

Model IQ140
Handheld pH/mV/Temperature Meter



Instruction Manual



IQ Scientific Instruments
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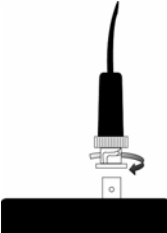






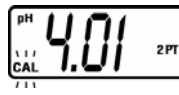
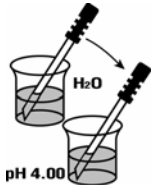


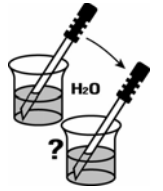
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MODEL IQ140 pH Meter

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 ON/OFF to turn on meter.</p>	<p>If necessary, press pH until pH icon is seen on the display.</p>
<p>5.</p> 	<p>6.</p> 	<p>7.</p> 	<p>8.</p> 
<p>Press CAL.</p>	<p>If necessary, press SELECT BUFFER until display matches first buffer value.</p>	<p>Press ENTER and wait until the large number display stops flashing.</p>	<p>When complete, meter will display the next stored buffer value. 2PT 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 SELECT BUFFER until display matches second buffer value.</p>	<p>Press ENTER 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 IQ140 pH/mV/Temperature meter accepts conventional glass sensor electrodes with BNC connectors.

The meter has a standard BNC connector for attachment of glass sensor pH electrodes and a 3.5 mm phono jack for attaching a 30K Ω thermistor. Contact IQ Scientific Instruments for convenient "3-in-1" pH electrodes that include the pH sensor and a built-in temperature sensor.

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Techniques and Tips for Best Performance

DO

DO: 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: During calibration 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: 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: Let a probe dry out. Always keep the probe immersed in electrode storage solution.

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

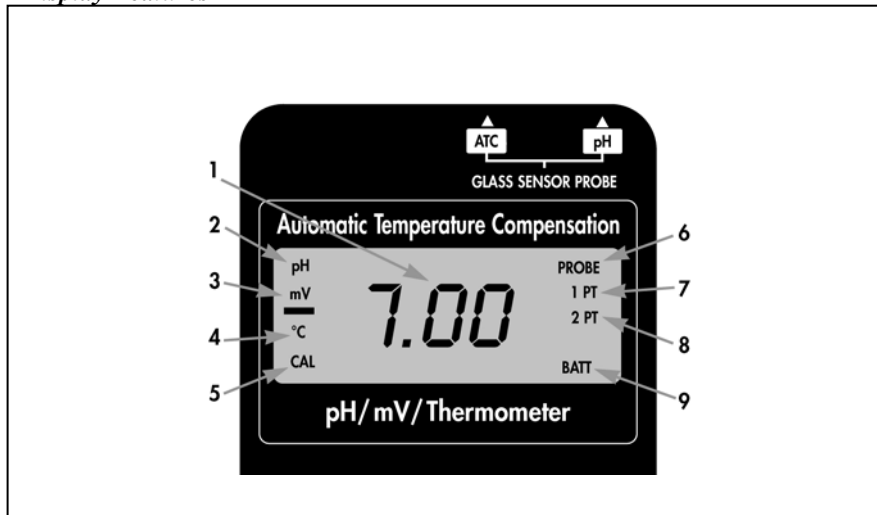
DO NOT: Use the probe in an environment that will damage the pH sensor, such as hydrofluoric acid or abrasive samples.

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

DO NOT: Use the probe for extended periods at temperatures over 60 °C. Extended use at elevated temperature will reduce the life of the probe. Call IQ Scientific Instruments for glass sensor probes for elevated temperature use.

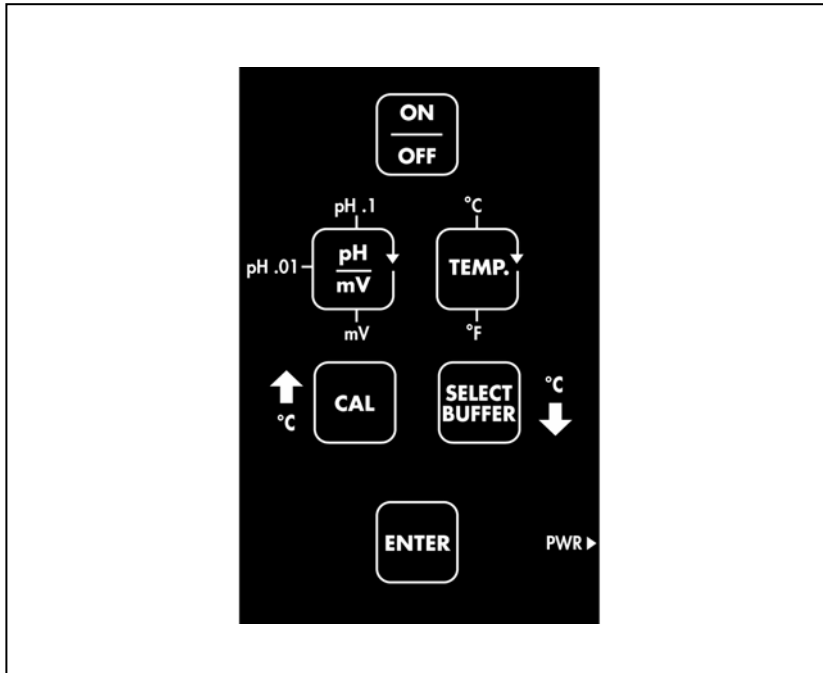
DO NOT: Put any other active measurement devices in buffers or samples while measuring pH. Even if another device is not actually turned on, AC power interference can still occur, especially if the pH meter AC battery adapter is in use.

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 calibration mode.
6. **Probe Indicator.** The **PROBE** symbol will flash in certain error conditions.
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.

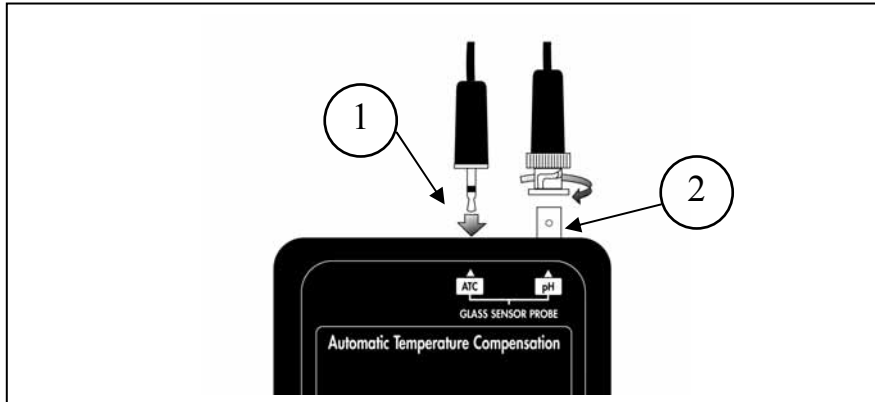


(**CAL** and **SELECT BUFFER** keys) Used to manually set temperature compensation.



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

Connecting the Electrode



1. **Temperature Probe Connector.**

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

2. **BNC Connector for Electrodes.**

The IQ140 pH meter accepts any pH or ORP 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 IQ140 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. Call IQ Scientific for special high temperature probes*

Hints For Best Calibration Results

- Always begin each measuring session with a two-point calibration.
- Calibrate no greater than 3 pH units apart.
- 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. Place probe in first buffer solution. Stir briefly to dislodge any bubbles from the probe surface.
2. Press **ON/OFF** to turn the meter on.
3. If necessary, press **pH/mV** until pH is displayed.
4. Press **CAL**.
5. 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.
6. 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.**
7. Rinse probe in deionized water and place in second buffer. Stir briefly to dislodge any bubbles from the sensor surface.
8. If necessary, press **SELECT BUFFER** until display matches second buffer solution pH. The **2 PT** icon will be displayed.
9. Press **ENTER**. The pH value will begin flashing to indicate calibration is underway. Wait until the large display stops flashing.

10. 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.**
11. 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 ± 0.1 pH is acceptable. It is highly recommended that each pH measuring session begin with a two-point calibration.

1. Follow steps 1 through 6 of the “Calibration with Two Buffers” procedure.
2. Press the **pH/mV** key to exit calibration mode after the first calibration point.
3. Rinse probe in deionized water and place in sample.
4. 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 a 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 pH 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 25 °C	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

Manual Temperature Compensation of pH Electrodes

Procedure:

1. Connect the BNC jack to the meter. Be sure no temperature probe is attached to the 3.5mm 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 a temperature probe to the 3.5mm 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.

Cleaning and Reconditioning pH 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 pH electrode 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 pH electrode with a gel filled reference, the reference can be reconditioned by soaking in 40 °C (104 °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 pH electrode 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 Pepsin (Protein Deposit Removal)

Digest proteins with a 1% solution of pepsin in 0.1M HCl. Make a 100:1 dilution of distilled water to 37% hydrochloric acid (typical lab grade HCl) and dissolve 1 gram of pepsin. Soak for one hour. Rinse well with deionized water. Soak the probe for at least two hours in pH 4.00 buffer.

Etching with Ammonium Bifluoride

This is generally considered the method of last resort. If the pH electrode response is still sluggish after trying other cleaning methods, immerse electrode tip in 0.1M NH_4HF_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 IQ140 pH meter in a titration application, please contact IQ Scientific Instruments for instructions.

Battery Replacement

A 9v alkaline battery powers the IQ140 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 IQ140 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 ON/OFF key.
	No Power.	Replace 9v battery, or use AC power adapter.
BATT icon displayed.	Battery is low.	Follow the directions for battery replacement.
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.
	Interference from other devices.	Remove other devices from solution. Unplug water baths, stirrers, etc.
	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 BATT 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 BATT 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.	Probe not in solution.	Place probe in liquid. Gently shake probe to be sure no air bubbles are trapped on the sensor surface.
	Out of calibration.	Carefully follow two point calibration instructions.
	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	pH electrode offset error.	E03 is displayed if the mV reading in pH 7.00 buffer is greater than 0.000 mV ± 25 mV.
		An offset error indicates poor pH electrode condition. Follow cleaning instructions.
		IF E03 persists, replace electrode.
		Override E03 by pressing pH/mV key for temporary use of the electrode.

E04	pH 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 pH/mV 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 CAL key.
14.00 or 0.00	Damaged sensor or probe connection problem.	See Troubleshooting guide.

Notes

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