

Advanced pH Meter & Advanced pH Meter Kit

850055 & 850056

Instruction Manual

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Advanced pH Meter 850055 & Advanced pH Meter Kit 850056

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INTRODUCTION

Thank you for purchasing the Advanced pH Meter. This meter reads the pH (balance of alkalinity and acidity) and ORP (oxidation reduction potential) in the determination of water quality in labs, industrial and municipal waste water aquariums, fish hatcheries, environmental testing and other applications.

FEATURES

- Multi-display LCD screen
- N.I.S.T. buffer recognition
- 5 points pH calibration
- Hold function
- Maximum and minimum
- Backlight for dark environment operation
- Easy to view probe calibration data
- “Ready” icon on LCD display indicates stability for reading
- USB connection for online logging and uploading 99 memories to PC for analysis
- Automatic or manual temperature compensation
- External power adapter (optional) for long use testing
- Auto power off to save battery

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LCD DISPLAY

LCD display indicates pH, mV, ORP (mV).

Icon **pH**, **mV** indicates the unit of measure displayed.

READY indicates the reading is stable.

MAX, **MIN** indicate maximum or minimum memory value.

HLD Holds the current reading on the display.

REC indicates the meter is in recall mode.

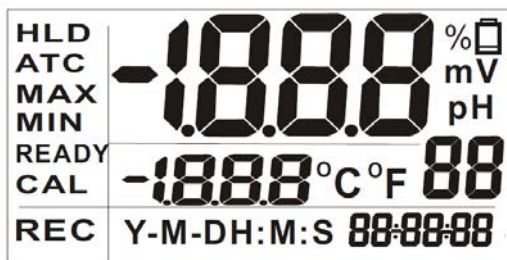
The two digits to the right of °C °F on the display indicate the total number of records that contain stored data.

The **88:88:88** are real time **Y-M-D** or **H:M:S**.

ATC means the meter is in automatic temperature compensation mode.

°C/°F are temperature units of measure

CAL indicates the meter is in calibration mode.



KEYPAD



Press to turn meter **on/off**. Press and hold for more than 1 second to enter **SET** mode.



Switch between **NORMAL** and **CALIBRATION** mode Press to enter manual temperature setting. In calibration, setting or recall mode, press to return to normal.



Press to freeze reading.
Press again to release.
Press for more than 1 second to switch between **NORMAL** and **RECALL** mode.



Press to switch mode.
Press to increase setting value.



Press to save current reading.
Press to decrease the setting value.



Press to confirm calibration/parameter setting.
Press to view the min/max of the memory in recall mode.

SETUP MODE

The advanced Setup Mode allows you to customize the following meter preferences and defaults:

- P1.0 Memory Transmission
- P2.0 Clear Memory
- P3.0 Electrode (pH probe)
- P4.0 Buffer Solution (pH)
- P5.0 Ready Function
- P6.0 Temperature Units
- P7.0 Real Time Clock
- P8.0 Reset

To enter Setup Mode, press **SET** for >2 seconds while the meter is in Normal Mode.

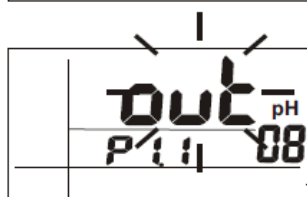
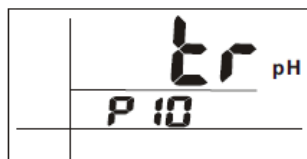
Note...

To exit Setup Mode without saving, press **ESC** until the Normal Mode appears. If the meter is in Setup Mode, press **ESC** twice to exit.

P1.0 Memory Transmission

To transfer stored data from the meter to the computer:

1. Connect the USB cable to the right side of the meter, then connect the other end of the cable with the D-sub connector to the computer's serial port. Run the software associated with this feature.
2. Press **SET** for 2 seconds to enter setup. The "TR" icon appears on the middle of the LCD display and P1.0 displays under the "TR" icon.
3. Press **MN/MX/AV**. The "OUT" icon flashes on the upper display and P1.1 displays under the "OUT" icon. This indicates that the memories are transferring. After transmission, the LCD will return to P1.0.



Note...

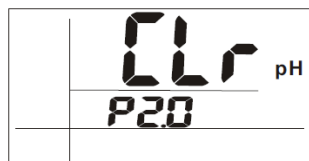
The meter can store up to 99 records for each parameter. If you want to transmit data for a different parameter, press **▲** to select your parameter before entering setup.

P2.0 Clear Memory

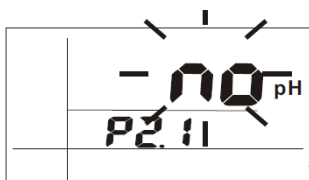
1. Press **MODE** to select the parameter you want cleared before entering Setup Mode.

2. Press **SET** for 2 seconds to enter setup.
Press **▲** to select memory clear function.

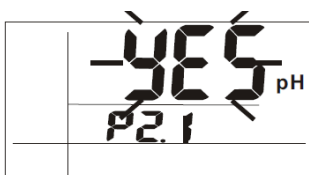
3. The “CLR” icon appears on the middle display and P2.0 illuminates in the lower display.



4. Press **MN/MX/AV** to enter P2.1.
The default “NO” icon flashes on the middle display and P2.1 appears in the lower display.



5. Press **▲** to change the status from “NO” on The display to “YES” and then press **MN/MX/AV** again to confirm clearing of all memory. The LCD display will return to P2.0 when memories are deleted.



CAUTION:

THE MEMORY CLEAR PROGRAM IS DESIGNED TO CLEAR 99 MEMORIES AT ONE TIME. PLEASE CONSIDER CAREFULLY IF YOU DECIDE TO CLEAR THE MEMORY AS THIS OPERATION CANNOT BE REVERSED.

P3.0 View Slope & Offset

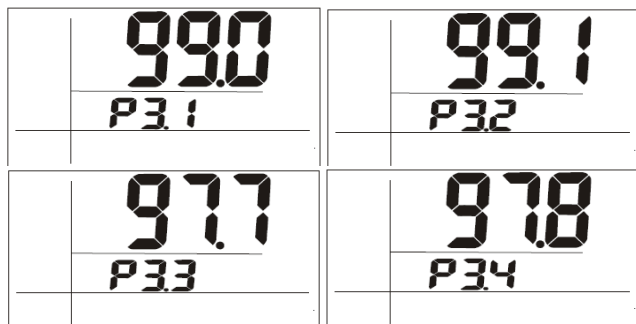
1. Press **MODE** to select probe type as pH.

2. Press **SET** for 2 seconds to enter setup.

3. Press **▲** until the icon “ELE” appears in the middle display and P3.0 appears in the lower display.



4. Press **MN/MX/AV** to enter P3.1, the LCD displays one of four available slope values; P3.1, P3.2, P3.3, P3.4. If the value is less than 75% or more than 115%, change the probe immediately.



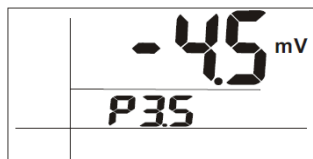
5. Press **MN/MX/AV** to enter P3.2, P3.3, and P3.4.

Note...

The solution range definition differs between N.I.S.T. and Custom buffers.

	P3.1	P3.2	P3.3	P3.4
NIST	0.00~4.01	4.01~6.86	6.86~9.18	9.18~14.00
CUST	0.00~4.50	4.50~7.00	7.00~9.50	9.50~14.00

6. Press **MN/MX/AV** to enter P3.5 and view the offset value. The offset value is the mV value of pH 7 and the default offset value is 0.0. The offset value will be different after calibration. If the value is outside the range of ± 60 mV, replace the probe.



P4.0 pH Calibration Buffer

This meter allows the selection of two different types of pH buffers: N.I.S.T. or CUSTOM. Selection of the proper buffer type more accurately calibrates the probe to specific requirements.

N.I.S.T. buffer: (five settings)

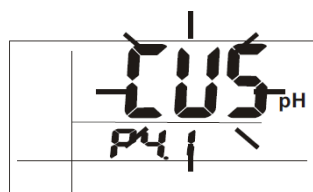
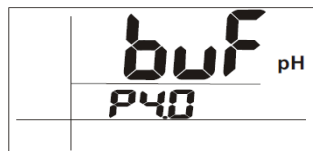
pH 1.68, 4.01, 6.86, 9.18, 12.45

CUSTOM buffer: (five ranges)

pH 1.00-3.00, 3.50-5.50, 6.00-8.00, 8.50-10.50, 11.50-13.50

Select Buffer

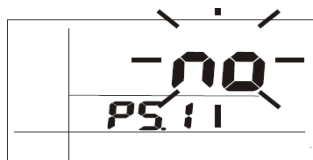
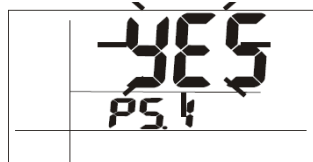
1. Press **SET** for 2 seconds to enter setup.
2. Press **▲** to select pH buffer. "BUF" will appear on the middle of the LCD and P4.0 will appear on the lower portion.
3. Press **MN/MX/AV** to enter P4.1. The default "NIS" (N.I.S.T.) will flash on the LCD and P4.1 will appear on the lower portion of the display. If you use N.I.S.T. buffers, press **MN/MX/AV** to confirm and the meter returns to P4.0.
4. If your requirement is not for N.I.S.T. buffers, press **▲** to change the status to CUSTOM buffer.
5. Press **MN/MX/AV** to confirm and the meter will return to P4.0.



P5.0 Ready Icon

This feature enables/disables the "READY" icon, which indicates that the measured reading is stable.

1. Press **SET** for 2 seconds to enter setup.
2. Press **▲** to select "READY" on the display.
3. Press **MN/MX/AV** to enter P5.1. "YES" will flash on the LCD display and P5.1 will appear on the lower display.
4. Press **▲** to switch between YES or NO.
5. Press **MN/MX/AV** to confirm.
6. Press **ESC** to return to Normal Mode.



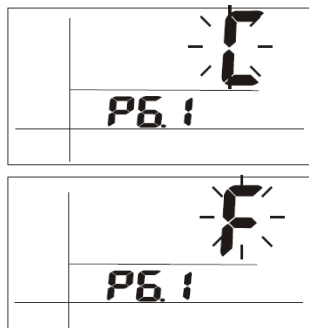
P6.0 Temperature Units

To select either Celsius or Fahrenheit temperature scale:

1. Press **SET** for 2 seconds to enter setup.
2. Press **▲** to select "U" on the upper display. P6.0 is displayed in the lower portion of display.



3. Press **MN/MX/AV** to enter P6.1. The last selected unit “C” or “F” will appear on the LCD.
4. Press **▲** to select either display.
5. Press **MN/MX/AV** to save the selection.
6. Press **ESC** to return to Normal Mode.



P7.0 Real Time Clock Setting

This procedure adjusts the meter’s internal clock. An internal battery powers the real time clock independent of the power source running the meter.

1. Press **SET** for 2 seconds to enter setup.
2. Press **▲** to select “RTC” on the LCD display. P7.0 appears on the bottom of the display.
3. Press **MN/MX/AV** to enter P7.1. The year flashes in the lower right corner of the LCD display. (The year is the last two digits only; for example, 1999 would be 99).

Symbol:

Y-M-D

H:M:S

Definition:

Yr.-Mo.-Day

Hr.-Min.-Sec.

Range:

99-12-31

23-59-59

4. Press **MN/MX/AV** to step through the following “P’s.” All are two digits.

P7.1 = Year

P7.2 = Month

P7.3 = Day

P7.4 = Hour

P7.5 = Minute

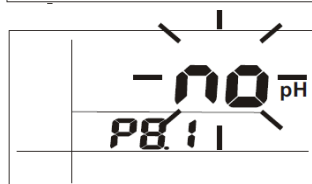
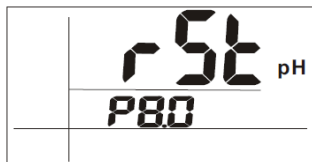
P7.6 = Seconds

5. Press **▲** and **▼** to adjust values up or down, respectively.
6. Press **ESC** to return to P7.0 and Normal Mode.

P8.0 Reset

This procedure will reset the meter to factory default settings. Memory locations are not reset after this procedure.

1. Press **SET** for 2 seconds to enter setup.
2. Press **▲** to select the reset section of the meter.
3. “rSt” will appear on the LCD and P8.0 will appear directly below.
4. Press **MN/MX/AV** to enter P8.1.
5. Press **▲** to switch between “YES” or “NO.”
6. Press **MN/MX/AV** to confirm.
7. Press **ESC** to return to Normal Mode.



PROBE CALIBRATION

Calibrate routinely before use, if the readings seem erratic, and whenever the batteries are replaced. For the highest accuracy, we recommend a two point calibration. If only calibrating at a single point, make certain that the buffer value is close to the sample that will be measured and the buffer temperature remains stable.

1. Press **POWER** to turn the meter on and press **MODE** to select “pH” mode. “pH” appears on the LCD.
2. Select the calibration buffer type: **N.I.S.T.** or **CUSTOM** (see page 14).

Note...

pH 4 may be calibrated using either the N.I.S.T.(recommended option) or CUSTOM buffer. pH 7 and pH 10 require the CUSTOM buffer. (See SETUP MODE on page 14.)

3. Rinse the probe in de-ionized water or rinse solution. DO NOT wipe the pH probe dry. Wiping the probe may cause static and cause calibration and measurement instability.
4. Select the pH buffer and pour enough solution to totally immerse the probe tip into a clean container.
5. Dip the probe into the container, immersing the probe tip.
6. Stir the probe gently to create a uniform sample.

7. Press **CAL** to enter calibration mode. "CA" will flash on the LCD. The pH value appears on the main display and 2.00 appears on the secondary display (CUSTOM) or 4.00 appears on the secondary display (N.I.S.T.).
8. When the measured pH value is stable and the Ready function is enabled (Refer to P5.0 READY ICON page 15). "READY" will appear on the left side of the LCD.

Note...

If the pH value continues to display different values, check the buffer or probe. (Refer to TROUBLESHOOTING page 32).

9. N.I.S.T. buffer: Skip to step 10. CUSTOM buffer: Follow instructions for your selected buffer solution:

pH 4

Press **HLD/REC**. 4.50 appears on the secondary display.
Use ▲ or ▼ to adjust to 4.00.

pH 7

Press **HLD/REC**. 4.50 appears on the secondary display.
Press **HLD/REC** again. If the secondary value does not default to 7.00, use ▲ or ▼ to adjust to 7.00.

pH 10

Press **HLD/REC**. 4.50 appears on the secondary display.
Press **HLD/REC** again. 7.00 appears on the secondary display.
Press **HLD/REC** again. 9.50 appears on the secondary display.
Use ▲ or ▼ to adjust to 10.00.

10. Press **MN/MX/AV** to confirm. Press **ESC** to save and return to Normal Mode.
11. Change the buffer solution and repeat previous steps to achieve multiple point calibration. Clean the probe in between each buffer.

MEASUREMENT PROCEDURES

- 1. The meter is powered by 4 AAA batteries. Install batteries or connect an AC adapter to the power jack on the side of the meter.
- 2. Connect a sensor probe to the BNC connector on top of the meter.
- 3. For the pH probe with temperature sensor, also connect the plug into the jack to the right of the BNC connector.
- 4. Connect the USB cable to the meter and computer to upload measurements for computer analysis.

Available measurement parameters of each probe:

	pH	mV
pH Probe	Yes	Yes
ORP Probe	N/A	Yes

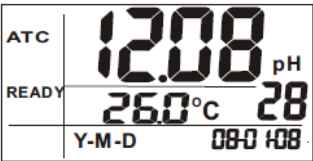
IMPORTANT: The temperature of the measured liquid must be stable.

pH Measurement

This meter is designed to take readings with automatic or manual temperature compensation. Automatic temperature compensation only occurs when a temperature sensor is plugged into the meter. For manual temperature compensation, the default setting is 25°C. It is also possible to manually adjust the temperature to match your working conditions, as measured by a separate thermometer.

To take measurements:

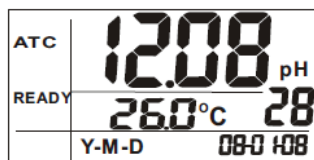
- 1. Remove the pH probe soaker bottle by rotating the bottle and cap and slide the bottle and cap off the probe. Rinse the probe tip with de-ionized or distilled water before use. If the probe tip is dehydrated, soak it for 30 minutes in a KCl solution. **DO NOT** wipe the pH probe dry. Wiping the probe may cause static and cause calibration and measurement instability.
- 2. Press **POWER** to turn on. **ATC** appears to indicate that the automatic temperature compensation probe is connected and working properly.
- 3. Immerse the probe tip (glass bulb) completely into the sample.
- 4. Stir the probe gently to create a uniform sample.
- 5. Wait until the reading has stabilized.
If selected in setup, “**READY**” illuminates to indicate a stable reading.



mV Measurement ($\pm 499\text{mV}$)

mV measurement range is from -499 mV to $+499\text{ mV}$ with a pH probe.

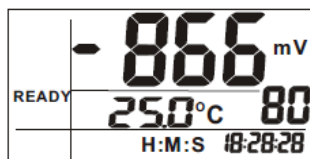
1. Follow Step 1 in the pH Measurement section to clean and soak the probe.
2. Press **POWER** to turn on. Press **MODE** to select mV mode.
3. Follow Steps 3-5 in the pH Measurement section to obtain a reading.
4. To switch between mV and pH, press **MODE**.



ORP (mV) Measurement ($\pm 1999\text{mV}$)

ORP (Oxidation Reduction Potential) measurement range is -1999 mV to $+1999\text{ mV}$. Use an ORP probe for measurement:

1. Follow Step 1 in the pH Measurement section to clean and soak the probe.
2. Press **POWER** to turn on. Press **MODE** to select mV measurement.
3. Follow Steps 3-5 in the pH Measurement section to obtain a reading.



Note...

There is no need to take temperature compensation into consideration when using an ORP probe to measure.

Temperature Compensation

Automatic with pH probe (ATC):

Plug the temperature sensor connector into the jack on top of the meter next to the larger BNC connector.

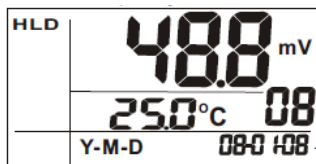
Manual with pH probe (MTC):

1. To set the temperature, press **MN/MX/AV** for more than 2 seconds, "CA" will flash on the LCD Display.
2. Press the **▲** or **▼** to change the temperature value and then press **MN/MX/AV** to save and return to Normal Mode.

Hold Function

This function allows you to freeze the current reading on the display in Normal Mode.

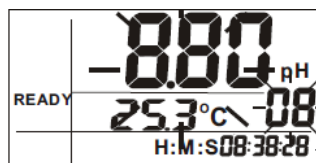
1. Press **HLD** in Normal Mode. “HLD” appears on the display.
2. Press **HLD** and the meter returns to Normal Mode.



Record Memory

The meter can store up to 99 records each of pH, mV, and ORP (mV) readings.

1. In any measurement or Hold Mode, press **MEM** to save the data.
2. The memory number and measured value will flash and then return to Normal Mode.



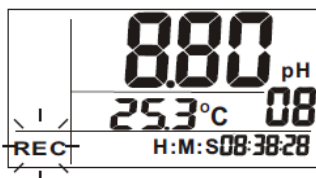
Note...

Further data can not be saved once the memory is full.
See Clear Memory on page 11 to create additional space.

Recall Memory

This function recalls readings stored in the memory.

1. Press **REC** for more than 2 seconds to enter Recall Mode. “REC” will flash on the LCD display.
2. Press **▲** to select next memory content. Press **▼** to select previous memory.
3. To exit memory recall, press **REC** for more than 2 seconds.



Recall Maximum & Minimum

This function reviews a maximum and minimum value for all the data points stored in memory.

1. Press **REC** for 2 seconds to enter Recall Mode. "REC" will flash on the LCD.
2. Press **MN/MX/AV** to view the minimum value of the memory. Press **MN/MX/AV** again to view the maximum value.
3. To exit memory recall, press REC for more than 2 seconds.

Backlight

1. Press any button to activate the backlight function.
The backlight turns off automatically after 10 seconds of inactivity.

Auto Power Off

The meter turns off automatically after 20 minutes of inactivity. To override the function, hold down **POWER** and **HLD** simultaneously for 2 seconds when turning the meter on until "n" appears.



Note...

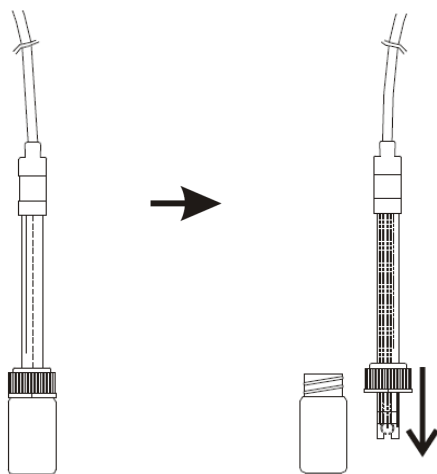
The auto power off function will be disabled while in calibration mode.

MAINTENANCE

pH Probe

It is important to keep the pH probe wet when the meter is not in use. The probe is well protected by a plastic bottle containing solution. To use or store the probe:

1. Rotate the bottle to remove from the probe. Pull down the cover and remove it from the probe.
2. After use, put cover back on the probe and plug the probe into the bottle. Rotate the bottle to fit into the cover tightly.



The following actions will keep the probe in good working condition.

- Always keep the pH glass bulb wet by using the plastic bottle to protect and store the probe. You can also store in a KCl solution. Never use distilled or de-ionized water for storage.
- Always rinse pH probe in de-ionized water before using.
- Never touch or rub the glass bulb tip.

Probe Testing

1. Connect the ORP probe to the meter via the BNC connector.
2. Put the probe in a buffer solution of pH 7.00 with saturated quinhydrone.
3. Stir; mV reading (E1) should be $86 \pm 15\text{mV}$.
4. Rinse the probe with distilled water between each use. Keep the ORP probe wet. If not in use for long periods, it should be rinsed and stored in the soaker bottle filled with the saturated KCL solution.

ORP Probe Cleaning

A contaminated sensing element can result in a slow response and/or inaccurate reading.

- If contamination is a mineral matter, put the sensing element in a HCl solution 0.1 N for 10 minutes. Then rinse in distilled water.
- If contamination is oil or grease, clean with a mild detergent. Then rinse with distilled water.

Upon completion of either cleaning method, immerse the probe in a saturated buffer solution with pH 4.01 for 15 minutes and rinse with distilled water.

Probe Performance

The sensing element of an ORP probe is made of a high purity metal. Slow response time and inaccurate readings may be caused by the sensing element previously having been soaked in a solution for a long period of time. An oxidation reduction coating may have formed on the surface of the sensing element. Resolve by cleaning the element.

When measuring solutions with a low concentration of oxidation reduction matter and slow ion exchange rate, a slow response time and inaccurate readings may occur. Under these conditions, it may take 8-24 hours to obtain an accurate reading.

TROUBLESHOOTING

Meter does not turn on:

1. Press **POWER** for more than 2 seconds.
2. Check connections of the power adapter or batteries.

Unstable readings:

1. Stir the solution to make a uniform sample and make sure the sensor is completely immersed in the solution. The measurement must be done while probe is in the container/solution.
2. Move to new location for measurement, RF emissions from unknown source may disrupt readings.

Readings not changing:

1. Check to see if meter is in "HOLD" mode.
2. Release "HOLD" function.
3. Check to see if meter is in "MTC," if so, input temperature value.

Slow response:

1. Clean and re-calibrate the probe. Replace with a new probe.

Wrong real time:

Incorrect real time display will not affect the measurements. Internal batteries (separate from internal batteries that power the meter) need replacing. Contact Sper Scientific for replacement documentation.

ERROR CODES

E02	Reading is under the lower limit
E03	Reading is over the upper limit
E04	Temperature sensor fail, replace probe.
E12	Factory calibration data error; Reset meter
E13	Slope or Offset value of pH probe is out of range
E31	Measuring circuit failure; Restart meter
E32	Memory Integrated Circuit failure

PC CONNECTION

The meter can interface with a personal computer to capture on-line or stored data.

Connection procedures:

1. Plug the USB cable into the cable jack on the side of the meter.
2. Plug D-sub 9 pin type connector into a computer Serial COM port. COM ports 1-8 can be used.
3. Insert CD-Rom in computer and follow the procedure in the operation manual located on the CD.

Protocol information

USB protocol settings: 9600 bps, 8 data bits, no parity.
(Transmits ASCII code every second.)

Normal Data:

pxx.xxpH: mxx.xxmV:Txxx.xC(F)@ 2007-04-18
18:48:48LRCCRLF

Protocol Information

Errors:

ExxNul: ExxNul: ExxNul @ 2007-04-18
18:48:48LRCCRLF

Description:

\$pH:mV:TpH LRC CRLF

Note...

The first value is pH reading in pH, the second value is Voltage reading in mV, the third value is Temperature of pH probe in C/F, and "x" is a numerical value.

Format in Memory Transmit pH Mode

Normal Data:

Pxx.xxpH: Txxx.xC(F)#xx@2007-04-18

18:48:48LRCCRLF

Errors:

ExxNul: ExxNul: #xx @2007-04-18

18:48:48LRCCRLF

Description:

\$pH: Temp LRCCRLF

Protocol information

Format in Memory Transmit mV mode

Normal Data:

Mxx.xxmV: Txxx.xC(F) #xx @2007-04-18

18:48:48LRCCRLF

Errors:

ExxNul: ExxNul #xx @2007-04-18

18:48:48LRCCRLF

Description:

\$mV:Temp LRC CRLF

POWER SUPPLY

The meter is powered by 4 AAA batteries or a 9V external adapter. Insert batteries into the battery compartment observing correct polarity and secure.

APPENDIX

Temperature effect on N.I.S.T. pH Buffers

	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C
pH 1.68	1.67	1.67	1.67	1.67	1.68	1.68	1.69	1.69	1.70	1.70	1.70
pH 4.01	4.01	4.01	4.00	4.00	4.00	4.01	4.01	4.02	4.03	4.04	4.06
pH 6.86	6.98	6.95	6.92	6.90	6.88	6.86	6.85	6.84	6.84	6.83	6.83
pH 9.18	9.47	9.38	9.32	9.27	9.22	9.18	9.14	9.10	9.07	9.04	9.01
pH 12.45	13.43	13.21	13.00	12.81	12.63	12.45	12.29	12.13	11.99	11.84	11.70

SPECIFICATIONS

Parameter	Range	Resolution	Accuracy
pH	0 to 14	0.01	± 0.02 pH
mV	-499 to 499	± 0.1 mV (-199.9 to 199.9) otherwise ± 1mV	± 0.2 mV -199.9 to 199.9 otherwise ± 2 mV
ORP	-199.9 to 199.9	± 0.1 mV (-199.9 to 199.9) otherwise ± 1mV	± 0.2 mV -199.9 to 199.9 otherwise ± 2 mV
Temp °F	23 to 176°F	0.1°	± 2 °F
Temp °C	-5 to 80°C	0.1°	± 1 °C

Operation temperature: 5°C to 40°C

Operation RH%: Up to 95% without condensation

Storage Temperature: -20°C to 60°C

Storage RH%: Up to 95% without condensation

Dimensions: 7" × 2¾" × 1¼" (178 × 70 × 32 mm)

Weight: 6.5 oz (184 g)

pH/mV default preferences (display “pH”)

Program	Preference	Default	Displayed
P1.0	Memory (Transmitting)	No default	“tr”
P1.1	Memory Sent by USB	No default	“out”
P2.0	Memory Clear	“no”	“CLR”
P2.1	CLR Confirm	“no”	“no” / “yes”
P3.0	Electrode		“ELE”
P3.1-3.4	Slope	100.0%	Slope value
P3.5	Offset	0.0 mV	Offset value
P4.0	Buffer Solution		“buF”
P4.1	Select Buffer	“NIST”	“nist” / “cust”
P6.0	Ready Function		“rdy”
P6.1	Enable or Disable	“yes”	“no” / “yes”
P7.0	Temp Unit		“U”
P7.1	Select C or F	“C”	“C” or “F”
P8.0	Real Time Clock		“rtc”
P8.1-8.6	Setting YMD, HMS		“rtc”
P9.0	Reset	“no”	“rst”
P9.1	Reset Confirm	“no”	“no” / “yes”

WARRANTY

Sper Scientific warrants this product against defects in materials and workmanship for period of **one years** from the date of purchase and agrees to repair or replace any defective unit without charge. If your model has since been discontinued, an equivalent Sper Scientific product will be substituted, if available. This warranty does not cover probes, batteries, battery leakage, or damage resulting from accident, tampering, misuse, or abuse of the product. Opening the meter to expose its electronics will void the warranty.

To obtain warranty service, ship the unit postage prepaid to:

SPER SCIENTIFIC LTD.
8281 E. Evans Rd, Suite #103
Scottsdale, AZ 85260

The defective unit must be accompanied by a description of the problem and your return address. Register your product online at www.sperwarranty.com within 10 days.

Contact :

EASTERN ENERGY CO.,LTD. (HEAD OFFICE)

40/4 Vitoondumri Rd., Banbueng, Banbueng, Chonburi 20170

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