newly calibrate.

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Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

Millivolt / Relative Millivolt Measurement

Meter can measure absolute or relative millivolt. The millivolt modes are useful when performing potentiometric titration or preparing calibration curves.

1. Millivolts

Absolute millivolt is displayed to 0.1 mV resolution in the range of -1999.9 to +1999.9 mV.

Access absolute millivolt mode by pressing **Mode** key and then **Measure** key. While measuring the display is shown as follows.



While measuring pH or Ion, measure each millivolt by pressing Mode key.

2. Relative Millivolts

Relative millivolt is displayed to 0.1 mV resolution in the range of -1999.9 to +1999.9 mV.

In the condition of measuring mV, current displayed value automatically changes into zero(0) value by pressing **Rel-mV** key and then relative millivolt is displayed.



Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

Dissolved Oxygen, Channel[C]

The basic condition is as follows.

- i Salinity and Altitude = 0
- i Alarm ? high : 60.00

low : 0.00

j Data-Log : memory

This meter contains function that can confirm the last calibration status of DO.

DO Calibration Status

In DO ready condition press **Setup** key and **Cal** key or in DO measure condition press **Cal** key to enter DO Calibration Status.

<< DO Calibration Status>>	
1.Date/Time : 98/03/26 17:30 2.Temp : 25.0 3.Method : DO Calibration	

Through DO Calibration Status, can confirm Date/Time, Temp and method for the last calibration. If pressing **Out** key return to an initial mode.

If clearing data, can;t confirm the last Calibration Status, and the display is shown as follows.

<< DO Calibration Status>>

- 1. Date/Time : 00/00/00 00:00
- 2. Temp: 0.0
- 3. Method :
- No Data

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

(1) Preparation

Connect probe and temperature sensor to Input and ATC jack respectively. Clearly rinse probe with distilled water and blot dry with tissue. Prepare solution for measurement and magnetic stirrer. It takes 1~10 minutes to polarize probe because of using polarographic probe.

(2) Calibration and Measurement

- DO Calibration and Measurement

Constantly stir solution by using magnetic stirrer.

Saturate solution with oxygen by the bubbling equipment at least 1~2 hours in advance before calibration.

Put saturated solution into BOD bottle and cap to minimize the exposure in the air.

Zero Calibration

There are two ways of zero calibration. In ready condition, press **Cal** key to enter calibration mode. The display is shown as follows.



1) In case of calibration with solution not containing DO, add excess sodium sulfite, Na_2SO_3 , and a trace of cobalt chloride, $CoCl_2$, to bring DO to zero. Put probe into this solution.



2) In case of calibration without solution, remove probe from Input and press **Measure** key.

If the reading is stable, press **Cal** key, and then Cal-OK message is displayed in the upper field and set automatically.



The above figure indicates to finish Zero calibration.

Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

Saturated Calibration

Connect probe, rinse it and dry(blot dry with tissue). Rapidly put probe into the prepared BOD bottle containing water saturated with air to minimize the exposure in the air. Press **Measure** key.



If the reading is stable, press **Cal** key. And then Cal-OK messages is displayed in the upper field and set automatically.



The above display indicates to finish saturated calibration. After finishing calibration, change to the initial display automatically. Put probe into sample and press the **Measure** key.

[C]	Ready	96 / 11 / 12 11:15
	8.2 mg/L	ATC 25.0 °C
DO		

If pressing **R**esolution key, change resolution

DO

If the reading is stable, store or report it.

- O₂ Calibration and Measurement

Clearly rinse probe with distilled water and dry(blot dry with tissue). Place probe in the air. Press **Cal** key.



Press Measure key.



pH/ISE/DO/Conductivity Meter



If the reading is stable, press **Cal** key. And then Cal-OK message is displayed in the upper field and set automatically.



This value is automatically adjusted in accordance with the selected altitude.

This display indicates to finish saturated calibration. If finishing calibration, automatically change to the initial display. Put probe into sample and press the **Measure** key.



After the reading is stable, store or report it.

While measuring DO, can also measure O_2 by pressing **Mode** key.

- Air Calibration and Measurement

In O₂ Mode, change to Air mode using **Mode** key

Clearly rinse probe with distilled water and dry(blot dry with tissue). Put probe in the air. Press **Cal** key.



If the reading is stable, press **Cal** key. And then Cal-OK message is displayed in the upper field and set automatically.

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*



This value is automatically adjusted in accordance with the selected altitude. This display indicates to finish saturated calibration. If finishing calibration, automatically change to the initial display. Put probe into sample and press **Measure** key to measure percentage of dissolved oxygen.



While measuring DO or O_2 , can also measure Air by pressing **Mode** key

- pO₂ Measurement

In O_2 Mode change to pO_2 mode using **Mode** key and press **Measure** key to measure pO_2 of solution.



While measuring DO, O_2 or Air, can also measure pO_2 by pressing **Mode** key.

Chapter V Calibration & Measurement *pH/ISE/DO/Conductivity Meter*

Triple and Simultaneous Display

In conductivity ready condition press **Display** key and then the divided screen appears as follows.

СН	Mode	Status	Value
Α	COND	Ready	0.00 uS
В	РН	Ready	7.00 pH
C	DO	Ready	0.00 mg/L
		TEMP	25.0°C

All functions are operated the same as that in single screen except Setup Functions. Can measure simultaneously in channel[A], [B] and [C].

If entering the divided screen in ready condition of channel[A], the display is shown as upper figure. Conductivity is measured by pressing **Measure** key, and then if pressing **Channel** key channel is converted as follows. pH is measured by pressing **Measure** key.

СН	Mode	Status	Value
Α	COND	Meas	146.9 uS
В	pН	Meas	7.00 pH
С	DO	Ready	0.00 mg/L
		TEMP	25.0°C

<u>Setup</u>

In the ready condition, press **Setup** key and then the display appears as follows.

<< DATA LOGGING >>

1. Destination :	Excel
2. Time Interval :	0 sec
3. Exit	

There are two ways for datalogging, example for Memory or Excel. The set of time interval refer to Chapter IV Setup.

Chapter V Calibration & Measurement

pH/ISE/DO/Conductivity Meter

Chapter VI. Data -Log

Model 915PDC 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.

[B]	<< DATA I	LOGGING >>
1. I	Destination :	Memory
2. 7	fime Interval :	0 min
3. I	Exit	

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.

[B]	<< DATA L	OGGING >>
1.	Destination :	Memory
2.	Time Interval :	1 min
3.	Exit	

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



1. Destination :	Memory
2. Time Interval :	0 sec
3. Exit	

Up to 100 points for each channel are stored in memory at once.

[B]	[DATA	MODI	E]	
No.	3	96 / 11 / 26	11:15		
	pН	:	7.023		
	ATC	:	25.0		

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 \blacktriangle or \triangledown key, and press **Memory** key to exit or press **Out** key to print data.

Chapter VI Data-Log *pH/ISE/DO/Conductivity Meter*

The following figure is an example to print.

[DATA MODE] [B] Number : 3 Date & Time [96/11/26 11:15] pH : 7.023 ATC : 25.0 °C

(2) 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*.

If printing data while measuring, can print by pressing **Memory** key regardless of time.

The following figure is an example to print.

```
[DATA MODE-B] Number : 3
Date & Time [ 96/11/26 11:15 ]
pH : 7.023
ATC : 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.

[B]	<< DATA LO	OGGING >>
1.	Destination :	Excel
2.	Time Interval :	1 min
3.	Exit	

If you want to see the measuring data as follows, please install the DAPS(Data Acquisition and Processing Software) in your computer.

Chapter	VI	Data-Log
Chapter	• •	Dutu Dog

pH/ISE/DO/Conductivity Meter

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1	"pH"					1477.0						
2	Number	Valu	Je	Temp	Date&Time							
3			6,98	25	99/01/11	25	98/12/16	16:34,54				
4	2	2	6,98	25	99/01/11	25	98/12/16	16:34,56				
5	3	3	6,98	25	99/01/11	25	98/12/16	16:34,58				
6	4	1	6,98	25	99/01/11	25	98/12/16	16:35,00				
7	5	5	6,98	25	99/01/11	25	98/12/16	16:35.02				
8	6	\$	6,98	25	99/01/11	25	98/12/16	16:35.04				
9	5	7	6,98	25	99/01/11	25	98/12/16	16:35,06				
10	8	3	6,98	25	99/01/11	25	98/12/16	16:35,08				
11	9)	6,98	25	99/01/11	25	98/12/16	16:35,10				
12	10)	6,98	25	99/01/11	25	98/12/16	16:35,12				
13	1	i l	6,98	25	99/01/11	25	98/12/16	16:35,14				
14	12	2	6,98	25	99/01/11	25	98/12/16	16:35,16				
15	13	3	6,98	25	99/01/11	25	98/12/16	16:35,18	-			
16	14	1	6,98	25	99/01/11	25	98/12/16	16:35,20		1		1
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If you want to datalog in the triple and simultaneous display, refer to Triple and Simultaneous Display of Chapter V. the display of monitor as follows.

es. So	ftware for Com	patible GLP							is	tek,Inc,	
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3	1	0	18,6(25,0)	HOLD	HOLD	0	25	99/01	/12 11:24	4.31	
4	2	0	18,7(25,0)	7	25	3,28	25	99/01	/12 11:24	4,33	
5	3	638,4	18,6(25,0)	7	25	3,28	25	99/01	/12 11:24	4,35	
6	4	639	18,6(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4,37	
7	5	639	18,7(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4,39	
8	6	639,1	18,6(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4.41	
9	7	639,1	18,6(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4,43	
10	8	639,2	18,6(25,0)	6,98	25	2,89	25	99/01	/12 11:24	1,45	
11	9	639	18,7(25,0)	6,98	25	2,89	25	99/01	/12 11:24	1.47	
12	10	639,2	18,7(25,0)	6,98	25	2,9	25	99/01	/12 11:24	1,49	
13	11	639,5	18,7(25,0)	6,98	25	2,9	25	99/01	/12 11:24	4.51	_
14	12	639,2	18,7(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4,53	
15	13	639,2	18,6(25,0)	6,98	25	2,89	25	99/01	/12 11:24	4,55	
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pH/ISE/DO/Conductivity Meter

Chapter VII. Remote Control

The meter can be remotely controlled by RS232C device or PC.

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



If inputting help while performing communication program, the remote control commands are displayed on the monitor of computer.

ISTEK-CH[A]>help

The following messages are the remote control commands.

:	Command List:	
1. cond	: Read Conductivity	
2. tds	: Read TDS	
3. sal	: Read Salinity	
3. r	: Read Resistivity	
4. temp	: Read Reference Temperature	
5. data	: Read the stored data in meter	

6. a,b,c	: Change Channel
7. help	: Command Help Message
8. exit	: Exit Remote Control

ISTEK-CH[B]> help

The following messages are the remote control commands.

:	Command List:
1.ph	: Read pH
2.mv	: Read mV
3.ion	: Read Concentration of Ion
4.temp	: Read Temperature
5.all	: Read pH, mV and Temperature
6.data	: Read the stored data in meter
7.a,b,c	: Change Channel
8.help	: Command Help Message
9.exit	: Exit Remote Control

Chapter VII Remote Control

pH/ISE/DO/Conductivity Meter

ISTEK-DO>help

The following messages are the remote control commands.

:: Command List:					
1. DO	: Read DO				
2. O2	: Read O ₂				
3. Air	: Read Air				
4. pO2	: Read pO ₂				
5. temp	: Read Temperature				
6. data	: Read the stored data in meter				
7. a,b,c	: Change Channel				
8. help	: Command Help Message				
9. exit	: Exit Remote Control				

The following figure is an example of the remote control using communication program and described on the base of the display.

ISTEK-pH>Remote Control Mode ISTEK-pH>data Data Reading No:

In case of reading the stored data in meter if inputting data, message "Data Reading No :" is displayed and if inputting Data Number the stored data in meter is displayed as follows. This is also used by storing in "screen capture" or recording.

[DATA MODE-B] Number : 3 48

 Date & Time :
 [96/11/26 11:15]

 pH
 :
 7.023

 ATC
 :
 25.0 'C

The following message is to read a measuring pH.

ISTE	ISTEK-pH>pH					
рН	:	7.203				

Chapter VII Remote Control

pH/ISE/DO/Conductivity Meter

Chapter VIII. Troubleshooting & Error Description

POSSIBLE CAUSE	REMEDY	
No power to meter	Press Power key.	
	Check that adaptor is correctly plugged.	
	Check that meter is	
	correctly connected	
	with cell and	
	temperature sensor.	
	Clearly rinse sensor of	
	cell to remove	
	interference.	
	POSSIBLE CAUSE No power to meter	

Channel[B] pH/ISE Error occurred in Cal mode ? Reading Out of Range	Electrode failure Out of Range for Buffer	Check that meter is correctly connected with electrode and ATC probe.		
	When trying to exit after calibrating only 1 point, error message (Err) appears.	Press Reset key or continue calibration.		
Error occurred in measure mode	Out of measuring range of pH	Check that meter is correctly connected with electrode and ATC probe. Check Calibration		
		Slope		
Channel[C] DO Out of range reading or unstable reading	Electrode failure	Clearly rinse electrode and blot dry.		
		If air bubble is occurred on membrane, remove air bubble.		

Chapter VIII Trobleshooting & Error Description *pH/ISE/DO/Conductivity Meter*

MALFUNCTION POSSIBLE CAUSE REMEDY

Check membrane for damage(i.e. holes and leak, etc.) If membrane get damage, replace membrane.

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

* When using Ion Selective Electorde, Refer to ISE manual.

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

Chapter VIII Trobleshooting & Error Description *pH/ISE/DO/Conductivity Meter*

Chapter IX. Specifications

Model	<i>915PDC</i>
Conductivity	
Range	0 to 199,999 µS/cm
Resolution	0.01/0.1 auto-range
Relative Accuracy	$\pm 0.5\%$
TDS	
Range	0 to 1999 mg/L
Resolution	1 mg/L
Relativie Accuracy	$\pm 2\%$
Salinity	
Range	0.0 to 70.0 ppt
Resolution	0.1
Relative Accuracy	$\pm .0.1$
Resistivity	5 ohm cm to 100 Mohm cm
рН	
Range	-2.000 to 19.999
Resolution	0.001/0.01/0.1

Relative Accuracy	±0.002
Auto-Buffer-Recognition	2.00, 4.00, 7.00, 10.00, 12.00
Concentration	
Range	0.00001 to 99999 mg/L
Resolution	$\pm one$ least significant
Relative Accuracy	± 0.25 % of reading
Millivolts	
Range	$\pm 1999.9 \ mV$
Resolution	0.1 mV
Relative Accuracy	$\pm 0.1 mV$
Relative Millivolts	
Range	±1999.9 mV
Resolution	0.1 mV
Relative Accuracy	$\pm 0.1 mV$
pH/ISE Slope	80 % to 120 %
Calibration	Auto(5points)/Manual(5 points)
DO	
Range	0.00 to 19.99 mg/L
Resolution	0.01/0.1
Relativie Accuracy	$\pm 0.5\%$
O ₂ (%)	
Range	0.0 to 60.0%
Resolution	0.1%
Relativie Accuracy	$\pm 1 \ digit$
Air Saturation(%)	
Range	0.0 to 199.9%
Resolution	0.1%
Relativie Accuracy	$\pm 1 \ digit$

Chapter IX Specifications

pH/ISE/DO/Conductivity Meter

Model	<i>915PDC</i>
Temperature Compensation	Auto
Data-Log	300 points
Print Capability	Yes
Display	Graphic LCD
Inputs	Three BNC, ATC, Power,
	RS232C
Outputs	Recorder,
	RS-232C(Computer/Printer)
Power	AC/DC Adaptor

* The details refer to catalog or contact *istek*.

Chapter IX Specifications *pH/ISE/DO/Conductivity Meter*

ISE Specifications

ISE Specification is simply described. The details refer to catalog or contact *istek*, *Inc*.

ISE	Sensing	Measurement Range			pН	Temp	Resp	Reference
	Туре	Molar(M)	ppm(mg/L)	Stope	Range	(°C) Range	Time	Electrode & Filling Solution
NH_3	GS	1.0~5×10 ⁻⁷	17,000~0.01	56±3	above 11	0~50	20	N/A, NH4Cl
NH_4^+	РМ	1.0~5×10 ⁻⁶	18,000~0.1	56±3	4~10	0~50	30	Dbl, NaCl
Br ⁻	SSM	1.0~5×10 ⁻⁶	79,900~0.4	57±2	0~14	0~80	20	Dbl, KNO3
Cd^{+2}	SSM	0.1~1×10 ⁻⁷	11,200~0.01	27±2	2~12	0~80	20	Dbl, KNO3
Ca^{+2}	PM	1.0~5×10 ⁻⁶	40,000~0.2	27±2	3~10	0~50	30	Sgl, KCl
CO_2	GS	$0.01 \sim 1 \times 10^{-4}$	440~4.4	56±3	4.8~5.2	0~50	20	N/A, NaHCO3
Cl	SSM	1.0~5×10 ⁻⁵	35,500~1.8	56±2	2~12	0~80	20	Dbl, KNO3
<i>Cu</i> ⁺²	SSM	0.1~1×10 ⁻⁸	6,350~0.0006	27±2	2~12	0~80	20	Dbl, KNO3
CN ⁻	SSM	0.01~5×10 ⁻⁶	260~0.1	57±2	11~13	0~80	20	Dbl, KNO3
F^{\cdot}	SSM	Sat;d~1×10 ⁻⁶	Sat;d~0.02	57±2	5~8	0~80	20	Sgl, KCl
BF_4	PM	1.0~7×10 ⁻⁶	$10,800 \sim 0.1(B)$	56+2	2.5~11	0~50	30	$Dbl_{1}(NH_{4})_{2}SO_{4}$

ľ	SSM	1.0~5×10 ⁻⁸	127,000~0.006	57±2	0~14	0~80	20	Dbl, KNO3
Pb^{+2}	SSM	$0.1 \sim 1 \times 10^{-6}$	20,700~0.2	25±2	3~8	0~80	20	Dbl, KNO3
Li^+	PM	1.0~1×10 ⁻⁵	6,900~0.7	56±2	5~10	0~50	30	$Dbl,(NH_4)_2SO_4$
NO ₃	PM	1.0~7×10 ⁻⁶	62,000~0.5	56±2	2.5~11	0~50	30	$Dbl,(NH_4)_2SO_4$
NO_x	GS	5.0×10 ⁻³ ~5×10 ⁻⁶	220~0.2	56±3	1.1~1.7	0~50	30	N/A, NaNO ₂
ClO_4	PM	1.0~7×10 ⁻⁶	98,000~0.7	56±2	2.5~11	0~50	30	$Dbl,(NH_4)_2SO_4$
K^+	PM	1.0~1×10 ⁻⁶	39,000~0.04	56±2	2~12	0~50	30	Dbl, NaCl
Ag^+/S^{-2}	SSM	1.0~1×10 ⁻⁷ 1.0~1×10 ⁻⁷	107,900~0.01 32,100~0.003	57±2 27±2	2~12 2~12	0~80 0~80	20 20	Dbl, KNO3 Dbl, KNO3
Na^+	PM	1.0~1×10 ⁻⁵	23,000~0.2	55±2	5~10	0~50	30	N/A, NH ₄ Cl
X^+/X^-	SSM	5.0×10^{-2} ~1×10 ⁻⁶	12,000~1.0	Titra- tion	2~12	0~50	30	Sgl, KCl
Ca^{+2}/Mg^{+2}	РМ	1.0~1×10 ⁻⁶	$40,000 \sim 0.4(Ca)$	26±3	5~10	0~50	30	Sgl, KCl

* Sensing Type

; GS(Gas Sensing), PM(Polymer Membrane), SSM(Solid State Membrane)

* Resp. Time ; indicates response time.

* Reference electrode ; N/A(No Reference Electrode), Dbl(Double Junction Reference Electrode), Sgl(Single Junction Reference Electrode)

Chapter IX Specifications *pH/ISE/DO/Conductivity Meter*

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

- * Combination pH Electrode/ATC Probe
- * AC/DC Adaptor
- * Buffer Solutions (pH4.00, 7.00, 10.00) 125ml
- * Instruction Manual
- * DAPS (Data Acquiition and Processing Software)

B. Option

* Luxury Third-Arm Stand

- * Conducivity Cell(K=1.0)
- * DO Polarographic Electrode
- * pH Electrode Storage Solution
- * pH Electrode Filling Solution
- * Buffer Solutions (pH4.00, 7.00, 10.00) 475ml
- * Conductivity Standard Solutions
- * DO Membrane Kit
- * RS232C Interface Cable

Chapter X Ordering Information