

# IQ 150 pH Meter

## PRODUCT MANUAL

Item 2162S

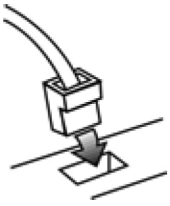







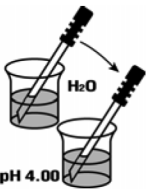


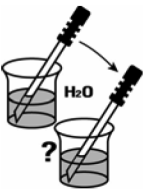


**Spectrum<sup>®</sup>**  
**Technologies, Inc.**

# MODEL IQ150 pH Meter

## Getting Started

### TWO-POINT CALIBRATION--QUICK REFERENCE GUIDE

<p>1.</p> 	<p>2.</p> 	<p>3.</p> 	<p>4.</p> 
<p>Connect probe to meter.</p>	<p>Put probe in first calibrating buffer.</p>	<p>Press <b>ON/OFF</b> to turn on meter.</p>	<p>If necessary, press <b>pH</b> until pH icon is seen on the display.</p>
<p>5.</p> 	<p>6.</p> 	<p>7.</p> 	<p>8.</p> 
<p>Press <b>CAL</b>.</p>	<p>If necessary, press <b>SELECT BUFFER</b> until display matches first buffer value.</p>	<p>Press <b>ENTER</b> and wait until the large number display stops flashing.</p>	<p>When complete, meter will display the next stored buffer value. <b>2PT</b> will be displayed.</p>
<p>9.</p> 	<p>10.</p> 	<p>11.</p> 	<p>12.</p> 
<p>Rinse probe in deionized water and place in second calibrating buffer.</p>	<p>If necessary, press <b>SELECT BUFFER</b> until display matches second buffer value.</p>	<p>Press <b>ENTER</b> and wait until the large number display stops flashing.</p>	<p>Rinse probe in deionized water and place in sample.</p>

## **INTRODUCTION**

### **IMPORTANT NOTICE**

**IF THE METER IS USED IN A MANNER OTHER THAN AS DESCRIBED, THE SAFETY AND PERFORMANCE OF THE METER CAN BE IMPAIRED.**

**IF THE SEAL ON THE BACK OF THE METER IS TAMPERED WITH, THE WARRANTY IS IMMEDIATELY VOIDED.**

The IQ150 pH “Dual Technology” meter accepts both traditional style glass sensor electrodes with BNC connectors as well as non-glass pH probes with ISFET (Ion Sensitive Field Effect Transistor) silicon chip sensors.

Throughout this manual, non-glass pH probes with silicon chip sensors will be referred to as “ISFET” probes. The meter has a standard BNC connector for attachment of glass sensor pH electrodes. Glass sensor pH electrodes will be referred to as “BNC” probes.

The meter is designed to use only one electrode at a time. The meter automatically identifies which type of electrode is attached when the meter is turned on. If both ISFET and BNC probes are attached at the same time, errors may occur. Always turn off the meter when changing electrodes

### **ESTIMATED LIFE OF AN ISFET SENSOR pH PROBE**

Depending upon the application, the expected life of an ISFET probe is approximately 18 months. The reference electrode contains a KCl gel, which becomes increasingly diluted with usage and time. The reference is sealed and is not refillable. When it becomes difficult to calibrate (pH buffer value does not stop flashing during calibration or takes an excessively long time to stop flashing), the probe should be replaced. A probe that is dirty, miscalibrated, or has reached the end of its useful life will give an error message **E06** or **E07** on the meter display. Your ISFET probe is warranted to be free from manufacturing defects for six (6) months from the date of purchase.

## *Table of Contents*

Two-Point Calibration Quick Reference Guide . . . . .	1
Introduction . . . . .	2
Techniques and Tips for Best Performance . . . . .	4
Display Features. . . . .	6
Keypad Functions. . . . .	7
Connecting Electrodes . . . . .	8
pH Calibration and Measurement . . . . .	9
Important Notes for Best Calibration Results. . . . .	9
Calibration with Two Buffers. . . . .	10
Calibration with One Buffer. . . . .	11
How to Abort Calibration. . . . .	11
Automatic Temperature Compensation . . . . .	12
Manual Temperature Compensation . . . . .	13
mV Measurement. . . . .	14
Temperature Measurement. . . . .	14
Cleaning and Reconditioning ISFET Probes . . . . .	15
Cleaning with Detergent . . . . .	15
Reconditioning with Warm Buffer . . . . .	15
Cleaning with Alcohol or Methanol . . . . .	16
Cleaning with Sodium Hypochlorite. . . . .	16
Cleaning and Reconditioning BNC Electrodes . . . . .	17
Cleaning with Detergent . . . . .	17
Reconditioning with Warm Buffer . . . . .	17
Cleaning with Acid . . . . .	17
Cleaning with Methanol or Acetone . . . . .	17
Cleaning with Pepsin . . . . .	18
Etching with Ammonium Bifluoride. . . . .	18
Titration . . . . .	18
Battery Replacement . . . . .	19
Automatic Shutoff . . . . .	19
AC Adapter . . . . .	19
Troubleshooting . . . . .	20
Error Codes . . . . .	22

## *Techniques and Tips for Best Performance*

### **DO**

**DO: (ISFET non-glass probe ONLY)** Soak the probe in pH 7.00 buffer for at least five minutes if the probe is new or has been stored dry for an extended period. This will hydrate the sensor and dissolve any reference material, which may have crystallized on the sensor surface.

**DO: (ISFET non-glass probe ONLY)** Clean the probe regularly with a toothbrush and mild detergent.

**DO: (ISFET non-glass probe ONLY)** STORE THE PROBE DRY with the black protective cap covering the probe tip. No electrode storage solution is required.

**DO: (BNC probe ONLY)** Store the probe in electrode storage solution.

**DO:** Always begin each measuring session with a two-point calibration. Update often with one-point or two-point calibrations.

**DO:** Use fresh buffers and deionized rinse solution.

**DO:** Use buffer solutions with pH values no greater than three pH units apart. Buffers should bracket the anticipated values of the samples to be measured.

**DO:** Choose buffer solutions that most closely mimic the chemical nature and conductivity level of the sample solutions to be measured.

**DO:** Use deionized water to rinse residual buffer and sample solutions from the probe after calibration and measurement.

**DO:** Calibrate at the same temperature as the sample solution. Although the meter has automatic temperature compensation, best results will be achieved if the calibration buffers and sample are the same temperature.

**DO:** Keep the connectors clean and dry. Dirty or damp connectors can cause unstable readings.

**DO:** Be sure the surface of the sensor in the probe is free from any deposits or films. See the cleaning instructions in this manual.

## DO NOT

**DO NOT:** change probe types (switch between BNC and ISFET probes) while the meter is turned on. Always turn off the meter before changing probes.

**DO NOT:** simultaneously use ISFET and BNC probes. Only have one type of probe attached to the pH meter at a time.

**DO NOT:** store an ISFET probe in solution or use for long-term pH measuring applications. Unlike BNC electrodes, stainless steel ISFET electrodes should be stored dry. Extended immersion will shorten the life of the probe.

**DO NOT:** leave an ISFET probe uncapped for long periods of time. Always place the protective cap over the probe tip when finished measuring.

**DO NOT:** allow oil, fat, food particles, starch, protein, or other materials to remain on the probe tip after use.

**DO NOT:** use a sharp metal object (needle, pin, etc.) to clean the sensor surface.

**DO NOT:** take readings in direct sunlight. Direct sunlight may cause unstable readings or difficulty in calibration. Call IQ Scientific Instruments or your Authorized Dealer for optional light shields.

**DO NOT:** use the probe in an environment that will damage the pH sensor, such as hydrofluoric acid or abrasive samples.

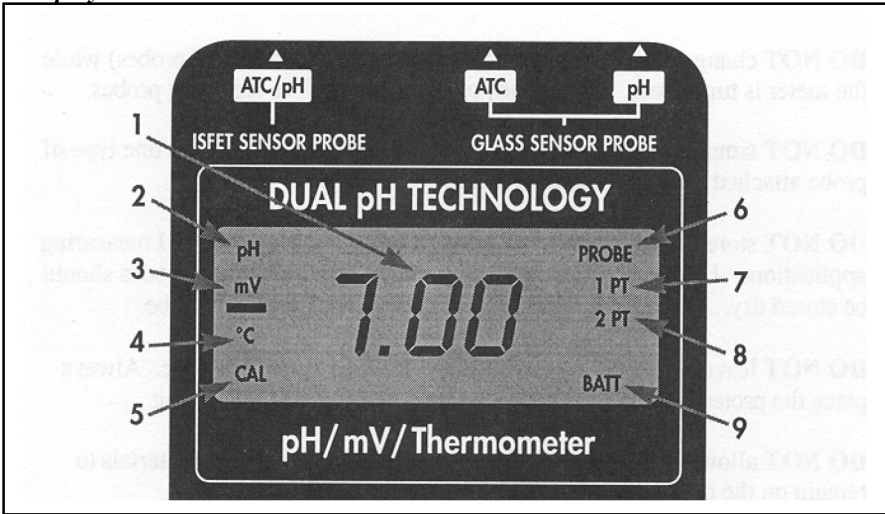
**DO NOT:** use the probe in environments that will damage the epoxy materials used in probe construction, such as, acetone, toluene, methylene chloride, xylene, and other strong organic solvents.

**DO NOT:** use in environments with static electricity. Electrostatic discharge may permanently damage the probe.

**DO NOT:** expose the ISFET probe to repeated temperature extremes (60 °C or higher). Do not use the probe for applications that require the probe to cycle between hot and room temperature samples.

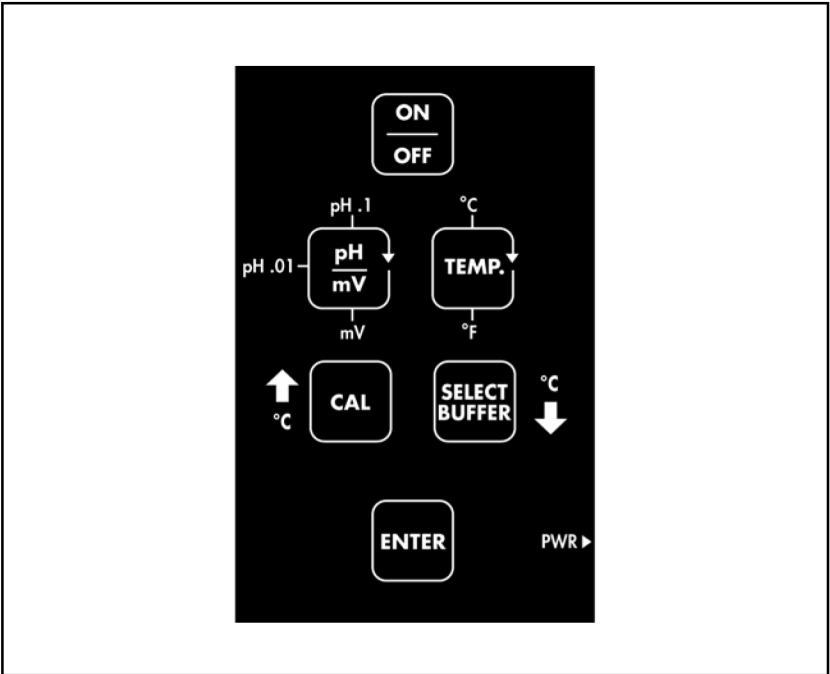
**DO NOT:** put any other active measurement devices in buffers or samples while measuring pH. Even if another device is not actually turned on, AC power interference can still occur, especially if the pH meter AC battery adapter is in use.

## Display Features



1. **Main Display.** Displays pH, mV or Temperature.
2. **pH Mode and pH Stabilization Indicator.** **pH** is displayed when the meter is measuring pH. This symbol will flash until a stable reading (endpoint) is reached.
3. **mV Mode Indicator.**
4. **Temperature Mode Indicator.**
5. **Calibration Mode Indicator.** The **CAL** symbol is displayed when the meter is in pH or temperature calibration mode.
6. **ISFET Probe Indicator.** **PROBE** is displayed when pH meter has detected the presence of an ISFET probe. The **PROBE** icon is not displayed when the pH meter is using a BNC electrode. Flashing **PROBE** icon indicates pending ISFET probe failure.
7. **One-Point Calibration Mode Indicator.** **1PT** is displayed when the meter is set for making a one-point calibration.
8. **Two-Point Calibration Mode Indicator.** **2PT** is displayed when the meter is set for making a two-point calibration.
9. **Low Battery Indicator.** **BATT** is displayed when approximately 10 hours of battery life remain. Replace battery as soon as possible.

## Keypad Functions



Turns the meter ON and OFF. When turned off, the meter retains the calibration in memory.



Selects 0.01 pH resolution, 0.1 pH resolution and mV mode.



Selects Temperature mode. Repeatedly pressing **TEMP** toggles between °C and °F.



Selects the Calibration mode.



Scrolls through calibration buffer values.



(**CAL** and **SELECT BUFFER** keys) Used to manually set temperature compensation.

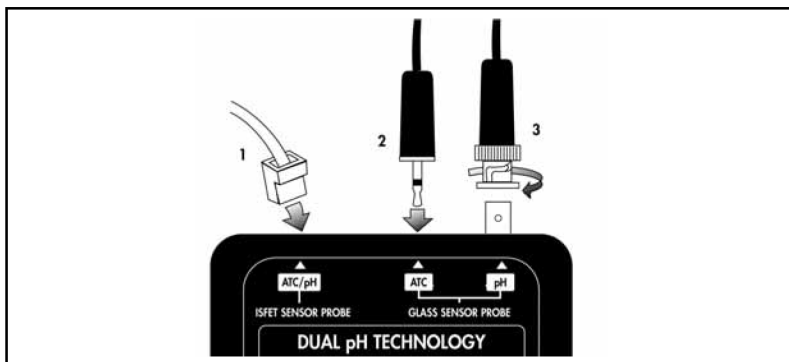


Used to confirm a displayed buffer value and begin calibration. Used to set manual temperature compensation value.



## Connecting Electrodes

The meter is designed to use only one electrode at a time. The meter automatically identifies whether a BNC or ISFET probe is attached when the meter is first turned on. Always turn off the meter when changing electrodes.



**CAUTION:** Do not operate meter with both an ISFET and a BNC probe attached.

### 1. ISFET pH Probe Connector.

The IQ150 Dual Technology pH meter accepts ISFET non-glass pH electrodes. The temperature sensor is built-in to the ISFET probe so a separate temperature probe is not required

### 2. Temperature Probe Connector for use with BNC Electrodes.

The temperature probe uses a 3.5 mm phono jack. When a temperature probe is connected, the meter will Automatically Temperature Compensate (ATC) pH values. Use only 30K $\Omega$  thermistors. Contact IQ Scientific Instruments for temperature probes or pH electrodes with built-in temperature sensors.

### 3. BNC Connector for Electrodes.

The IQ150 Dual Technology pH meter accepts any pH, ORP, or Ion Selective Electrode with BNC connector. Be sure that both the receptacle on the meter and the connector on the probe are clean and dry; wet or dirty connections may cause unstable readings.

## *pH Calibration and Measurement*

### **Range**

The IQ150 can measure from pH 0 to 14. Temperature compensation is automatic from 0 °C to + 100 °C. The meter can perform a one or two point calibration using any buffer listed below.

### **Calibration Buffer Options**

1.68, 4.01, 6.86, 7.00, 9.18, 10.01, and 12.45.



***Caution:** It is recommended that you avoid temperatures above 60 °C (140 °F) when possible. Elevated temperatures shorten the life of pH probes.*

### **Hints For Best Calibration Results**

- Always begin each measuring session with a two-point calibration.
- Calibrate no greater than 3 pH units apart.
- If the ISFET probe is new or has not been in regular use, soaking the probe in pH 7.00 buffer for at least 5 minutes is recommended.
- For best accuracy, when working at non-ambient temperatures, allow the probe to equilibrate to the temperature of the buffer or sample solution before starting calibration or pH measurement.
- Erroneous readings will occur if the meter is incorrectly calibrated; e.g. setting the Buffer Value to pH 7.00 when the probe is in pH 4.00 buffer. If unusual behavior occurs, turn the meter off, turn the meter back on, recheck the buffer values, and recalibrate the meter.
- If calibration times are excessive (over 2 minutes) follow the cleaning and reconditioning instructions in this manual.
- If you are calibrating with tris buffer, please contact IQ Scientific Instruments for the best probe recommendation.

- **Calibration with Two Buffers**



**Remember:** Always use buffers that bracket the sample pH range. (For example, if the sample is about 8.5, use 7.00 and 10.01 buffers). The narrowest calibration range gives the most accurate reading.

1. Remove the protective cap from the probe tip and connect probe to the meter. On new ISFET probes, a small amount of clear or blue gel may be visible. If present, wipe the gel from the probe tip.
2. If using an ISFET probe that has not been in regular use, soak the probe for at least five minutes in pH 7.00 buffer.
3. Place probe in first buffer solution. Stir briefly to dislodge any bubbles from the probe surface.
4. Press **ON/OFF** to turn the meter on. If using an ISFET probe, be sure **PROBE** icon is displayed.
5. If necessary, press **pH/mV** until pH is displayed.
6. Press **CAL**.
7. Meter will default to pH 7.00 buffer. If the display does not match the pH of the buffer, press **SELECT BUFFER** until display matches first buffer solution pH. The **1 PT** icon will be displayed.
8. Press **ENTER**. The pH buffer value will begin flashing to indicate calibration is underway. Wait until the large display stops flashing. **NOTE: When calibration is complete, the meter will display the next buffer value for a two-point calibration.**
9. Rinse probe in deionized water and place in second buffer. Stir briefly to dislodge any bubbles from the sensor surface.
10. If necessary, press **SELECT BUFFER** until display matches second buffer solution pH. The **2 PT** icon will be displayed.
11. Press **ENTER**. The pH value will begin flashing to indicate calibration is underway. Wait until the large display stops flashing.

- When the pH buffer value stops flashing, two-point calibration is complete. **NOTE: When calibration is complete, the pH reading displayed will be the automatically temperature compensated (ATC) pH value of the buffer. For example, pH 7.00 buffer will be corrected to 7.02 if the buffer is at 20 °C, pH 10.01 buffer will be corrected to 10.06 at 20 °C.**
- Rinse probe in deionized water and place in sample. Read sample pH.



**Remember:** You can change resolution by pressing the **pH/mV** key to optimize for accuracy or response time. Use 0.01 pH resolution for maximum accuracy. Use 0.1 pH resolution to optimize for speed; the response time in 0.1 resolution will be approximately twice the speed of 0.01 resolution.

### **Calibration with One Buffer**



**Remember:** One point calibration is recommended only if the sample pH is very close to the calibration buffer pH and an accuracy of  $\pm 0.1$  pH is acceptable. It is highly recommended that each pH measuring session begin with a two-point calibration.

- Follow steps 1 through 8 of the “Calibration with Two Buffers” procedure.
- Press the **pH/mV** key to exit calibration mode after the first calibration point.
- Rinse probe in deionized water and place in sample.
- Change pH resolution by pressing the **pH/mV** key to optimize for accuracy or response time.

### **How to Abort Calibration**

If calibration times are excessive (pH value continues to flash for over 3 minutes) or you wish to stop during calibration for any other reason, press the **pH/mV** key. The meter will enter the pH reading mode. Please refer to the Troubleshooting Tips and the Cleaning and Reconditioning Instructions in this manual if trouble is experienced in calibration.

### *Automatic Temperature Compensation*

Automatic Temperature Compensation (ATC) only occurs when using an ISFET pH probe (built-in temperature sensor) or when a BNC pH electrode is used with the separate temperature plug attached. After calibration is complete and the meter is in the pH mode, the pH values displayed will be temperature compensated. If no temperature plug is attached when using a BNC electrode, automatic temperature compensation is disabled and the meter temperature display will default to 25 °C.

The table below shows the pH values of buffers at various temperatures.

Nominal Value	0 °C	5 °C	10 °C	20 °C	30 °C	40 °C	50 °C
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71
4.01	4.00	4.00	4.00	4.00	4.01	4.03	4.06
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83
7.00	7.12	7.09	7.06	7.01	6.99	6.97	6.97
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.02
10.01	10.32	10.25	10.18	10.06	9.97	9.89	9.83
12.45	13.42	13.21	13.00	12.63	12.29	12.04	11.70

## Manual Temperature Compensation



**Remember:** ISFET probes have a built-in temperature sensor and never require manual temperature compensation.

## Manual Temperature Compensation of BNC Electrodes

### Procedure:

1. Connect the BNC jack to the meter. Be sure no temperature probe is attached to the 3.5 mm phono receptacle.
2. Place probe in buffer.
3. Press **ON/OFF** to turn on the meter.
4. Press **TEMP** to enter temperature mode. Repeatedly pressing the **TEMP** key toggles between °C and °F
5. Press **CAL** to enter manual temperature compensation mode.
6. Press **↑** (**CAL** key) or **↓** (**SELECT BUFFER** key) to manually set temperature. The default temperature value is 25 °C.
7. Press **ENTER** to store temperature value.
8. Press **pH/mV** to exit manual temperature compensation mode.
9. Calibrate the pH meter following the directions in this manual. pH values will compensate to the temperature set during the above procedure.



**Remember:** Manual temperature compensation will not take effect until a new pH calibration is completed.

## *mV Measurement*

### **Procedure:**

1. Connect probe to meter.
2. Press **ON/OFF** to turn on meter.
3. Press **mV** to place meter in mV mode. The **mV** icon will be displayed. The display shows the current mV reading.

### **Automatic Ranging of mV Display**

From -199.9mV to +199.9mV will display 0.1 resolution. From 200mV to 1999mV meter will display 1 mV resolution.

## *Temperature Measurement*

The meter will display temperature in Centigrade with a range of -5 °C to +105 °C. The Fahrenheit display range is 20 °F to 200 °F.

### **Procedure:**

1. Connect ISFET pH probe with built-in temperature sensor, or if using a BNC electrode, connect a temperature probe to the 3.5 mm phono receptacle.
2. Press **ON/OFF** to turn on meter.
3. Press **TEMP** to place meter in temperature mode. The display shows the current temperature reading.
4. Pressing **TEMP** toggles between °C and °F. When displaying temperature in Centigrade, the °C icon will be displayed.



**Remember:** Do not use a separate temperature probe when using an ISFET probe with built-in temperature sensor.

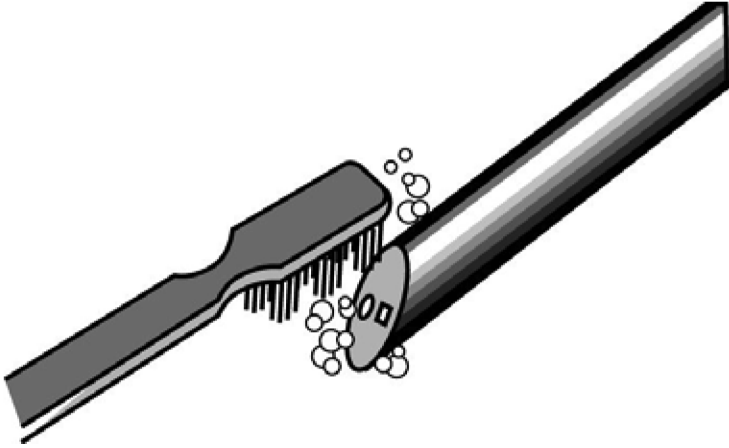


**CAUTION:** Do not expose the ISFET probe to repeated temperature extremes (60 °C or higher). Do not use the probe for applications that require the probe to cycle between hot and room temperature samples.

## *Cleaning and Reconditioning ISFET (non-glass) Probes*

### **Cleaning with Detergent**

Regularly clean the ISFET probe with detergent (a few drops of dish detergent in a cup of warm water). Rinse well with deionized water.



*ISFET probes can be cleaned with a toothbrush and detergent*

### **Reconditioning with Warm Buffer**

ISFET probes are designed to be stored dry and have a virtually unlimited shelf life; however an extended period of dry storage can crystallize the KCl gel at the reference junction. Heat pH 7.00 buffer to between 45 °C and 60 °C (115 °F and 140 °F). Soak the probe for 2 minutes. Place the probe in room temperature pH 7.00 buffer and allow to cool.



**CAUTION:** Do not use the probe as a thermometer to determine if the buffer is above 60 °C. Sudden immersion in excessively hot water may permanently damage the probe.



## Cleaning With Alcohol or Methanol

The ISFET sensor (recessed shiny blue-green spot at the probe tip) can be gently cleaned using alcohol or methanol and a wooden toothpick tipped with a small amount of cotton wool. Be sure that the cotton tip is small enough to actually make contact with the recessed sensor.



**CAUTION:** *Cleaning with alcohol is not recommended if the sample you are testing contains proteins. Use Sodium Hypochlorite (see below).*



**CAUTION:** *Do not use metal objects such as pins or paperclips to clean the sensor. The sensor can be permanently damaged with aggressive abrasion of the sensor surface.*

## Cleaning with Sodium Hypochlorite (Bleach)

If the ISFET probe has been exposed to fat or protein, the response time may begin to slow. Soak the probe for five minutes in a 10:1 dilution of deionized water to household bleach (0.5% solution of sodium hypochlorite). Brush with a soft bristle brush or toothbrush to remove deposits. The sensor is slightly recessed, be sure to make gentle contact with the sensor surface. Rinse well with deionized water.



**CAUTION:** *Do not soak the probe in sodium hypochlorite for more than 5 minutes. Extended immersion will permanently damage the probe.*

## Cleaning with Pepsin (Protein Deposit Removal)

Digest proteins by soaking for 15 minutes to one hour in *Probe Cleaning Solution*, available from IQ Scientific Instruments as item #PCS50. Rinse well with deionized water. Soak the probe for at least two hours in pH 4.00 buffer.

## ***Cleaning and Reconditioning BNC (Glass Sensor) Electrodes***

*Check with the electrode product insert provided with your pH electrode for full details on maintaining glass sensor pH electrodes.*

### **Cleaning with Detergent**

Vigorously stir the BNC probe in a solution of warm water and detergent (a few drops of dish detergent in a cup of warm water) for 5 minutes. Rinse well with deionized water.

### **Reconditioning with Warm Buffer**

Many glass sensor problems are related to the reference junction. If using a BNC pH electrode with a gel filled reference, the reference can be reconditioned by soaking in 60 °C (140 °F) pH 4.00 buffer with added KCl for ten minutes. Place the probe in room temperature electrode soak solution (pH 4.00 buffer with added KCl) and allow it to soak for 30 minutes.

### **Cleaning with Acid**

Soak the BNC probe for 30 minutes in 0.1 molar HCl (about a 100:1 dilution of distilled water to 37% hydrochloric acid). Rinse well, then soak in pH 4.00 buffer for 30 minutes.



**CAUTION:** *When mixing acid, wear protective clothing and eyewear. Always add acid to water-- NOT water to acid.*

### **Cleaning with Methanol or Acetone (Grease and Oil Removal)**

Rinse the BNC probe in methanol or acetone for 5 minutes. Rinse well with deionized water. Soak the probe for at least two hours in pH 4.00 buffer.

## **Cleaning with Pepsin (Protein Deposit Removal)**

Digest proteins by soaking for 15 minutes to one hour in Probe Cleaning Solution, available from IQ Scientific Instruments as item #PCS50. Rinse well with deionized water. Soak the probe for at least two hours in pH 4.00 buffer.

## **Etching with Ammonium Bifluoride (DO NOT ETCH ISFET PROBES)**

This is generally considered the method of last resort. If the BNC electrode response is still sluggish after trying other cleaning methods, immerse electrode tip in 0.1M  $\text{NH}_4\text{HF}_2$  (ammonium bifluoride) for one minute. This is a solution of about 5.7 grams ammonium bifluoride to 1 liter of distilled water. This will etch the surface of the glass and may restore performance. Rinse well with deionized water. Soak the probe overnight in pH 4.00 buffer.



**CAUTION:** *This solution is extremely hazardous. Protective clothing and eyewear must be worn. Dispose of used solution properly.*

## ***Titration***

Should you wish to use the IQ150 pH “Dual Technology” meter in a titration application, please contact IQ Scientific Instruments for instructions.

## ***Battery Replacement***

A 9v alkaline battery powers the IQ150 meter. The expected battery life is 200 hours of operation. The **BATT** icon on the display indicates low battery voltage. Replace the battery whenever low voltage is indicated.

### **To Replace the Battery:**

1. Disconnect all connectors from the meter.
2. Remove the meter from the protective holster and turn the meter upside down.
3. Gently open the battery compartment cover on the back of the meter.
4. Remove the old battery, and install the new battery.
5. Replace the cover.

### **Automatic Shutoff**

If the meter is on battery power and no key is pressed for 12 hours, the meter will turn off automatically. Calibration is retained in memory after shutoff. If the meter is operating on battery power and an error message is displayed for 20 minutes, the meter will turn off automatically. If the meter is operating on AC power, it will not automatically turn off.

### **AC Power Adapter**

The IQ150 pH meter can be used with an optional AC power adapter. Use only IQ Scientific Instruments AC power adapters. The use of other adapters may cause AC power interference that may result in unstable readings.

The meter automatically identifies the presence of the AC adapter and will not use the internal 9-volt battery when the AC adapter is attached.

## Troubleshooting

INDICATION	CAUSE	USER ACTION
No Display.	Auto Power Off has cleared display.	Press <b>ON/OFF</b> key.
	No Power.	Replace 9v battery, or use AC power adapter.
<b>BATT</b> icon displayed.	Battery is low.	Follow the directions for battery replacement.
<b>PROBE</b> icon flashing.	Slight ISFET probe damage.	The ISFET sensor has slight damage. The probe is still useable, however a replacement probe should be kept on hand.
Unstable reading; pH icon does not stop flashing.	Dirty probe.	Follow the probe cleaning procedures described in this manual.
	Dirty probe/meter connectors.	Clean probe contacts on probe cable connector <i>and</i> on meter with methanol and a cotton swab <i>and let dry completely</i> . Reconnect probe to meter.
	Reference junction not flowing.	Follow warm buffer cleaning procedure.
	ISFET probe not properly hydrated.	Soak probe for at least five minutes in neutral buffer (pH 7.00).
	Interference from other devices.	Remove other devices from solution. Unplug water baths, stirrers, etc.
	Interference from direct sunlight.	If working outside, shield the probe from direct sunlight.
	Probe is in a very low ionic strength solution.	Stable reading may not be possible.
	pH or temperature of solution is changing.	Stable reading not possible until pH and temperature is constant.
	Probe near end of useful life.	Replace probe.
	Low battery.	Use AC adapter or replace battery if <b>BATT</b> icon is displayed.

Trouble calibrating. Display does not stop flashing during calibration.	Probe sensor surfaces are dirty or probe needs reconditioning.	Follow cleaning and reconditioning instructions.
	Reference junction not flowing.	Follow warm buffer cleaning procedure.
	Buffers may be contaminated or expired.	Recalibrate with fresh buffers.
	Interference from other devices in solution. Such as improperly grounded stirrers, water baths, or other devices.	Remove any other devices from solution. Unplug water baths, stirrers, or any other electrical devices near the probe.
	Battery is low.	Use AC adapter or replace battery if <b>BATT</b> icon is displayed.
	Interference from direct sunlight.	Shield probe from sunlight.
	If trouble persists, probe may have reached the end of its useful life and may need to be replaced.	Replace probe.
Meter continually displays 14.00 or 0.00 with electrode attached.	Presence of ISFET probe not detected by meter or probe	If using an ISFET probe, be sure that the <b>PROBE</b> icon is displayed. If not displayed, turn off the meter, disconnect, and then reconnect the probe. Be sure to listen for an audible click as the connector snaps into place. Turn on the meter. If <b>PROBE</b> is not displayed, replace ISFET probe.
	Out of calibration.	Carefully follow two point calibration instructions.
	Probe not in solution.	Place probe in liquid. Gently shake probe to be sure no air bubbles are trapped on the sensor surface.
	No probe attached.	Turn off meter. Attach pH probe. Turn on meter.
	Dirty probe.	Follow cleaning instructions.
	Damaged probe.	If problem persists, replace probe.

## Error Codes

DISPLAY	CAUSE	USER ACTION
E01	This error code is displayed after the meter is turned on if any meter malfunction is detected.	Turn the meter off. Disconnect, and then reconnect the probe. Turn meter back on.
		If E01 persists, and the meter is used with the AC power adapter, turn the meter off. Disconnect then reconnect the power adapter. Turn the meter on.
		If E01 persists, turn the meter off. Disconnect the AC power adapter. Turn the meter back on using battery power only.
		If E01 persists, meter requires repair.
E02	This error code is displayed after the meter is turned on if any probe malfunction is detected.	Turn the meter off. Disconnect, and then reconnect the probe. Turn meter back on.
		Clean probe and meter contacts with methanol and a cotton swab <i>and let dry completely.</i>
		If E02 persists, probe requires replacement.
E03	BNC electrode offset error.	E03 is displayed if the mV reading in pH 7.00 buffer is greater than 0.000 mV $\pm 25$ mV.
		An offset error indicates poor pH electrode condition. Follow cleaning instructions.
		IF E03 persists, replace electrode.
		Override E03 by pressing <b>pH/mV</b> key for temporary use of the electrode.

E04	BNC electrode slope error.	E04 is displayed if the electrode slope is less than 85% of the theoretical maximum of 59.16mV per unit of pH.
		A slope error indicates poor pH electrode condition. Follow cleaning instructions.
		IF E04 persists, replace electrode.
		Override E04 by pressing <b>pH/mV</b> key for temporary use of the electrode.
E05	Wrong Buffer.	Place probe in correct buffer. Follow calibration instructions in this manual.
		Dirty sensor may slow response time so that the buffer is incorrectly identified. Clean sensor and recalibrate.
		If you are confident that the buffer is correct, override E05 by pressing the <b>CAL</b> key.
E06	ISFET slope out of range.	Follow the cleaning instructions
	Calibration error.	Carefully follow the two point calibration instructions.
	Damaged probe	If problem persists, replace probe.
E07	ISFET offset out of range.	Stir the probe in solution to remove any air bubble trapped on the sensor surface.
		If problem persists, replace probe.
E09	Damaged ISFET sensor.	Replace probe.
14.00 or 0.00	Damaged sensor or probe connection problem.	See Troubleshooting guide.
Flashing <b>PROBE</b>	Damaged ISFET probe advance warning.	Slightly damaged sensor surface. Probe is still usable. Replacement probe should be kept on hand.



# **WARRANTY**

---

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.





# ***Spectrum***<sup>®</sup> ***Technologies, Inc.***

12360 S. Industrial Dr. East  
Plainfield, IL 60585  
(800) 248-8873 or (815) 436-4440  
FAX: (815) 436-4460  
E-Mail: [info@specmeters.com](mailto:info@specmeters.com)  
[www.specmeters.com](http://www.specmeters.com)