Instruction Manual

Portable pH Meter

pH -20N (pH/mV/ORP/Temp)

pH -25N (pH/ISE/mV/ORP/Temp)

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T A B L E   OF   C O N T E N T S

Chapter I. Introduction

Istek's advanced portable Meters (Model pH-20N/pH-25N) is operated by Rechargeable Battery (AAA size x 6ea) and it is improved for more accurate measuring at field(River or sea) and laboratory(School or university) and it's operation is quite simple for user.

This meter features a custom LCD that simultaneously displays various functions along with measurement results. For getting further information about this, refer Part <Chapter 6. Data-Log>

It is available storing up to 100 points in memory at once for each items.

pH Mode

When measuring pH value is stable, "**S** (Stable)" is displayed in the left part of LCD, and this model is a pH meter which is feature auto calibration and manual calibration simultaneously (3 points).

This portable pH Meter **pH-20N(pH-25N)** is displays pH,(ISE), mV, ORP(Relative millivolt) and Temp(°C).

pH   Indicates Power of hydrogen(H^+). (Unit is pH)
        pH = -log$_{10}$[H$^+$]

ISE   Indicates Concentration of ION. (Unit is mg/L) To measure an ION, must be used proper electrode which selected for the purpose.

mV   Indicates Electromotive Force of each ION. (Unit is 'mV')

**ORP**   Indicates Strength of Relative Potential. (Unit is 'mV')

ATC   For automatic temperature compensation, a temperature probe supplied by *istek* must be used. Temperature Compensation is automatically performed while measuring.
        ATC(Automatic Temperature Compnsation)

Chapter II. General Functions

1) Instrument Setup

Rear Panel

DIN4P (Power/RS232)   DIN8P(For ATC Probe)   BNC(For sensor)
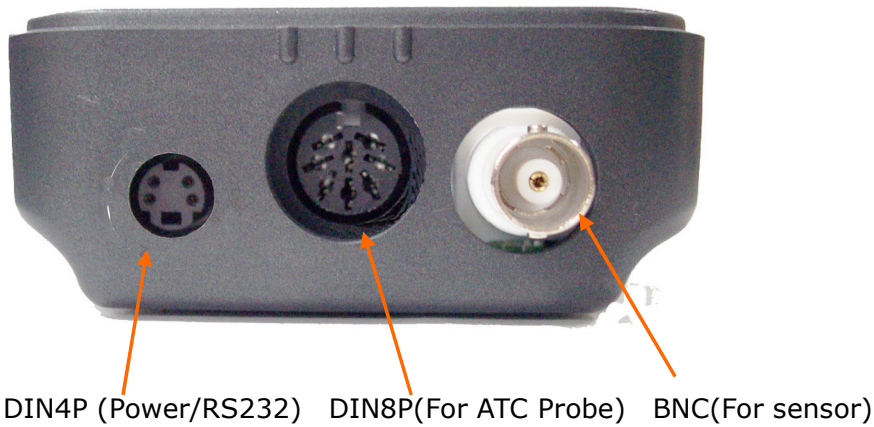
Electrode and ATC probe connection

Insert an electrode provided by istek into BNC Connector and ATC to DIN8P Connector.

RS232C Interface Cable and Printer Connection

Insert RS232C interface cable into the DIN4P Connector.
Please refer Chapter 6 and Chapter 7 for further information.

Power Source

Operating by Rechargeable Battery (AAA x 6) & AC/DC Adaptor
When it is appeared a message as "BAT" on screen, charge them with electricity using AC/DC Adaptor. It takes 3~ 4 hours to recharge fully. When the battery has exhausted in the suburb, you can replace with rechargeable battery to open the cover which is located a lower column of the meter's backside.

2) Key Function

■ pH-20N (pH/ *mV/ ORP/Temp Meter*)

Key	Description
On	Used to turn ON / OFF.
Mode	Used to select operating modes For example, pH or mV.
Resolution	Indicate Data's resolution displayed(0.01/0.1)
Meas	Used to move from <Measure> to <Read> or from <Ready> to <Measure>
Cal	Used this to start calibration or set a value of calibration, And, used to exit to initial display on the calibrating
Setup	Used this for Data-Log, Temp regulation and Current time setting for user
Select	Used to <Memory Clear>
Memory	1) Data saving in <Measure> Mode 2) Data saving in <Ready> Mode 3) Exit from <Memory> Mode 4) Used to save selected Calibration Buffer in <Setup> Mode in ISE
Out	Used to exit from <Setup> or Print the saved data
Rel mV (⩘)	Used to increase Data in manual calibration Setting present value is "0" when you measuring mV value
Slope (⩗)	Used to decrease Data in manual calibration Indicate Slope's condition in pH Mode.

■ pH-25N (pH*/ISE/mV/ORP/Temp Meter*)

Key   Description

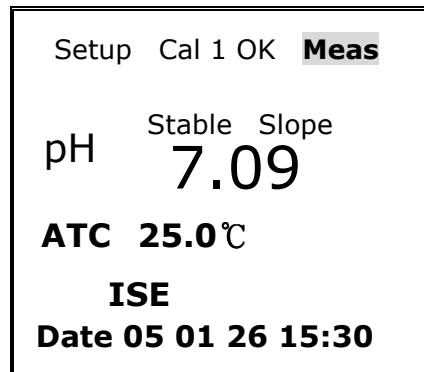=====================================

On   Used to turn ON / OFF.

Mode   Used to select operating modes
          For example, pH or mV.

Resolution indicate Data's resolution displayed(0.01/0.1)

Meas   Used to move from <Measure>
          to <Read> or from <Ready> to <Measure>

Cal   Used this to start calibration or set a value
          of calibration, And, used to exit to initial
          display on the calibrating

Setup   Used this for Data-Log, Temp regulation and

          Current time setting for user

Select   Used to <Memory Clear>

Memory   1) Data saving in <Measure> Mode
          2) Data saving in <Ready> Mode
          3) Exit from <Memory> Mode
          4) Used to save selected Calibration
             Buffer in <Setup> Mode in ISE

Out   Used to exit from <Setup> or Print the saved data

Rel mV (⩘) Used to increase Data in manual calibration
          Setting present value is "0" when you
          Measuring mV value

Slope (⩙)   Used to decrease Data in manual calibration
          Indicate Slope's condition in pH Mode.

3) Display Description

◉ pH-20N

```
  Setup   Cal 1 OK   Meas


 pH        Stable  Slope
            7.09

  ATC  25.0℃



 Date 05 01 26 15:30
```

◉ pH-25N

```
   Setup   Cal 1 OK   Meas


  pH       Stable  Slope
            7.09

  ATC  25.0℃

       ISE
 Date 05 01 26 15:30
```

Display   Function

===

pH   Indicates Power of Hydrogen(H^+).(Unit pH)
        $pH = -\log_{10}[H^+]$ It means a Hydrogen Ion Concentration

ISE   Indicates concentration of any given ion. (Unit mg/L)
        To measure an ion, must use proper electrode which according to the type of the selected. For further information, please refer the description of each ion sensor.

mV   Indicates electromotive force of each ion. (Unit mV)

ORP   Indicates a relative potential. (Unit mV)

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

Meas   Indicates that meter is in <Measurement> Mode.
        If this is not shown, indicates ready condition.

Ready   Indicates that the meter is in <Ready> Mode now.

SETUP   Indicates that meter is in setup mode.

DATA1   Indicates number of data stored in meter.

Stable Displays when the data is stable during it is measuring or calibrating

Cal   Indicates that meter is in calibration condition. used to calibration

Cal OK Indicates the end of calibration corresponding to number.

Slope   Displays when user check Slop value after calibrating of pH or ISE

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Error   Displays when it is not available to correctly measure because something is wrong in the meter or buffer while calibrating or measuring.

4) Electrode Structure

General pH Combination Electrode Structure
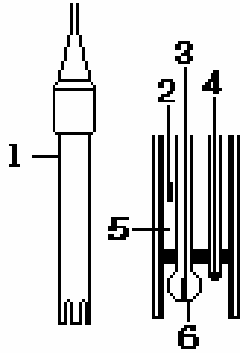
1. Electrode Body
2. Ag/AgCl or calomel electrode ; Reference Electrode
3. pH mono electrode ; Indicator electrode
4. ATC ; Temperature sensor
5. Reference Filling Solution ; Saturated KCl Solution
6. Glass Membrane : Membrane selectively responding hydrogen ION

pH Electrode Storage & Maintenance

A) pH Electrode Storage
Electrodes are stored in the cap of 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.
Electrode is sometimes stored in distilled water, but this method causes electrode life to decrease.

B) 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 $60 \sim 80°C$. The electrode use be stored in this solution for approx. 10 minutes, then cool electrode in not heated KCl solution.

* **Protein removal**
   Protein coatings can be removed by soaking glass electrode in a 10% pepsin solution adjusted

Chapter III. Setup Functions

1. Setup in pH Mode

Data Logging (Hyper Terminal）

In pH ready condition if pressing **[Setup]** key to enter the setup, the display is shown as follows. Set by using ▲ or ▼ key

When this setup is set "ON", meter transmits data with time interval of one second. This data can be taken by communication program or printer via RS232C interface cable.   Press [Out] Key to exit to initial display
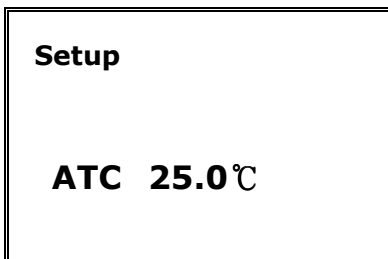
```
pH   7.09
ATC  25.0℃
Date 05 01 26 15:30
```

<Initial Display>

```
Setup

232C
OFF
```
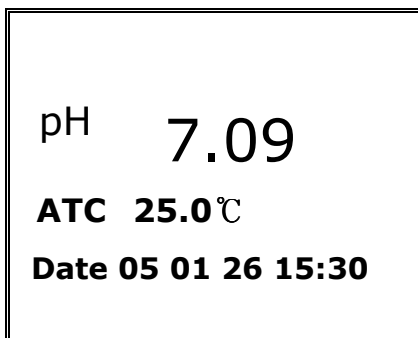
< Setup Mode>

Temperature Setup

```
Setup


ATC  25.0℃
```

If temperature on display differs from a real temp, then set a real temperature. From the initial display of pH, press [**Setup]** key to enter Temp setup display. After that set real temp by using ▲ or ▼ key. After a setup temp, press [Out] key to exit to pH initial display.

### Data and Time Setup

```
ATC  25.0℃
Date 05 01 26 15:30
```
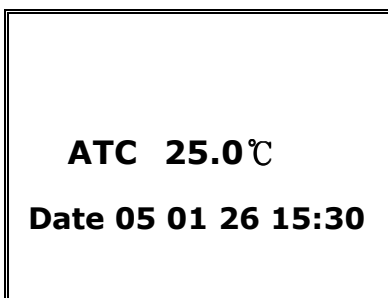
If Date and time on display differ from a real one, then set a real date and time. From the initial display of pH, press [**Setup]** key to enter time in setup display. Set real date and temp by using ▲ or ▼ key. After finishing setup, press [Out] key to return to pH initial display.

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2. Setup in ISE Mode (Come under Model pH-25N)

Press [Mode] Key twice to convert to ISE Mode in pH Mode.
In ISE ready condition press [Setup] key to enter below ISE mode. In ISE ready condition if pressing Setup key, the display is shown as follows.

```
SETUP

        ×10³

1.00
```
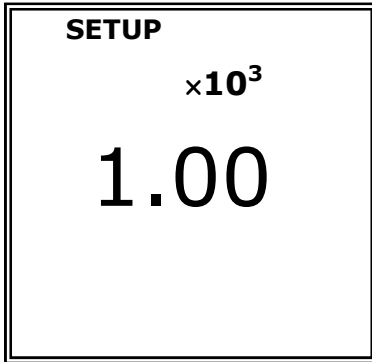
If pressing [Select] key, concentration of buffer $(1.00 \times 10^{-2}, 1.00 \times 10^0, 1.00 \times 10^1, 1.00 \times 10^2, 1.00 \times 10^3)$ is played in turn and then set buffer by using [Memory] key. It is available to set buffer up to 5 points. Please note that it is not available to set just only 1 point.
If finishing setup press [Out] key exit setup mode.

** Memory Clear

If clearing all the stored data, settled press [Mode] key to go mV mode and then press [Select] key to delete the whole former data saved. When [Memory Clear] is finished, it comes back to pH initial display automatically.

Chapter V. Calibration and Measurement

1. pH Calibration and Measurement

Perform calibration every two hours to compensate for electrode drift.
There are two ways of calibrations   a) Auto Calibration 2) Manual Calibration.
Minimum two point calibration should be performed for accurate measurement of pH. Please note that it is not available 1 point calibration.

First of all, it needs to select proper buffer solutions and electrode for calibration.

1) Auto Calibration

Auto calibration is applied when you would like to calibrate 3 points from 2.00, 4.00, 7.00, 10.00, 12.00.

1) pH Meter
2) pH Electrode/ ATC Probe.
3) pH Calibration Buffer Solutions(commonly 4.00,7.00,10.00)
4) Stirrer, Magnetic Bar, Distilled water for rinse and 100ml Beaker etc.

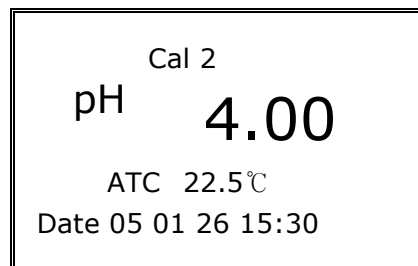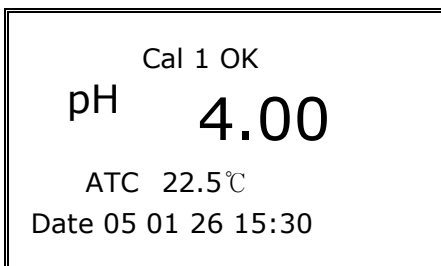**Calibration of Cal 1 (Setting Buffer1)**

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맑은누리 가꿈이

영원한 우리땅, 독도
Dokdo forever
belongs to Korea

From pH ready, press [Cal] Key to move Cal 1 then below display is shown.
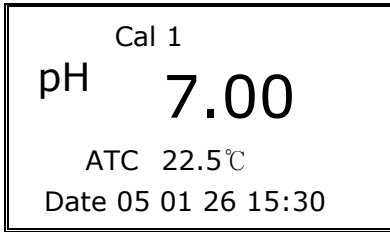
```
        Cal 1
pH     7.00

    ATC  22.5℃
  Date 05 01 26 15:30
```

Put in the electrode into <pH Buffer 4.00> and stir it carefully for a while and press [Measure] Key, then Meas is appeared on the screen and Calibration buffer's pH vale is also indicated.

```
        Cal 1      Meas
pH     4.00

    ATC  22.5℃
  Date 05 01 26 15:30
```
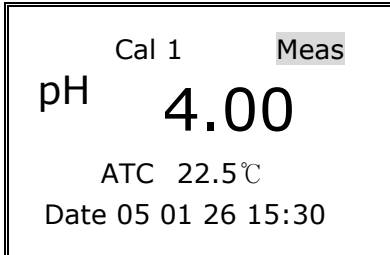
From above display, when 'Stable Data' is appeared, press [Cal] Key. Then "Cal 1 OK" message is appeared a top row of the screen. The first buffer's calibration is completed. After first calibration, it is passed to Cal 2 display automatically.

```
        Cal 1 OK
pH     4.00

    ATC  22.5℃
  Date 05 01 26 15:30
```

```
        Cal 2
pH     4.00

    ATC  22.5℃
  Date 05 01 26 15:30
```

Calibration of Cal 2 to Cal 3

```
                Meas
       186.0

   ATC  22.5℃
mV
  Date 05 01 26 15:30
```

Calibration of Cal2 and Cal 3 has same way as Cal 1 After finishing 3 Points calibrations, it is return to pH initial display automatically. If you would like to calibrate only 2 points, then press [Out] Key after calibrating Cal 2 (Buffer 7.00). After calibration, It is displayed accurate data when you put the sensor in the sample and press [Meas] Key. If you press [Mode] Key again when pH measuring, you can get mV value.

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

2) Manual Calibration

Calibration of Cal 1 (Setting Buffer1)

```
        Cal 1

pH        7.00

ATC  22.5℃
Date 05 01 26 15:30
```

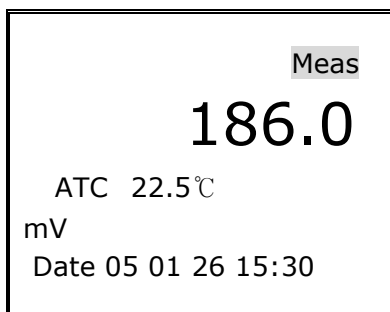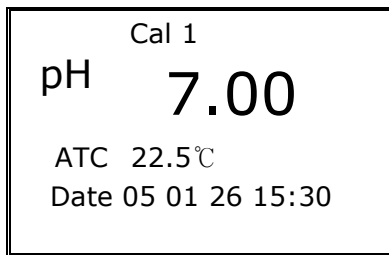From pH ready, press [Cal] Key to move Cal 1 then left display is shown.
Put in the electrode into <pH Buffer 4.00> and stir it carefully for a while and press [Measure] Key, then Meas is appeared on the screen and calibration buffer's pH(pH 4.00) also indicated.

```
        Cal 1        Meas

pH        4.00

ATC  22.5℃
Date 05 01 26 15:30
```
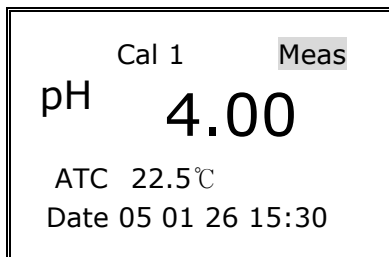
From this display, when 'Stable Data' is appeared, set manually the pH buffer's pH by using [⋀] or [⋁] key. After that press [Cal] Key then "Cal 1 OK" message is appeared a top row of the screen. When it is stable, it is passed to Cal 2 display automatically

```
        Cal 1        Meas
           Stable

pH        4.00

ATC  22.5℃
Date 05 01 26 15:30
```

```
        Cal 1 OK

pH        4.00

ATC  22.5℃
Date 05 01 26 15:30
```

The first buffer's calibration is completed

Calibration of Cal 2 to Cal 5

```
            Meas
pH        7.09

ATC  25.0℃

Date 05 01 26 15:30
```
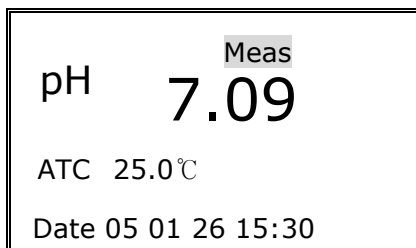
Calibration of Cal2 and Cal 5 has same way as Cal 1 (It is available 3 points(Cal 3) calibration for pH-20N, In the case of pH-25N available to calibrate 5 points (Cal 5)

Press [Cal] Key again, then you can get out pH initial display after 2 or 3 points calibration. After calibration, It is displayed accurate data when you put the sensor in the

the sample and press [Meas] Key. If you press [Mode] Key again when pH measuring, you can get mV value.

Please note that it is not available to calibrate just only 1 point. If try exit after calibrating only 1 point, error message("Err") is displayed. In this case press [Reset] key or continue calibration.
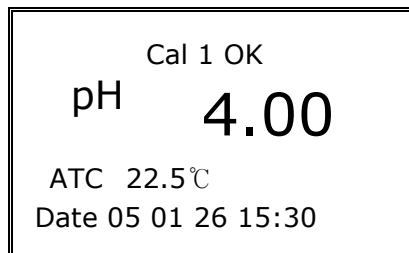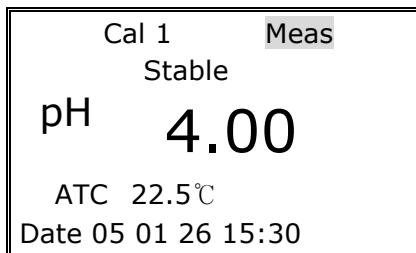
2. ISE Calibration and Measurement (For Model pH-25N)

Preparation

For calibrating ION electrode, a preparation is as a follows.

1) ION Meter
2) Proper ION sensor (According as a preparation progress which was written in ION sensor's Manual, sink the sensor in the standard solution for 30 minute to 2 hours. Shake the sensor, you should remove the airdrops on surface of the Membrane.)
3) Ion Standard Solution (Generally 100ppm, 1000ppm)
4) ION ISA Solution
5) Stirrer, Magnetic Bar, 100ml Beaker, Pipette etc.

Temp of sample should be same with standard buffer solution's temp. 1℃ difference between the sample and standard solution brings about 2% errors.
After finishing, drop ISA solution for removing Interferences in the sample (The ratio is 100% (sample) to 2% (ISA solution)) to the 2 kinds of standard solutions (100ppm, 1000ppm) and the sample. In the case of ION calibration & measuring, careful rinsing and stirrer of the sensor is surely essential.

ION Calibration and Measurement

Calibration of CAL1 (Buffer 1)
In ISE ready condition, press [Cal] key and then the set buffer in Setup is shown as follows.

0.0 mg/ℓ ATC 25.0℃ ISE Date 05 01 26 15:30	Cal 1 $1.00^{\times 10^2}$ mg/ℓ ATC 25.0℃ ISE Date 05 01 26 15:30
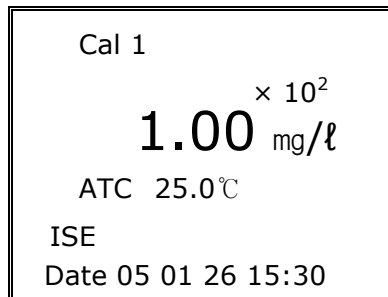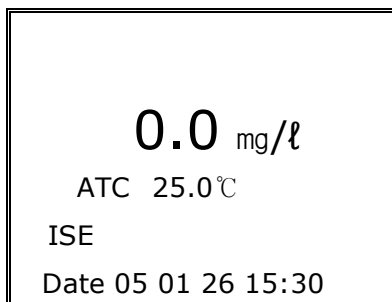
At fist, rinse the sensor with distilled water carefully, remove moisture clearly and put in the electrode into First calibration Buffer<Cal 1> and stir it carefully for a while and press [Meas] Key, then Meas is appeared on the screen and Calibration buffer's ION vale is also indicated.

```
Cal 1              Meas
                × 10²
      1.00 mg/ℓ
  ATC  25.0℃
 ISE
  Date 05 01 26 15:30
```
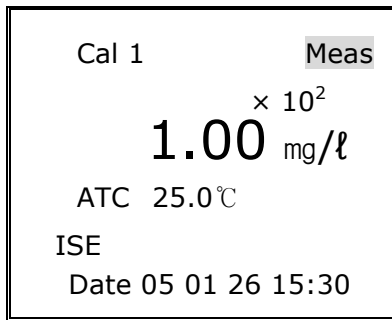
When this value(mg/L) is stable, press [Cal] Key to complete calibration.
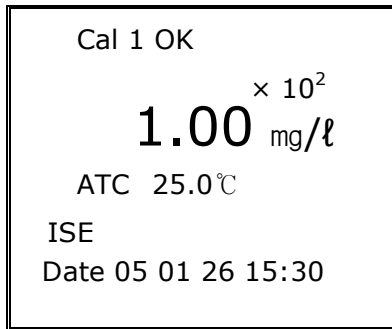
```
Cal 1 OK
                × 10²
      1.00 mg/ℓ
  ATC  25.0℃
 ISE
 Date 05 01 26 15:30
```

The first buffer's calibration is completed

Calibration of Cal 2 to Cal 5

```
Cal 2              Meas
                × 10³
      1.00 mg/ℓ
   ATC  25.0℃
 ISE
 Date 05 01 26 15:30
```
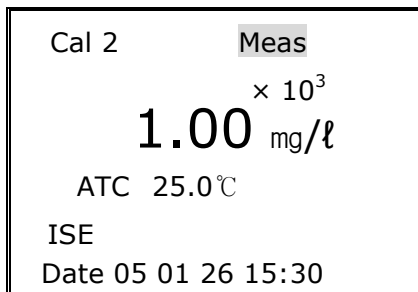
Calibration of Cal 2 and Cal 5 has same way as Cal 1. Press [Cal] Key again, then you can get out ISE initial display after 2 or 3 points calibration. After calibration, It is displayed accurate data when you put the sensor in the sample and press [Meas] Key.

```
               Meas
                × 10²
      3.12 mg/ℓ
   ATC  25.0℃
 ISE
 Date 05 01 26 15:30
```

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

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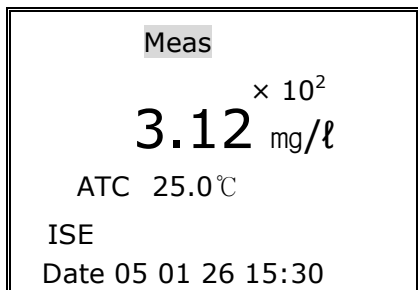
3. Slope Feature & Functions

After pH Calibration, if you would like to know an electrode's slop value, then press [Slop] Key. The slope displays in the main field (%) and then disappeared. The below figure indicates pH slope. For the correct operation, the range of slope must be within 80 ~ 120%. If the slope is not within this range, it is recommended to replace the sensor or change the buffer and measure again for getting accurate value.

```
+-------------------------------+
|            Slope              |
|  pH      98.0                 |
|                               |
|  ATC  25.0℃     %             |
|                               |
|  Date 05 01 26 15:30          |
+-------------------------------+
```
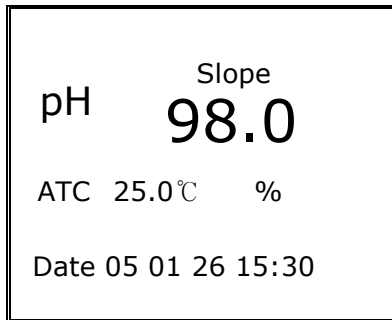
4. Millivolt and Relative Millivolt Measurement

Meter can measure absolute or relative millivolt. This relative millivolt value will be needed when performing potentiometric titration or preparing calibration curves. Relative Millivolt is displayed to 0.1mV resolution in the range of −1999.9 to +1999.9 mV

Millivolt Measurement

Press [Mode] key to go mV Mode and press [Meas] Key

Millivolt is displayed to 0.1mV resolution in the range of −1999.9 to +1999.9 mV

Below is display of measuring mV value

```
+-------------------------------+
|                  Meas         |
|       150.0                   |
|    ATC  25.0℃                 |
|  mV                           |
|    Date 05 01 26 15:30        |
+-------------------------------+
```

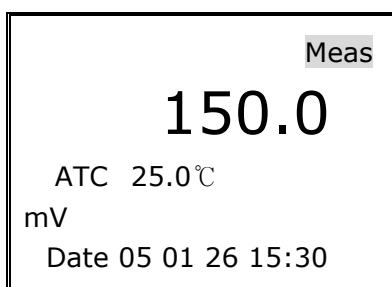Also it is available to measure mV value for pH or ION when they are measuring

Relative Millivolt Measurement

This relative millivolt value will be needed when performing potentiometric titration or preparing calibration curves. Relative Millivolt is displayed to 0.1mV resolution in the range of −1999.9 to +1999.9 mV.
In the measuring condition of mV, changed from a currently displayed value to 0 value by pressing Rel-mV key and then measures relative millivolt.

```
                          Meas
       150.0

    ATC  25.0℃
  mV
     Date 05 01 26 15:30
```
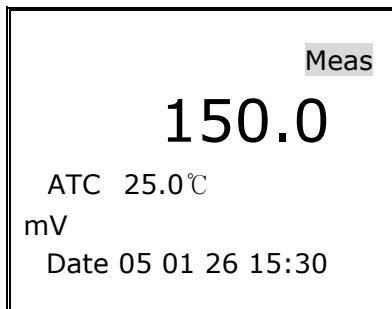
Chapter VI. Data-Log

The measured data is stored by pressing [**Memory**] key manually.
The measuring data is saving in regular sequence as a follow picture

```
  Data 1
  pH     7.09

    ATC  25.0℃

    Date 05 01 26 15:30
```
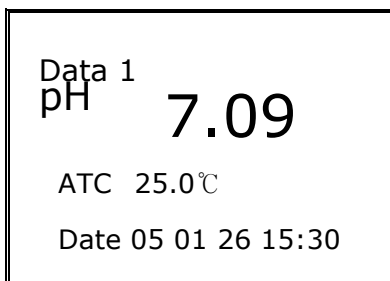
If the data stored in meter is required to print, it is available to output by using printer supplied by *istek*. After searching data stored in instrument by using [Select] key, press Out key to print data.
It is available to search former data by using [Up/Down] Key

It is also available to print by using built-in printer. Press [Printer] Key to print the data
The following figure is an example of printed paper

```
  Data Memory 〔No. 1〕


  Date 05/01/26
          15:30
  pH : 7.09
  TEMP : 25.0
```

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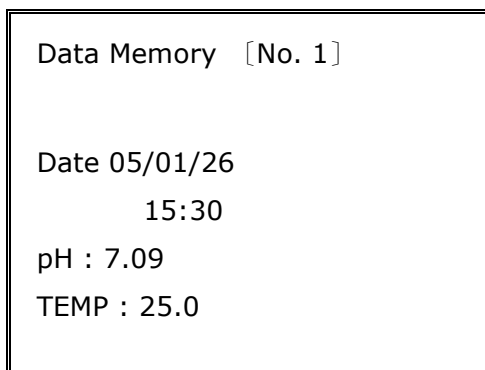
Chapter VII. RS232C Remote Control

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

The following messages are the remote control commands(Item /value/ temp /time)

```
pH 7.09   25.0   05/06/13   01:26
 pH 7.09   25.0   05/06/13   01:26
 pH 7.09   25.0   05/06/13   01:26
 pH 7.09   25.0   05/06/13   01:26
 pH 7.09   25.0   05/06/13   01:26
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Chapter VIII Troubleshooting & Error Description

MALFUNCTION	POSSIBLE CAUSE	REMEDY
No display	No power to meter	Press Power key.
		Check that the adaptor is correctly plugged.
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

If you failed to find the cause of error,
- Please do Memory Clear (Refer Setup Function Part for getting further information)
- The problem still persists, please contact istek, Inc Product Service Department.
 (Tel : 82-2-2108-8400, E-mail : istek@istek.co.kr, Contact Person, Mr. S. H Park)

Chapter IX Specifications

자세한 사항은 catalog 를 참조하거나 (주)이스텍으로 연락 바랍니다.

Moldel		pH-20N	pH-25N
pH	Range Resolution Relative Accuracy	-2.00 to 19.01 ±0.02	-2.000 to 19.999 0.001/0.01/0.1 ±0.002
Millivolt (ORP)	Range Resolution Relative Accuracy	±1999.9 mV 0.1 mV ±0.1 mV	±1999.9 mV 0.1 mV ±0.1 mV
Concentration (ISE)	Range Resolution Relative Accuracy	×	0.00001 to19999 ± one least significant ±0.25% of reading
Temperature	Range Resolution Relative Accuracy	-10 to 110℃ 0.1℃ ±0.4℃	-10 to 110℃ 0.1℃ ±0.4℃
pH Calibration		Auto/Manual (3points)	Auto(3points) / Manual (5points)
Data Logging		100 Points	100 Points
Slope		80 ~ 120%	
Temperature Compensation		Auto	
Calibration		Auto	
Input		BNC , DIN 8P(Temp), DIN 4P(RS232, AC/DC adapter)	
Output		DIN 4P(RS232C- Computer/Printer)	
Power		Rechargeable Battery(AAAx6)	
Standard Accessories		Combination pH Electrode/ ATC Probe, AC/DC Adaptor, Instruction Manual, Buffer Solution 4,7,10 each 125ml	
Optional Accessories		ORP, Ion electrode, Carrying Case pH Storage, Filling Solution, RS232C Cable, Printer	

* ISE Specifications (For pH-25N)

ISE	Sensing Type	Measurement Range		Slope	pH Range	Temp(℃) Range	Response Time	Reference Electrode & Filling solution
		Molar(M)	mg/L(ppm)					
NH_3	GS	$1.0 \sim 5 \times 10^{-7}$	17,000~0.01	56±3	above11	0~50	20	N/A,NH_4Cl
NH_4^+	PM	$1.0 \sim 5 \times 10^{-6}$	18,000~0.1	56±2	4~10	0~50	30	Dbl,NaCl
Br^-	SSM	$1.0 \sim 5 \times 10^{-6}$	79,900~0.4	57±2	0~14	0~80	20	Dbl,KNO_3
Cd^{+2}	SSM	$0.1 \sim 1 \times 10^{-7}$	11,200~0.01	27±2	2~12	0~80	20	Dbl,KNO_3
Ca^{+2}	PM	$1.0 \sim 5 \times 10^{-6}$	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,$NaHCO_3$
Cl^-	SSM	$1.0 \sim 5 \times 10^{-5}$	35,500~1.8	56±2	2~12	0~80	20	Dbl,KNO_3
Cu^{+2}	SSM	$0.1 \sim 1 \times 10^{-8}$	6,350~0.0006	27±2	2~12	0~80	20	Dbl,KNO_3
CN^-	SSM	$0.01 \sim 5 \times 10^{-6}$	260~0.1	57±2	11~13	0~80	20	Dbl,KNO_3
F^-	SSM	Sat'd~1×10^{-6}	Sat'd~0.02	57±2	5~8	0~80	20	Sgl,KCl
BF_4^-	PM	$1.0 \sim 7 \times 10^{-6}$	10,8,00~0.1(B)	56±2	2.5~11	0~50	30	Dbl,$(NH_4)_2SO_4$
I^-	SSM	$1.0 \sim 5 \times 10^{-8}$	127,000~0.006	57±2	0~14	0~80	20	Dbl,KNO_3
Pb^{+2}	SSM	$0.1 \sim 1 \times 10^{-6}$	20,700~0.2	25±2	3~8	0~80	20	Dbl,KNO_3
Li^+	PM	$1.0 \sim 1 \times 10^{-5}$	6,900~0.7	56±2	5~10	0~50	30	Dbl,$(NH_4)_2SO_4$
NO_3^-	PM	$1.0 \sim 7 \times 10^{-6}$	62,000~0.5	56±2	2.5~11	0~50	30	Dbl,$(NH_4)_2SO_4$
NO_X	GS	$5 \times 10^{-3} \sim 5 \times 10^{-6}$	220~0.2	56±3	1.1~1.7	0~50	30	N/A,$NaNO_3$
ClO_4^-	PM	$1.0 \sim 7 \times 10^{-6}$	98,000~0.7	56±2	2.5~11	0~50	30	Dbl,$(NH_4)_2SO_4$
K^+	PM	$1.0 \sim 1 \times 10^{-6}$	39,000~0.04	56±2	2~12	0~50	30	Dbl,NaCl
Ag^+/ S^{-2}	SSM	$1.0 \sim 1 \times 10^{-7}$	107,900~0.01	57±2	2~12	0~80	20	Dbl,KNO_3
		$1.0 \sim 1 \times 10^{-7}$	32,100~0.003	27±2	2~12	0~80	20	Dbl,KNO_3
Na^+	PM	$1.0 \sim 1 \times 10^{-5}$	23,000~0.2	55±2	5~10	0~50	30	Dbl,NH_4Cl
X^+/X^-	SSM	$5 \times 10^{-2} \sim 1 \times 10^{-6}$	12,000~1.0	Titration	2~12	0~50	30	Sgl,KCL
Ca^{+2}/ Mg^{+2}	PM	$1.0 \sim 1 \times 10^{-5}$	40,000~0.4(Ca)	26±3	5~10	0~50	30	Sgl,KCl

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

* Response Time ;   Indicates response time.

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

Chapter X. Ordering Information

※ Other items contact istek, Inc,
For getting further information about accessories, please feel free to contact istek at any time.

A. Standard

* Combination pH Electrode/ATC Probe

* AC/DC Power Adaptor

* Buffer Solutions (pH4.00, 7.00, 10.00) 125ml

* Instruction Manual

B. Option

* pH, ORP, ION Electrode Set

* Luxury Third-Arm Stand

* Electrode Storage Solution 475ml

* Electrode Filling Solution 125ml

* Buffer Solutions (pH4.00, 7.00, 10.00) 475ml

* RS232C Interface Cable

* SDIS Program

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URL : http://www.istek.co.kr   E-mail : istek@istek.co.kr

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	pH-20N / pH -25N	
Serial Number		2years
Manufacturing Month/Year		

Date.   .   , 2006

Authorized signature