



HI981914

Professional Waterproof Portable pH/ORP/ISE Meter



INSTRUCTION MANUAL

Dear
Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using this instrument.

This manual will provide you with the necessary information for correct use of this instrument, as well as a precise idea of its versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

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TABLE OF CONTENTS

1. PRELIMINARY EXAMINATION 5

2. METER SPECIFICATIONS 6

3. HI72911B - PROBE SPECIFICATIONS..... 7

4. GENERAL DESCRIPTION 8

5. FUNCTIONAL DESCRIPTION..... 9

6. MAINTENANCE 11

7. GENERAL OPERATIONS..... 13

 7.1. BATTERY REPLACEMENT 13

 7.2. CONNECTING THE PROBE..... 14

 7.3. TURNING THE METER ON..... 14

 7.4. BACKLIGHT FEATURE 14

8. METER SETUP 15

 8.1. GENERAL PARAMETER SCREENS 16

 8.2. PROBE SPECIFIC PARAMETERS 20

9. CALIBRATION 23

 9.1. pH CALIBRATION..... 23

 9.2. pH BUFFER TEMPERATURE DEPENDENCE..... 30

 9.3. RELATIVE mV CALIBRATION 31

 9.4. ISE CALIBRATION 31

10. TEMPERATURE CORRELATION FOR pH SENSITIVE GLASS..... 35

11. mV & TEMPERATURE CALIBRATION (for technical personnel only) 36

12. MEASUREMENT..... 38

 12.1. pH MEASUREMENT 38

 12.2. ORP MEASUREMENT 39

 12.3. RELATIVE mV MEASUREMENT 39

 12.4. ISE MEASUREMENT 40

 12.5. TEMPERATURE MEASUREMENT 40

13. GOOD LABORATORY PRACTICE (GLP)..... 41

14. LOGGING..... 42

 14.1. LOGGING THE CURRENT DATA 42

 14.2. VIEW LOGGED DATA 42

 14.3. AUTOEND..... 42

15. PC CONNECTION 43
 15.1. HI92000 – HANNA PC SOFTWARE..... 43
 15.2. REMOTE CONNECTION VIA USB CABLE..... 43
16. TROUBLESHOOTING GUIDE 48
17. ACCESSORIES..... 49
CERTIFICATION 53
RECOMMENDATIONS FOR USERS..... 53
WARRANTY 54

1. PRELIMINARY EXAMINATION

Remove the instrument and accessories from the packaging and examine it carefully. For further assistance, please contact your local Hanna Instruments Office or email us at tech@hannainst.com.

HI981914 is delivered in a rugged carrying case and is supplied with:

- HI72911B pH electrode with built-in temperature sensor
- HI7662 Temperature probe
- pH 4.01 & 7.01 buffer solutions (230 mL each)
- HI7006014 General purpose cleaning solution (3 pcs.)
- 100 mL plastic beaker (2 pcs.)
- 1.5V AA batteries (4 pcs.)
- HI920015 Micro USB cable
- Instrument quality certificate
- Instruction manual

Note: Save all packing material until you are sure that the instrument works correctly. Any damaged or defective item must be returned in its original packing material with the supplied accessories.

2. METER SPECIFICATIONS

pH	Range	-2.0 to 20.0 pH / -2.00 to 20.00 pH / -2.000 to 20.000 pH
	Resolution	0.1 pH / 0.01 pH / 0.001 pH
	Accuracy	± 0.1 pH / ± 0.01 pH / ± 0.002 pH
mV	Range	± 2000 mV
	Resolution	0.1 mV
	Accuracy	± 0.2 mV
ISE	Range	From 1.00 E^{-7} to 9.99 E^{10} concentration
	Resolution	3 digits 0.01, 0.1, 1, 10 concentration
	Accuracy	$\pm 0.5\%$ of reading (monovalent ions) $\pm 1\%$ of reading (divalent ions)
Temperature	-20.0 to 120.0 °C (-4.0 to 248.0 °F)	
Rel mV Offset Range	± 2000 mV	
pH Calibration	Up to five point calibration using seven standards (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and five custom buffers	
Slope Calibration	From 80 to 110%	
ISE Calibration	Up to five point calibration points using six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)	
Temperature Compensation	Manual or Automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)	
pH Electrode	HI72911B pH & temperature	
Logging Memory	300 records, log-on-demand (100 records per range)	
Input Impedance	$10^{12} \Omega$	
Battery Type/Life	1.5V AA batteries / approximately 200 hours of continuous use without backlight (50 hours with backlight)	
Auto Power Off	5, 10, 30, 60 minutes or disabled	
PC Interface	Opto-isolated USB	
Dimensions	185 x 93 x 35.2 mm (7.3 x 3.6 x 1.4")	
Weight	400 g (14.2 oz)	
Environment	0 to 50 °C (32 to 122 °F) max. RH 100% IP67	

3. HI72911B - PROBE SPECIFICATIONS

pH Range	0 to 13 pH
Reference	Double, Ag/AgCl
Junction	PTFE
Electrolyte	Polymer
Maximum Pressure	3.0 bar
Operating Temperature	0 to 80 °C (32 to 176 °F)
Body Material	Titanium
Glass Type	GP (General Purpose)
Tip / Shape	Flat
Body Length / Overall Length	110 mm / 150.5 mm
Temperature Sensor	Yes
Outer Diameter	14 mm
Cable	Coaxial, 1 m (3.3') long
Connector Type	BNC + phono

4. GENERAL DESCRIPTION

HI981914 is a heavy-duty, portable pH/ORP/ISE meter with the features of a benchtop meter, part of Hanna Instruments pool-line family.

The pH probe can be exchanged out for an ORP probe to obtain mV readings in the ± 2000 mV range. HI981914 adds direct ion concentration readings for ISEs with a choice of units for calibration and display.

Main features

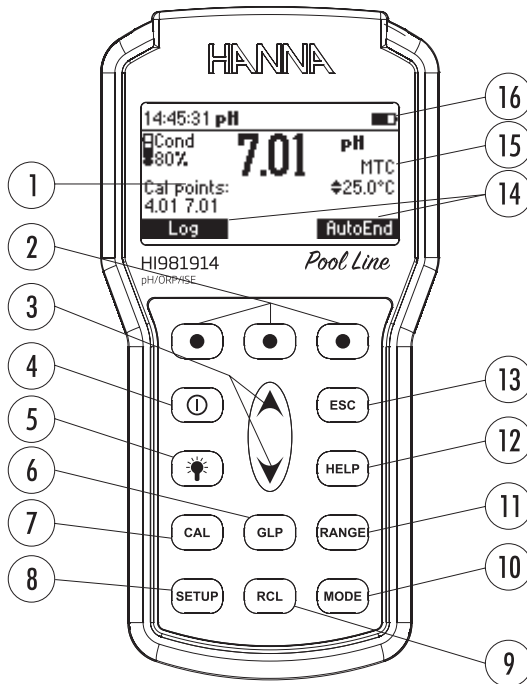
- Seven standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) for calibration
- pH calibration up to five calibration points
- Custom calibration with up to five custom buffers
- Messages on the graphic LCD for an easy and accurate calibration
- CAL Check[®] diagnostic features to alert the user when the electrode needs cleaning
- Optional, user enabled, "Outside Calibration Range" warning
- Monitoring of electrode condition
- User selectable "Calibration Time Out"
- Temperature range from -20 to 120 °C (-4 to 248 °F) using the integrated temperature sensor

Other features

- Relative mV measurements
- Log on demand up to 300 samples (100 samples per range)
- Auto Hold feature, to freeze first stable reading on the LCD
- GLP feature, to view last calibration data for pH, Rel mV, or ISE
- PC interface

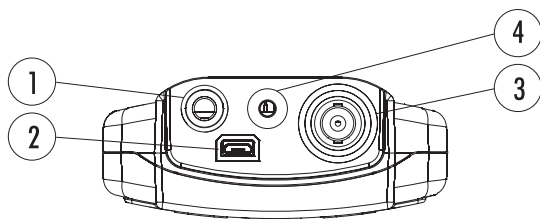
5. FUNCTIONAL DESCRIPTION

Front View



1. Liquid Crystal Display (LCD)
2. Functional keys, press to perform the function displayed above them on the screen
3. ▲/▼ keys, press to scroll the displayed options and messages
4. **Power** (⏻) **ON/OFF** key, press to turn the instrument on and off
5. **LIGHT** (💡) key, press to turn the backlight on and off
6. **GLP** key, press to display stored calibration data
7. **CAL** key, press to enter or exit calibration mode
8. **SETUP** key, press to enter or exit setup mode
9. **RCL** key, press to enter or exit view logged data
10. **MODE** key press to change pH resolution or to toggle between mV and Rel mV mode
11. **RANGE** key, press to switch between pH, mV and ISE range
12. **HELP** key, press to display the context sensitive help menu
13. **ESC** key, press to return to the previous screen
14. Soft key functions defined on display
15. Temperature compensation status
16. Battery level indicator

Top View



1. Input for temperature probe
2. USB connector
3. BNC electrode connector
4. Input for reference electrode

6. MAINTENANCE

Electrode Care & Maintenance

Proper care and maintenance of the pH probe is essential for accurate readings. Cleaning, calibrating, and appropriate storage will extend the life of the probe.

Remove the electrode protective cap. Do not be alarmed if any salt deposits are present, this is normal. Rinse the probe with water.

Shake the electrode down as you would do with a clinical thermometer to eliminate any air bubbles inside the glass bulb (pH electrode only).

If the bulb and/or junction are dry, soak the electrode in [HI703004](#) or [HI80300](#) Storage solution for a minimum of 30 minutes. Rinse with water.

Calibrate before using.

When the electrode is not in use, add a few drops of [HI703004](#) Storage solution to the protective cap and replace the cap. To ensure a quick response, the glass bulb (pH electrode) and the junction should be kept moist and not allowed to dry out.

Note: *Never store the electrode in distilled or deionized water.*

Refillable electrodes

If the electrolyte is more than 2 1/2 cm (1") below the fill hole, add [HI7082](#) or [HI8082](#) 3.5M KCl Electrolyte Solution (double junction) or [HI7071](#) or [HI8071](#) 3.5M KCl+AgCl Electrolyte Solution (single junction electrodes).

For faster response, unscrew the fill hole screw during measurements.

AmpHel[®] electrodes

If the electrode does not respond to pH changes, the battery is depleted and the electrode should be replaced.

General Maintenance

After prolonged storage or cleaning, calibration is required.

After use, rinse the probe with tap water and dry it. The pH electrode bulb must be kept moist.

Inspect the electrode and connection cable for scratches or cracks. The cable insulation and electrode bulb must be intact.

Rinse the sensor in flowing water then clean by soaking it for 1 minute in [HI70670](#) Cleaning solution for mineral deposits or [HI70671](#) Cleaning & disinfection solution for algae, fungi and bacteria.

After cleaning, soak the sensor in [HI703004](#) Storage solution for 30 minutes before calibrating.

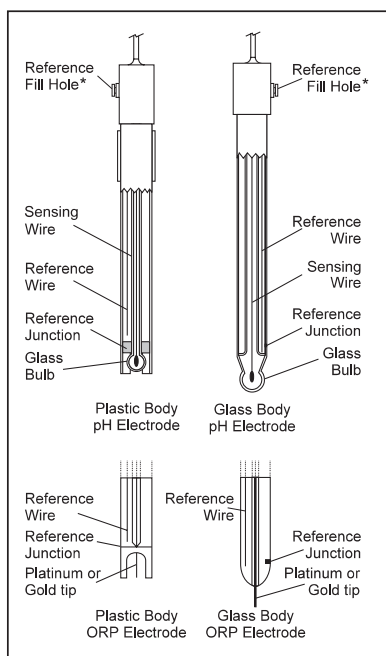
pH refillable probes

Refill the reference chamber with fresh electrolyte ([HI7071](#) or [HI8071](#) for single junction or [HI7082](#) or [HI8082](#) for double junction electrodes). Allow the electrode to stand upright for 1 hour.

pH Cleaning Procedure

- General cleaning: soak in HI70614 or HI8061 General cleaning solution for approximately ½ hour.
- Protein cleaning: soak in HI7073 or HI8073 Protein cleaning solution for 15 minutes.
- Inorganic cleaning: soak in HI7074 Inorganic cleaning solution for 15 minutes.
- Oil or grease cleaning: rinse with HI70774 or HI8077 Oil and Fat Cleaning Solution.

Important: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water, refill the reference chamber with fresh electrolyte (not necessary for gel-filled electrodes) and soak the electrode in HI703004 or HI80300 Storage Solution for at least 1 hour before taking measurements.



*Not present in gel electrodes.

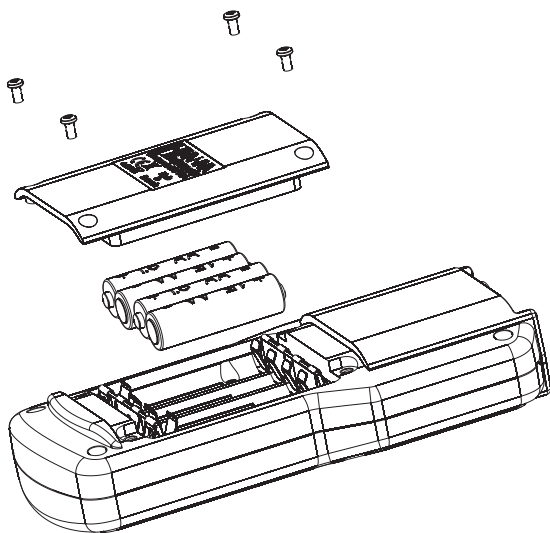
7. GENERAL OPERATIONS

7.1. BATTERY REPLACEMENT

To replace the batteries, follow the next steps:

- Turn OFF the instrument.
- Open the battery compartment by removing the four screws from the back of the instrument.
- Remove the old batteries.
- Insert four new 1.5V AA batteries in the battery compartment while paying attention to the correct polarity.
- Close the battery compartment using the four screws.

If the battery capacity is less than 20% the serial communication and the backlight feature are not available.



Note: The instrument is provided with the BEPS (Battery Error Prevention System) feature, which automatically turns the instrument off when the batteries level is too low to ensure reliable readings.

7.2. CONNECTING THE PROBE

To prepare the instrument for field measurements close the serial communication socket and all unused connector sockets with proper stopper (to ensure waterproof protection). Use the holed temperature rubber cork for the temperature socket when temperature probe is connected.

Connect the pH electrode and the temperature probe to the BNC and temperature sockets on the top of the instrument. Push the pH electrode sleeve to cover the connector accommodation.

The temperature probe is used in conjunction with the pH electrode to utilize the instrument's ATC capability, but it can also be used independently to take temperature measurements. If the probe is disconnected, temperature can be set manually with the ▲/▼ keys.

7.3. TURNING THE METER ON

Turn the instrument ON by pressing **ON/OFF** key.

At start-up the display will show the Hanna Instruments logo for a few seconds followed by the percentage indication of the remaining battery life, then enters the measurement mode.

7.4. BACKLIGHT FEATURE

The instrument is provided with a Backlight feature. Press **LIGHT** to switch the backlight on/off.

***Note:** The backlight automatically shuts off after a set period (see **METER SETUP** section for details).*

8. METER SETUP

The general SETUP menu items with options and default values are detailed here:

	Description	Option	Default
Backlight	Backlight level	0 to 7	4
Contrast	Contrast level	0 to 20	10
Auto light off	Time until backlight is ON	1, 5, 10, 30 min.	1
Auto power off	Time after the instrument is powered OFF	Disabled 5, 10, 30, 60 min.	30
Date/Time		day, month, year 00:00 to 23:59	current date/time
Time Format		AM/PM or 24 hours	24 hours
Date Format		DD/MM/YYYY MM/DD/YYYY YYYY/MM/DD YYYY-MM-DD Mon DD, YYYY DD-Mon-YYYY YYYY-Mon-DD	YYYY/MM/DD
Language	Message display language	Up to four languages	English
Temperature unit		°C or °F	°C
Beep ON	Beeper Status	Enabled or Disabled	Disabled
Instrument ID	Instrument Identification	0000 to 9999	0000
Baud Rate	Serial Communication	600, 1200, 2400, 4800, 9600	9600
Meter information	Displays general information	—	—

The probe specific SETUP menu items are detailed here:

Item	Description	Option	Default
Calibration Timeout (pH & ISE)	Number of days after Calibration warning is displayed	Disable, 1 to 7 days	Disable
First point mode (pH)	Management of 1 point calibration	Replace or offset	Replace
Custom buffer (pH)	Custom buffer setting	Max. 5 buffers	No
View calibration points (pH)	Display calibration points	Enable or disabled	Enable
Out of Cal. Range Warning	—	Enable or disabled	Enable
ISE probe	Type of ISE probe	Custom or Standard (17)	Fluoride
ISE unit	—	User, ppt, g/L, ppm, mg/L, ppb, μ g/L, mg/mL, M, mol/L, mmol/L, % W/V	ppm

8.1. GENERAL PARAMETER SCREENS

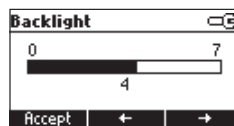
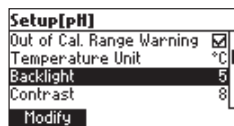
Backlight

Option: 0 to 7

This function allows the adjustment of the LCD backlight intensity.

With item selected press **Modify** functional key and use the arrow keys to change the backlight intensity.

Press **Accept** to save or press **ESC** key return to the Meter Setup menu.



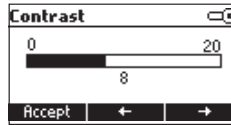
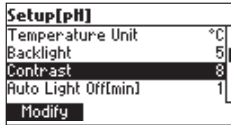
Contrast

Option: 0 to 20

This function allows the adjustment of the LCD contrast.

With item selected, press **Modify** functional key. Press the arrow keys to increase or decrease the contrast.

Press **Accept** to save or press **ESC** key to return to the Meter Setup menu.

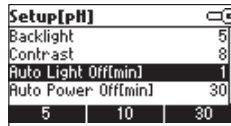


Auto Light Off

Option: 1, 5, 10 or 30 minutes

This function allows modifying the light auto-off time.

With item selected, press the functional key to select desired option.



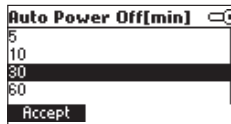
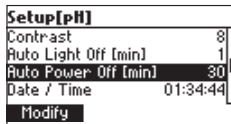
Auto Power Off

Option: 1, 5, 10, 30 minutes or disabled

This function allows modifying the automatic power off time.

With item selected, press **Modify** functional key. Press the **▲/▼** keys to select desired option.

Press **Accept** to save or **ESC** key to return to the Meter Setup menu.

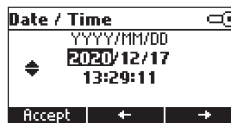
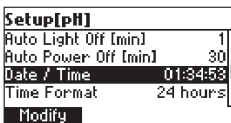


Date / Time

Option: YYYY/MM/DD, Hours/Minutes/Seconds

With item selected, press **Modify** functional key. Press the **▲/▼** keys to select desired option.

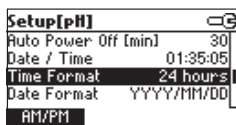
Press the functional arrow keys to select year, month, day, hour, minute, and seconds.



Time Format

Option: AM/PM or 24 hours

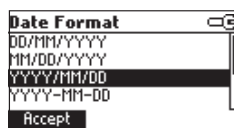
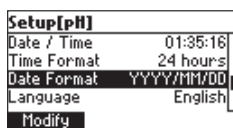
With item selected, press the functional key to select desired option.



Date Format

Option: DD/MM/YYYY; MM/DD/YYYY; YYYY/MM/DD; YYYY-MM-DD; Mon, DD, YYYY; DO-Mon-YYYY; YYYY-Mon-DD

With item selected, press **Modify** functional key. Press the ▲/▼ keys to select desired option. Press **Accept** to save or **ESC** key to return to the Meter Setup menu.



Language

Option: English, Italiano, Español, Portuges

With item selected, press the functional key to select desired option.

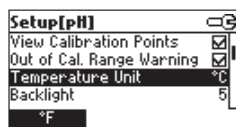
If one of the options can not be selected, the instrument works in “safe mode” whereby all messages are displayed in English and Help is not available.



Temperature Unit

Option: °C or °F

With item selected, press the functional key to select desired option.

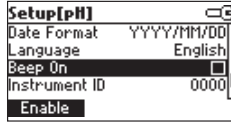


Beep On

Option: Enable or Disable

With item selected, press the functional key to select desired option.

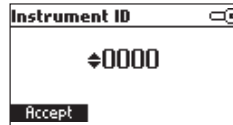
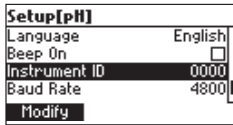
When enabled, a short beep is heard every time a key is pressed or the calibration can be confirmed. A long beep alert sounds when the pressed key is not active or wrong condition is detected during calibration.



Instrument ID

Option: 0000 to 9999

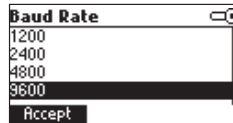
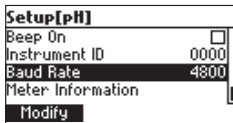
With item selected, press **Modify** functional key. Press the ▲/▼ keys to modify the value. Press **Accept** to save or **ESC** key to return to the Meter Setup menu.



Baud Rate

Option: 600, 1200, 2400, 4800 or 9600

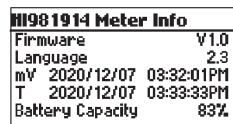
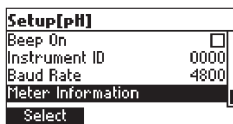
With item selected, press **Modify** functional key. Press the ▲/▼ keys to select desired option. Press **Accept** to save or **ESC** key to return to the Meter Setup menu.



Meter Information

With item selected, press **Select** functional key. The instrument displays: firmware version, language version, mV and temperature factory calibration time and date, battery capacity.

Press **ESC** key to return to the Meter Setup menu.



8.2. PROBE SPECIFIC PARAMETERS

Calibration Timeout

Option: Disabled, 1 to 7 days

With item selected, press **Modify** functional key. Press the ▲/▼ keys to set desired option. Press **Accept** to save or **ESC** key to return to the Meter Setup menu.



Note: If enabled, "CAL DUE" warning will be displayed after the selected time has elapsed.

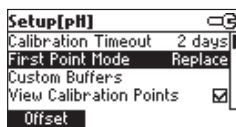
First Point Mode

Option: Replace or Offset

With item selected, press the functional key to select desired option.

With "Replace", the slopes between current buffer and nearest lower and higher buffers will be reevaluated.

With "Offset", an electrode offset correction is performed keeping unchanged the existing slopes.



Custom Buffers

Option: None, 1 to 5

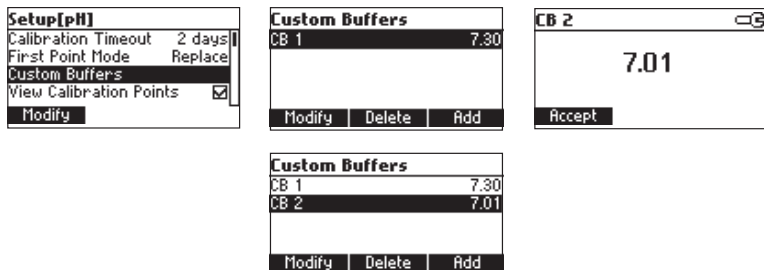
With item selected, press **Modify** functional key.

Press **Add** to add a custom buffer to the list (maximum 5).

With a buffer highlighted, press **Modify** to edit custom buffer value. Press the ▲/▼ keys to change the value. Press **Accept** to save or **ESC** key to return to the custom buffer list screen.

Press **Delete** to delete the selected custom buffer from the list.

Press **ESC** key to return to the Meter Setup menu.

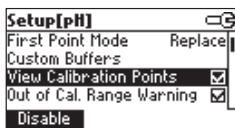


View Calibration Points

Option: Enable or Disable

With item selected, press the functional key to select desired option.

If enabled, the buffers used in the last calibration are displayed on the pH measurement screen.

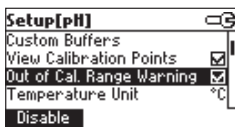


Out of Calibration Range Warning

Option: Enable or Disable

With item selected, press the functional key to select desired option.

If enabled, when the pH reading is outside the calibration range, the “Out Cal. Range” message is displayed.

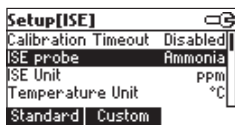


ISE Probe

Option: 17 standard ISE probes or custom

Press **Standard** functional key to select desired probe from the standard probes list.

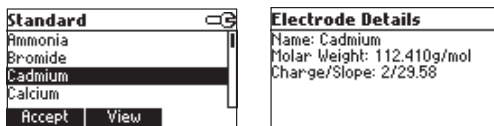
Press **Custom** functional key to set the parameters for a custom probe.



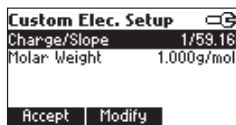
If **Standard** is pressed, press the ▲/▼ keys to select desired probe.

Press **Accept** to save or **ESC** key to return to the previous screen.

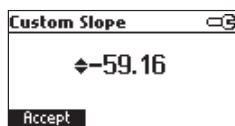
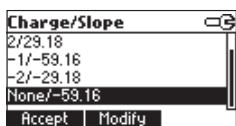
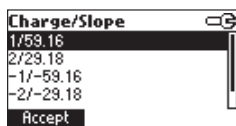
Press **View** to see probe parameters then **ESC** to return to the probes list screen.



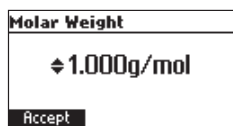
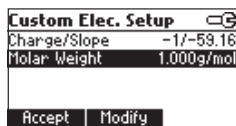
If **Custom** is pressed, press the \blacktriangle / \blacktriangledown keys to select the parameter to be modified. Press **Accept** to save or **ESC** key to return to the previous screen.



- When "Charge/Slope" is chosen, press the \blacktriangle / \blacktriangledown keys to select the desired pair of values. Press **Accept** to confirm or press **ESC** key to return to the previous screen.
If "None/-59.16" is selected, press **Modify** to enter a custom slope value. Press the \blacktriangle / \blacktriangledown keys to change the slope. Press **Accept** to confirm or press **ESC** key to return to the previous screen.



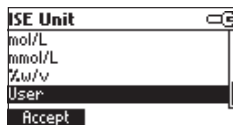
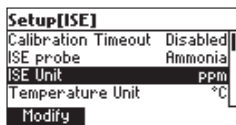
- When "Molar Weight" is chosen, press **Modify** to change the value. Press the \blacktriangle / \blacktriangledown keys. Press **Accept** to confirm or press **ESC** key to return to the previous screen.



ISE Unit

Option: ppt, g/L, ppm, mg/L, ppb, μ g/L, mg/mL, M, mol/L, mmol/L, % W/V or User

With item selected, press **Modify** functional key. Press the \blacktriangle / \blacktriangledown keys to select desired option. Press **Accept** to save or **ESC** key to return to the Meter Setup menu.



Note: If the unit is changed or "User" is selected, a warning message is displayed to alert that the ISE range must be recalibrated.

If a new probe was selected or custom probe parameters are changed, the ISE range must be calibrated.

9. CALIBRATION

9.1. pH CALIBRATION

It is recommended to calibrate the instrument frequently, especially if high accuracy is required.

The pH range should be recalibrated:

- whenever the pH electrode is replaced
- at least once a week
- after testing aggressive chemicals
- when “CAL DUE” is blinking (if enabled), indicating that the calibration has expired
- when “Outside Cal Range” message blinks during pH measurement (if enabled), indicating that the reading is outside an optimal measurement range enclosed by a minimum of two calibration points.

Procedure

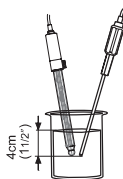
The HI981914 offers a choice of 7 standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to 5 custom buffers for calibration. The set custom buffers are the buffer values at 25 °C.

When a custom buffer is selected during calibration, **Custom** functional key is displayed.

Press **Custom** to enter custom buffer edit mode. Press \blacktriangle / \blacktriangledown keys to modify the value in a ± 1.00 pH window, according to the temperature reading and then press **Accept**. Press **ESC** to exit without changing. For accurate pH measurements a five point calibration is recommended, a minimum of a two-point calibration is suggested.

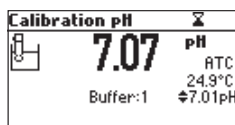
The instrument will automatically skip the buffers used during calibration and the buffers which are in a ± 0.2 pH window around one of the calibrated buffers.

- For accurate calibration and to minimize cross-contamination, use two beakers for each buffer solution: one for rinsing the electrode and one for calibration.
- If using a temperature probe separately, ensure that it is positioned close to the pH electrode.

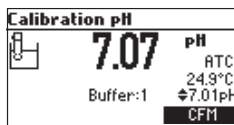


Five-Point Calibration

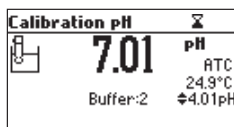
1. Immerse the pH electrode approximately 4 cm (1 1/2”) into the first buffer solution and stir gently.
2. Press **CAL**. The instrument displays the measured pH, the first expected buffer and the temperature reading.



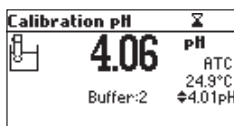
If necessary, press the ▲/▼ keys to select a different buffer value.
 The “Σ” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected buffer, **CFM** functional key is displayed.



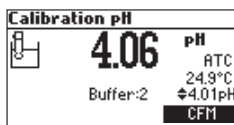
- Press **CFM** to confirm first point. The instrument displays the calibrated value and the second expected buffer.



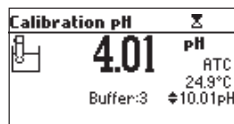
- After first calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½”) into the second buffer solution and stir gently.



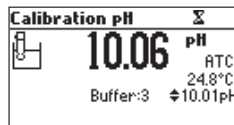
If necessary, press the ▲/▼ keys to select a different buffer value.
 The “Σ” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected buffer, the **CFM** functional key is displayed.



- Press **CFM** to confirm the calibration point. The instrument displays the calibrated value and the third expected buffer.

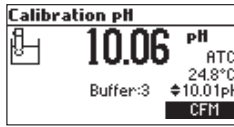


- After the second calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½”) into the third buffer solution and stir gently.

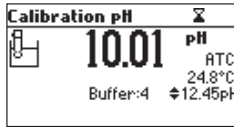


If necessary, press the ▲/▼ keys to select a different buffer value.

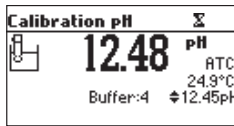
The “Σ” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected buffer, the **CFM** functional key is displayed.



- Press **CFM** to confirm the calibration point. The instrument displays the calibrated value and the fourth expected buffer.

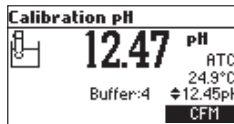


- After the third calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½”) into the fourth buffer solution and stir gently.

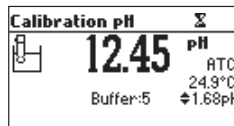


If necessary, press the ▲/▼ keys to select a different buffer value.

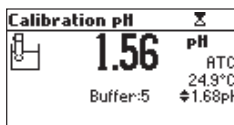
The “Σ” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected buffer, the **CFM** functional key is displayed.



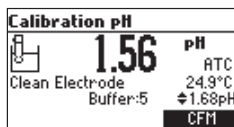
- Press **CFM** to confirm the calibration point. The instrument displays the calibrated value and the fifth expected buffer.



- After the fourth calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½”) into the fifth buffer solution and stir gently.



If necessary, press the ▲/▼ keys to select a different buffer value. The “∞” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected buffer, the CFM functional key is displayed.



1. Press CFM to confirm. The instrument stores the calibration values and returns to measurement mode.

Four-, Three- or Two-Point Calibration

1. Follow the steps described in five-point calibration procedure.
2. Press CAL or ESC after the appropriate accepted calibration point. The instrument returns to measurement mode and memorizes the calibration data.

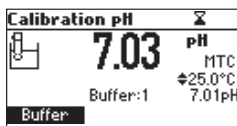
One-Point Calibration

Two selectable options are available for one point calibration: “Replace” and “Offset” (see METER SETUP section for details).

1. Follow the steps described in Five-Point Calibration procedure
2. Press CAL or ESC after first calibration point is confirmed. The instrument saves the calibration point and returns to measurement mode.

Notes: Press MTC or MODE key to toggle between pH buffer selection and the temperature reading during calibration in MTC mode (temperature probe not connected).

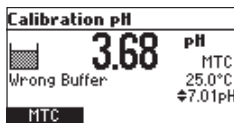
The arrow symbols are displayed next to the temperature value. Press the ▲/▼ keys to change the temperature.



Calibration Error & Warning Messages

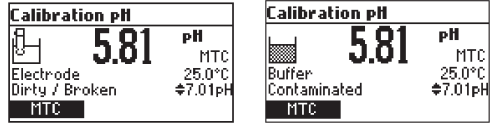
Wrong Buffer

The calibration cannot be confirmed. The pH reading is not within the range of the selected buffer. Select another buffer using the ▲/▼ keys or change the buffer.



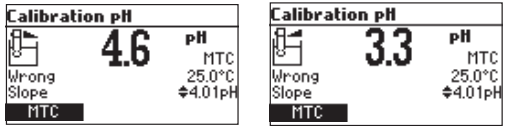
Electrode Dirty/Broken alternatively with **Buffer Contaminated**

The calibration cannot be confirmed. The offset of the electrode is not within the accepted range. Check the electrode and follow cleaning procedure (MAINTENANCE section). Check buffer quality. If necessary, change the buffer.



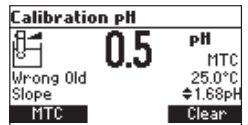
Wrong Slope

The calibration cannot be confirmed. The current slope is under 80% or over 110% of the default slope. Recalibrate the instrument using fresh buffers.



Wrong Old Slope

An inconsistency between new and previous (old) calibrations is detected. Clear old calibration parameters and proceed with the calibration from the current point. The instrument stores the values confirmed during current calibration.

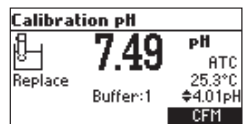


Note: For one-point calibration the electrode condition is not displayed in the measurement screen.

Each time a buffer is confirmed, the new calibration parameters replace the old calibration parameters of the corresponding buffer.

If the current confirmed buffer has no correspondence in the existing, stored calibration and this is not full, the current buffer is added to the existing calibration.

If the stored calibration is full (five calibration points), after confirming the calibration point, the instrument will ask which buffer to replace by the current buffer. Press the ▲/▼ keys to select another buffer to be replaced then press CFM to confirm.

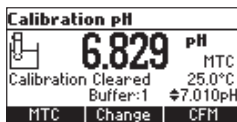


Press **CAL** or **ESC** to exit without saving.

Note: The replaced buffer is not removed from calibration list and it can be selected for the next calibration points.

Clean Electrode Warning

Each time pH calibration is performed, the instrument compares the new calibration with the previously stored one. When a significant difference is seen, the “Clean Electrode” warning message is displayed.

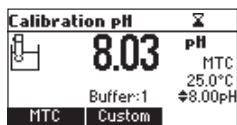


Clean the electrode, following the details from MAINTENANCE section, and then perform a new calibration.

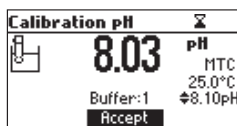
Note: If there is no calibration data, the comparison is done with the default values.

Working with Custom Buffers

Custom buffers are set at the value of 25 °C. When calibrating with custom buffers, the buffer value can be modified by pressing **Custom**.

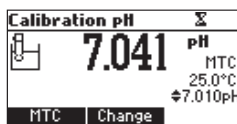


Press the **▲/▼** keys to change the buffer value (± 1.00 pH) based on the temperature reading. Press **Accept** to save the value or press the **ESC** key to return to the calibration screen.



Working with Mili pH Buffers

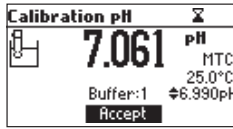
Mili pH buffers are only available if the pH resolution is set to 0.001 pH when you enter calibration. The exact value of the mili pH buffer is reported in the label, buffers can be modified in a ± 0.020 pH window.



Press **Change** to enter buffer edit mode.

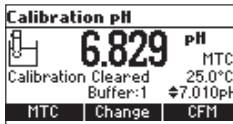
Press **▲/▼** keys to change the buffer value.

Press **Accept** to confirm new value or **ESC** to exit edit mode.



Clear Calibration

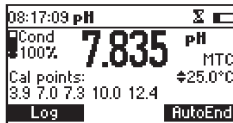
Press **Clear** functional key to clear previous calibrations. Calibration points saved during current calibration are not deleted.



***Note:** If Clear calibration is invoked during the first calibration point, the instrument returns to measurement mode.*

Electrode Condition

If enabled (see METER SETUP section), the display will show the probe icon and electrode condition (%) after a successful calibration. The electrode condition is evaluated only if current calibration includes at least two standard buffers and remains active until the end of the calibration day.



9.2. pH BUFFER TEMPERATURE DEPENDENCE

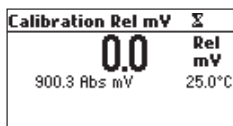
The temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions. During calibration the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature.

TEMP		pH BUFFERS						
°C	°F	1.68	4.01	6.86	7.01	9.18	10.01	12.45
0	32	1.67	4.01	6.98	7.13	9.46	10.32	13.38
5	41	1.67	4.00	6.95	7.10	9.39	10.25	13.18
10	50	1.67	4.00	6.92	7.07	9.33	10.18	12.99
15	59	1.67	4.00	6.90	7.05	9.27	10.12	12.80
20	68	1.68	4.00	6.88	7.03	9.22	10.06	12.62
25	77	1.68	4.01	6.86	7.01	9.18	10.01	12.45
30	86	1.68	4.02	6.85	7.00	9.14	9.96	12.29
35	95	1.69	4.03	6.84	6.99	9.11	9.92	12.13
40	104	1.69	4.04	6.84	6.98	9.07	9.88	11.98
45	113	1.70	4.05	6.83	6.98	9.04	9.85	11.83
50	122	1.71	4.06	6.83	6.98	9.01	9.82	11.70
55	131	1.72	4.08	6.84	6.98	8.99	9.79	11.57
60	140	1.72	4.09	6.84	6.98	8.97	9.77	11.44
65	149	1.73	4.11	6.84	6.99	8.95	9.76	11.32
70	158	1.74	4.12	6.85	6.99	8.93	9.75	11.21
75	167	1.76	4.14	6.86	7.00	8.91	9.74	11.10
80	176	1.77	4.16	6.87	7.01	8.89	9.74	11.00
85	185	1.78	4.17	6.87	7.02	8.87	9.74	10.91
90	194	1.79	4.19	6.88	7.03	8.85	9.75	10.82
95	203	1.81	4.20	6.89	7.04	8.83	9.76	10.73

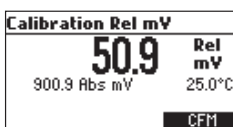
During calibration the instrument displays the pH buffer value at 25 °C.

9.3. RELATIVE mV CALIBRATION

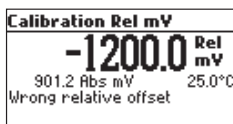
1. Press **CAL** when the instrument is in relative mV measurement mode. The relative mV value and the temperature value are displayed.
2. Press the **▲/▼** keys to modify displayed relative mV value.



3. When the reading is stable and the Relative mV offset is inside the offset window (± 2000 mV), **CFM** functional key is displayed.



4. Press **CFM** to confirm. The instrument returns to measurement mode.
5. If the absolute mV reading is out of range or the Relative mV offset is out of the offset window, "Wrong relative offset" message is displayed.



Change the input value or the Relative mV value to complete the calibration process.

9.4. ISE CALIBRATION

It is recommended to calibrate the instrument frequently, especially if high accuracy is required. The ISE range should be recalibrated:

- whenever the ISE probe or ion charge is changed,
- at least once a week,
- after testing aggressive chemicals,
- when calibration alarm time out is expired - "CAL DUE" tag blinks (if enabled).

The ISE electrode requires conditioning so it must be kept immersed a few seconds to stabilize.

Procedure

- Select the ISE probe in SETUP menu or the Ion Charge (see METER SETUP section for details).

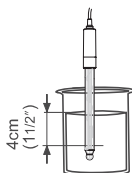
Note: If ISE probe is not calibrated in at least one point, “----” is displayed.



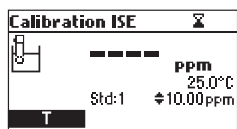
- Pour small, volumetrically measured 50 mL of calibration standard solutions and transfer into clean beakers. If possible, use plastic beakers to minimize any EMC interferences. For accurate calibration and to minimize cross-contamination, use two beakers for each standard solution: one for rinsing the electrode and one for calibration.
- There are six memorized standard solutions: 0.1, 1, 10, 100, 1000, 10000 ppm and up to five point calibration can be performed. For fluoride electrode, the 2 ppm standard is also available.
- Remove the protective cap from the ISE electrode.

Five-Point Calibration

1. Immerse the ISE electrode approximately 4 cm (1½”) into the less concentrated standard solution and stir gently.

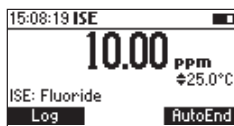
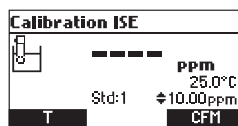


2. Press **CAL**. The LCD displays the ion concentration in the selected unit or “----” if not calibrated.



If necessary, press the ▲/▼ keys to select a different standard value.

The “⏏” tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected standard, the CFM functional key is displayed.



3. Press **CFM** to confirm calibration. The instrument displays the calibrated value and the second expected standard.
4. After the first calibration point is confirmed, immerse the ISE electrode approximately 4 cm (1½") into the second calibration solution.
If necessary, press the ▲/▼ keys to select a different standard value.
The "⌘" tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected standard, the **CFM** functional key is displayed.
5. Press **CFM** to confirm calibration. The instrument displays the calibrated value and the third expected standard.
6. After the second calibration point is confirmed, immerse the ISE electrode approximately 4 cm (1½") into the third calibration solution.
If necessary, press the ▲/▼ keys to select a different standard value.
The "⌘" tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected standard, the **CFM** functional key is displayed.
7. Press **CFM** to confirm calibration. The instrument displays the calibrated value and the fourth expected standard.
8. After the third calibration point is confirmed, immerse the ISE electrode approximately 4 cm (1½") into the fourth calibration solution.
If necessary, press the ▲/▼ keys to select a different standard value.
The "⌘" tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected standard, the **CFM** functional key is displayed.
9. Press **CFM** to confirm calibration. The instrument displays the calibrated value and the fifth expected standard value.
10. After the fourth calibration point is confirmed, immerse the ISE electrode approximately 4 cm (1½") into the fifth calibration solution.
If necessary, press the ▲/▼ keys to select a different standard value.
The "⌘" tag is displayed blinking until the reading has stabilized. When the reading is stable and within range of the selected standard, the **CFM** functional key is displayed.
11. Press **CFM** to confirm calibration. The instrument stores the calibration value and returns to measurement mode.

Note: *The instrument will automatically skip the standard solutions used during calibration.*

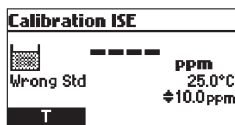
Four-, Three-, Two- or One-Point Calibration

1. Follow the steps described in Five-Point Calibration procedure.
2. Press **ESC** or **CAL** key after the appropriate accepted calibration point. The instrument stores the calibration data and returns to measurement mode.

Error Messages

Wrong Standard

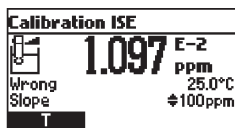
The calibration cannot be confirmed. The message is displayed if mV input is outside ± 2000 mV range.



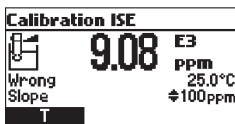
Wrong Slope

The calibration cannot be confirmed. This message is displayed if slope is out of the accepted range.

- Slope under accepted value (30 % default slope).



- Slope over accepted value (130 % default slope).



Wrong Old Slope

An inconsistency between new and previous (old) calibrations is detected.

Clear old calibration parameters and proceed calibration from the current point. Values confirmed during current calibration will not be cleared.

The instrument displays "----" if is not calibrated (or after all calibrations have been cleared).

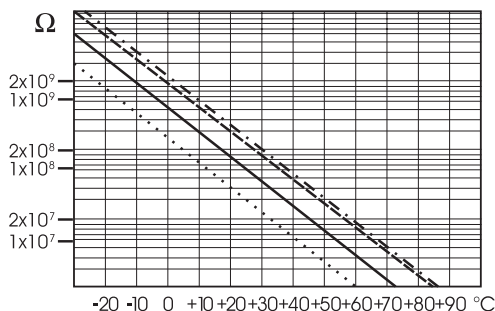
If **Clear** is pressed during the first calibration point, the instrument returns to measurement mode.

Notes: When the temperature probe is not connected, press T functional key (or MODE) to select temperature value to be changed.

ISE range is not temperature compensated.

10. TEMPERATURE CORRELATION FOR pH SENSITIVE GLASS

- The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. The higher the resistance, the longer the time required for the reading to stabilize. The response time is affected by temperatures below 25 °C (77 °F).



Since the resistance of the pH electrode is in the range of 50 – 200 MΩ, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours.

- High humidity environments, short circuits and static discharges are detrimental to a stable pH reading.
If constantly used at high temperatures, the electrode life is drastically reduced.

Typical Electrode Life

Ambient temperature 1 – 3 years

90 °C (194 °F) less than 4 months

120 °C (248 °F) less than 1 month

Alkaline Error

High concentrations of sodium ions interfere with readings in alkaline solutions. The pH at which the interference starts to be significant depends upon the composition of the glass. This interference is called alkaline error and causes the pH to be underestimated. Hanna Instruments's glass formulations have the indicated characteristics.

Sodium Ion Correction for the Glass at 20-25 °C (68-77 °F)		
Concentration	pH	Error
0.1 Mol L ⁻¹ Na ⁺	13.00	0.10
	13.50	0.14
	14.00	0.20
1.0 Mol L ⁻¹ Na ⁺	12.50	0.10
	13.00	0.18
	13.50	0.29
	14.00	0.40

11. mV & TEMPERATURE CALIBRATION (for technical personnel only)

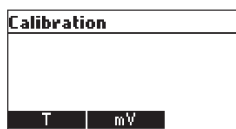
The meter is factory calibrated for mV and temperature.

Hanna Instruments's temperature probes are interchangeable and no temperature calibration is needed after probe replacement.

If temperature or ORP measurements are not accurate, follow instruction below or contact your local Hanna Instruments Office.

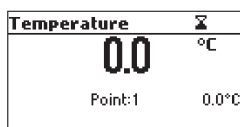
Enter Calibration Mode

With the instrument off, press and hold down the ▲/▼ then power on the instrument. The calibration screen is displayed. Press "T" functional key to enter the temperature calibration mode.

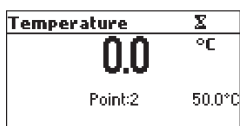


Temperature Calibration

1. Prepare a vessel containing ice and water and another one containing hot water (at approximately 50 °C or 122 °F). Place insulation material around the vessels to minimize temperature changes.
2. Use a calibrated thermometer with a resolution of 0.1 °C as a reference thermometer. Connect the temperature probe to the appropriate socket.



3. Immerse the temperature probe or the pH probe including temperature sensor into the vessel with ice and water as close as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
4. Press the ▲/▼ keys to set the calibration point value to that of ice and water mixture, measured by the reference thermometer. When the reading is stable and within range of the selected calibration point, the CFM functional key is displayed.
5. Press CFM to confirm.
6. The second expected calibrated point is displayed.



- Immerse the temperature probe into the second vessel as close as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.

Temperature	
49.8	°C
Point:2	50.0°C

- Press the ▲/▼ keys to set the calibration point value to that of the hot water.
- When the reading is stable and within range of the selected calibration point, press displayed CFM functional key to confirm. The instrument returns to measurement mode.

Temperature	
49.8	°C
Point:2	50.0°C
CFM	

Note: Press ▲/▼ keys to change calibration point if necessary (± 10.0 °C) around the point. If the reading is not within range of the selected calibration point, "Wrong" message will blink. Change the temperature probe and restart calibration.

mV Calibration

A two point calibration can be performed at 0 mV and 1800 mV.

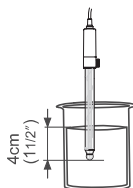
- Attach to the BNC connector a mV simulator with an accuracy of ± 0.1 mV.
- Enter the calibration screen. Press **mV** functional key.
- Set 0.0 mV on the simulator.
- When the reading is stable and within range of the selected calibration point, press displayed **CFM** functional key to confirm.
- Press **CFM** to confirm. The second calibration point of 1800 mV will be displayed.
- Set 1800.0 mV on the simulator.
- When the reading is stable and within range of the selected calibration point, the **CFM** functional key is displayed.
- Press **CFM** to confirm. The instrument returns to calibration screen.
- Press **ESC** key to return to measurement mode.

Notes: If the reading is not within range of the selected calibration point, "WRONG" tag will blink. Verify calibration condition or contact your local Hanna Instruments Office. Press **CAL** or **ESC** during calibration to return to measurement mode.

12. MEASUREMENT

12.1. pH MEASUREMENT

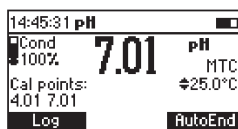
To take a pH measurement remove the electrode protective cap and simply submerge the tip of the electrode (4 cm/1½") into the sample to be tested.



Press **RANGE** key until the display changes to the pH range, if necessary.

Press **MODE** key to select the pH resolution.

Allow for the electrode to adjust and reading to stabilize (stability indicator not displayed).



On the pH screen are displayed:

- pH reading with the selected resolution
- temperature reading in the selected unit (°C or °F)
- temperature compensation mode (MTC - manual, ATC - automatic)

While in MTC mode the \blacktriangledown indicates that the temperature can be manually changed using \blacktriangle / \blacktriangledown keys.

- electrode condition on calibration day
- buffers used for previous calibration (if enabled)
- battery level indicator
- available functional keys

For accurate pH measurements, make sure that the instrument is calibrated (see pH CALIBRATION section for details).

It is recommended that the electrode is always kept moist and rinsed thoroughly with the sample to be measured before use.

The pH reading is directly affected by temperature. For accurate pH measurements, temperature must be taken into consideration. If the sample temperature is different from the temperature at which the pH electrode was kept, allow a few minutes to reach thermal equilibrium.

To use the instrument's Automatic Temperature Compensation (ATC) feature, submerge the temperature probe into the sample as close to the electrode as possible and wait for a few seconds.

If manual temperature compensation (MTC) is desired, the temperature probe must be disconnected from the instrument.

The display will show the default temperature of 25 °C, the last measured temperature reading, or the last set temperature, with the MTC status.

The MTC tag and the \blacklozenge symbol light up to indicate that the instrument is in MTC mode. Press the \blacktriangle / \blacktriangledown keys to enter the desired temperature value.

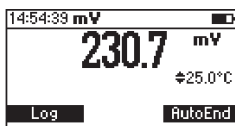
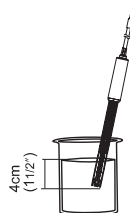
Note: When in MTC the user can press and hold the \blacktriangle / \blacktriangledown keys, and the instrument will start incrementing /decrementing the temperature value. The instrument keeps measuring and the display is updated periodically.

12.2. ORP MEASUREMENT

To perform ORP measurements:

1. Connect an ORP electrode (not supplied) to the instrument and turn it ON.
2. Press **RANGE** key until mV range is displayed, if necessary.
3. Submerge the ORP electrode tip (4 cm/1½") into the sample to be tested and wait a few seconds for the reading to stabilize.

Measurements are displayed with 0.1 mV resolution.

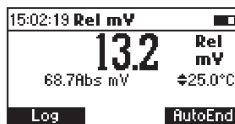


Temperature compensation status is turned off because mV readings are not temperature compensated. For accurate ORP measurements, the surface of the electrode must be clean and smooth. Pretreatment solutions are available to condition the electrode and improve its response time.

12.3. RELATIVE mV MEASUREMENT

To enter Relative mV mode, press **MODE** while in mV measurement mode. The relative mV reading is displayed along with the Absolute mV value and the current temperature readings.

The relative mV reading is equal to the difference between the absolute mV input value and relative mV offset established in the relative mV calibration.



Note: If using the pH electrode while in mV mode, the instrument will measure the mV generated by the pH electrode.

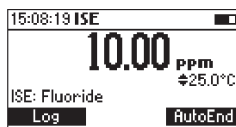
12.4. ISE MEASUREMENT

To perform ion concentration measurements:

1. Connect an ISE electrode (not supplied) and the corresponding reference (if necessary) to the instrument and turn it ON.
2. Press **RANGE** to enter ISE mode (until the display changes to ISE range).
3. Submerge the ISE electrode tip (4 cm/1½") into the sample to be tested and wait a few seconds for the reading to stabilize.



The ISE reading is displayed along with the current temperature reading.



Temperature compensation status is turned off because ppm readings are not temperature compensated.

In order to take accurate ISE measurements, make sure that the appropriate ISE electrode type and ISE unit are configured in SETUP menu and the instrument is calibrated (see ISE CALIBRATION section for details).

Notes: When the reading is out of range, the display will flash the closest full-scale value. The instrument will display "----" on the primary LCD if it is not calibrated. A minimum of one-point calibration is required prior to taking any ISE measurements.

Changing the ISE electrode or the ion charge will need ISE range calibration.

12.5. TEMPERATURE MEASUREMENT

Connect the temperature connector to the appropriate socket. Immerse the pH electrode into the sample and allow the reading, displayed on the secondary LCD, to stabilize.

Note: The temperature can be displayed in Celsius (°C) or in Fahrenheit (°F) degrees (see METER SETUP section for details).

13. GOOD LABORATORY PRACTICE (GLP)

GLP (Good Laboratory Practice) is a set of functions that allows storage and retrieval of data regarding electrode status and maintenance.

Last pH, relative mV and ISE calibration data are automatically stored after a successful calibration. To recall data, when in measurement mode, press the GLP key.

Notes: When the instrument is not calibrated or calibration is cleared (default values loaded), "CAL DUE" tag is displayed blinking.

When an abnormal condition in the RTC is detected, the instrument forces the "Expired Calibration" status.

Last pH Calibration Data

When in pH measurement mode, press GLP key. The instrument displays: calibration buffer, offset, slope, electrode condition.

Last pH cal	Buffer[pH]
Date: 2020/12/02	8.00*
Time: 16:08:25	4.01
Cal Expire: Disabled	7.01
Offset: -1.4mV	
Average Slope: 99.3%	

Note: Buffers displayed in reverse video are from previous calibrations. The custom buffers are marked with a "*" symbol. "No user calibration" message is displayed if all calibrations are cleared or the instrument was not calibrated in the pH range.

Last Relative mV Calibration Data

When in Relative mV measurement mode, press GLP key. The instrument displays: calibration date, time and offset.

Last Rel mV cal
Date: 2020/12/02
Time: 08:34:14
Offset: -28.6mV

Last ISE Calibration Data

When in ISE measurement mode, press GLP key. The instrument displays: calibration status, date, time, slope, and electrode type.

Last ISE cal	Standard(User)
Date: 2020/12/02	10.0
Time: 08:38:32	1.00
Cal Expire: Disabled	
Slope: 96.2%	
ISE: Ammonia	

Notes: Press GLP or ESC and the instrument resumes measurement mode.

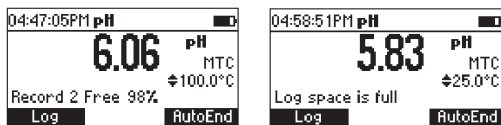
If no calibration has been performed, "No user calibration" message is displayed.

The calibration standards from previous calibrations are displayed in reverse video.

14. LOGGING

14.1. LOGGING THE CURRENT DATA

From measurement mode, press **Log** functional key to store current reading. Stored record number and available log space are displayed for a few seconds. If log space is full, “Log space is full” is displayed for a few seconds.



14.2. VIEW LOGGED DATA

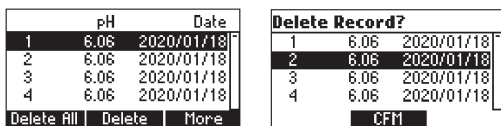
From measurement mode, press **RCL** to retrieve stored information.

“No Records” is displayed if no logged data available.

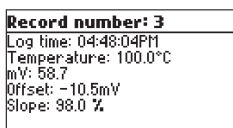
Use **▲/▼** keys to scroll logged data.

Press **Delete All** to delete all data. Press **CFM** functional key to confirm or **ESC** key to exit without deleting.

Press **Delete** to enter “Delete Record?” screen. Press the **▲/▼** keys to select desired record and press **CFM** key to delete. Press **ESC** to exit without deleting.



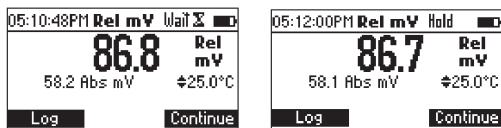
Press **More** to view information on selected record. Press the **▲/▼** keys to scroll log information.



14.3. AUTOEND

From measurement mode, press **AutoEnd** to freeze a stable reading.

Wait message displayed blinking and stability indicator are replaced by “Hold” message once the reading has stabilized.



Press **Continue** soft functional key to enter measurement mode.

15. PC CONNECTION

15.1. HI92000 – HANNA PC SOFTWARE

The logged data can be transferred to a PC via the **HI92000** PC application.

The PC compatible software is available for download at <http://software.hannainst.com>. Select the product code and click **Download Now**. After download is complete, use the **setup.exe** file to install the software.

15.2. REMOTE CONNECTION VIA USB CABLE

Use a USB cable connector to connect the meter to a PC.

1. Power the meter off and plug one connector to the meter's USB socket
2. Plug the other connector to the serial or USB port of the PC.
3. Follow commands detailed here.

Sending Commands from PC

Start the terminal program and set the communication options as follows: 8, N, 1, no flow control.

Command Types

To send a command to the instrument follow the next scheme:

< command prefix> < command> <CR>

where: < command prefix> is the 16 ASCII character
< command> is the command code.

Note: Either small or capital letters can be used.

Simple Commands

KF1	Is equivalent to pressing functional key 1
KF2	Is equivalent to pressing functional key 2
KF3	Is equivalent to pressing functional key 3
RNG	Is equivalent to pressing RANGE key
MOD	Is equivalent to pressing MODE key
CAL	Is equivalent to pressing CAL key
UPC	Is equivalent to pressing the UP arrow key
DWC	Is equivalent to pressing the DOWN arrow key
RCL	Is equivalent to pressing RCL key
SET	Is equivalent to pressing SETUP key
CLR	Is equivalent to pressing CLR key
OFF	Is equivalent to pressing OFF key
CHR xx	Change the instrument range according with the parameter value (xx): <ul style="list-style-type: none"> • xx=00 pH range/0.001 resolution • xx=01 pH range/0.01 resolution

- xx=02 pH range/0.1 resolution
- xx=03 mV range
- xx=04 Relative mV range
- xx=05 ISE range

The instrument will answer for these commands with:

<STX> <answer> <ETX>

where: <STX> is 02 ASCII code character (start of text)

<ETX> is 03 ASCII code character (end of text)

<answer>:

<ACK> is 06 ASCII code character (recognized command)

<NAK> is 21 ASCII code character (unrecognized command)

<CAN> is 24 ASCII code character (corrupted command)

Commands Requiring an Answer

The instrument will answer for these commands with:

<STX> <answer> <checksum> <ETX>

where the checksum is the bytes sum of the answer string sent as 2 ASCII characters.

All the answer messages are with ASCII characters.

RAS Causes the instrument to send a complete set of readings in according with the current range:

- pH, temperature and mV reading on pH range.
- Rel mV, absolute mV and temperature reading on Rel mV range.
- concentration, mV and temperature reading on ppm range.

The answer string contains:

- Meter mode (2 chars):
 - 00 - pH range (0.001 resolution)
 - 01 - pH range (0.01 resolution)
 - 02 - pH range (0.1 resolution)
 - 03 - mV range
 - 04 - Rel mV range
 - 05 - ISE range
- Meter status (2 chars of status byte): represents a 8 bit hexadecimal encoding.
 - 0x10 - temperature probe is connected
 - 0x01 - new GLP data available
 - 0x02 - new SETUP parameter
 - 0x04 - out of calibration range
 - 0x08 - the meter is in autoend point mode
- Reading status (2 chars): R - in range, O - over range, U - under range. First character corresponds to the primary reading. Second character corresponds to mV reading.

- Primary reading (corresponding to the selected range) - 11 ASCII chars, including sign and decimal point and exponent.
- Secondary reading (only when primary reading is not mV) - 7 ASCII chars, including sign and decimal point.
- Temperature reading - 7 ASCII chars, with sign and two decimal points, always in °C.

MDR
GLP

Requests the instrument model name and firmware code (16 ASCII chars).

Requests the calibration data record.

The answer string contains:

- GLP status (1 char): represents a 4 bit hexadecimal encoding.
 - 0x01 - pH calibration available
 - 0x02 - Rel mV calibration available
 - 0x04 - ISE calibration available
- pH calibration data (if available), which contains:
 - the number of calibrated buffers (1 char)
 - the ion charge, with sign (2 chars)
 - the offset, with sign and decimal point (7 chars)
 - the average of slopes, with sign and decimal point (7 chars)
 - the calibration time, **yymmddhhmmss** (12 chars)
 - buffers information (for each buffer)
 - type (1 char): 0 - standard, 1 - custom
 - status (1 char): N (new) - calibrated in last calibration; 0 (old) - from an old calibration.
 - warnings during calibration (2 chars): 00 - no warning, 04 - Clean Electrode warning.
- buffer value, with sign and decimal point and exponent (11 chars).
- calibration time, **yymmddhhmmss** (12 chars).
- electrode condition, with sign (3 chars). The "-01" code means not calculated.
- Rel mV calibration data (if available), which contains:
 - the calibration offset, with sign (7 chars)
 - the calibration time, **yymmddhhmmss** (12 chars).
- ISE calibration data (if available), which contains:
 - the number of calibrated standards (1 char)
 - the ion charge, with sign (2 chars)
 - the calibration slope, with sign and decimal point (7 chars)
 - the calibration time, **yymmddhhmmss** (12 chars)
 - standards information (for each standard)
 - type (1 char): 0 - always standard solution.

- status (1 char): N (new) - calibrated in last calibration; O (old) - from an old calibration.
- warnings during calibration (2 chars): 00 - no warning.
- standard value, with sign and decimal point and exponent (11 chars).
- calibration time, **yymmddhhmmss** (12 chars).

- PAR** Requests the setup parameters setting.
The answer string contains:
- Instrument ID (4 chars)
 - Calibration Alarm time out for pH (2 chars)
 - Calibration Alarm timeout for ISE (2 chars) - if ISE available
 - SETUP information (2 chars): 8 bit hexadecimal encoding.
 - 0x01 - beep ON (else OFF)
 - 0x04 - degrees Celsius (else degrees Fahrenheit)
 - 0x08 - Offset calibration (else Point calibration)
 - Auto Light Off time (3 chars)
 - Auto Power Off time (3 chars)
 - The number of custom buffers (1 char)
 - The custom buffer values, with sign and decimal point, for each defined custom buffer (7 chars)
 - The ID of the ISE electrode (2 chars) - if ISE available
 - The molar weight of the selected ION, with sign and decimal point (9 ASCII characters)
 - The ion charge (2 chars)
 - The ISE unit (2 chars)
 - The short name of the selected language (3 chars)
- NSLx** Requests the number of logged samples (4 chars).
The command parameter (1 char):
- P - request for pH range
 - M - request for mV and Rel mV ranges
 - I - request for ISE range
- LODPxxx** Requests the xxxth pH record logged data.
- LODMxxx** Requests the xxxth mV/Rel mV record logged data.
- LODIxxx** Requests the xxxth ISE record logged data.
- LODPALL** Requests all pH Log on demand.
- LODMALL** Requests all mV/Rel mV Log on demand.

LODIALL Requests all ISE Log on demand.

The answer string for each record contains:

- The logged mode (2 chars):
 - 00 - pH range (0.001 resolution)
 - 01 - pH range (0.01 resolution)
 - 02 - pH range (0.1 resolution)
 - 03 - mV range
 - 04 - Rel mV range
 - 05 - ISE range
- Reading status (1 char): R, O, U
- Calculated reading, with sign and decimal point and exponent (11 chars) - for pH, Rel mV and ISE range
- Temperature reading, with sign and two decimal points (7 chars)
- mV reading status (1 char): R, O, U
- The mV reading, with sign and decimal point (7 chars)
- The logged time, **yymmddhhmmss** (12 chars)
- The calibration slope, with sign and decimal point (7 chars) - not available for Rel mV range
- The calibration offset, with sign and decimal point (7 chars) - not available for ISE
- Temperature probe presence (1 char)

Notes: "Err8" is sent if the instrument is not in measurement mode.

"Err6" is sent if the requested range is not available.


"Err4" is sent if the requested set parameter is not available.

"Err3" is sent if the Log on demand is empty.

"Err9" is sent if the battery power is less than 30%.

Invalid commands will be ignored.

16. TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	SOLUTION
Slow response/excessive drift.	Dirty pH electrode.	Soak the electrode tip in HI70614 solution for 30 minutes and then follow the Cleaning Procedure.
Reading fluctuates up and down (noise).	Clogged/dirty junction. Low electrolyte level (refillable electrodes only).	Clean the electrode. Refill with fresh electrolyte (refillable electrodes only).
Display shows blinking full scale value.	Reading out of range.	Check that sample is within measurable range
mV scale out of range.	Dry membrane or dry junction.	Soak electrode in HI703004 storage solution for at least 30 minutes.
Display shows  symbol in front of temperature reading.	Out of order or missing temperature probe.	Replace temperature probe or check the connection.
Display shows "Clean electrode" blinking.	Difference between new and previous calibration has been detected.	Clean electrode and recalibrate. If the problem remains, check the buffer solutions.
Meter does not work with temperature probe.	Broken temperature probe.	Replace temperature probe.
Meter fails to calibrate or gives faulty readings.	Broken pH electrode.	Replace electrode.
Error messages are displayed during pH calibration procedure.	Wrong or contaminated buffer, electrode dirty or broken.	Check that buffer solution is correct and fresh.
Meter shuts off.	Dead batteries; Auto-off feature is enabled: in this case, meter shuts off after selected period of non-use.	Replace batteries; Press ON/OFF .
"Errxx" message at start up.	Internal error.	Contact your local Hanna Instruments Office.
The instrument does not start when pressing ON/OFF .	Initialization error.	Press and hold down ON/OFF for about 20 seconds or disconnect and then connect the batteries.

17. ACCESSORIES

pH Calibration Solutions

HI50004-01	pH 4.01 buffer solution, 20 mL sachet (10 pcs.)
HI50004-02	pH 4.01 buffer solution, 20 mL sachet (25 pcs.)
HI50007-01	pH 7.01 buffer solution, 20 mL sachet (10 pcs.)
HI50007-02	pH 7.01 buffer solution, 20 mL sachet (25 pcs.)
HI50010-01	pH 10.01 buffer solution, 20 mL sachet (10 pcs.)
HI50010-02	pH 10.01 buffer solution, 20 mL sachet (25 pcs.)
HI5016	pH 1.68 buffer solution, 500 mL
HI5004	pH 4.01 buffer solution, 500 mL
HI5068	pH 6.86 buffer solution, 500 mL
HI5007	pH 7.01 buffer solution, 500 mL
HI5091	pH 9.18 buffer solution, 500 mL
HI5010	pH 10.01 buffer solution, 500 mL
HI5124	pH 12.45 buffer solution, 500 mL
HI700044P	Pool Line 4.01 pH buffer solution sachet, 20 mL sachet (25 pcs.)
HI700074P	Pool Line 7.01 pH buffer solution sachet, 20 mL sachet (25 pcs.)
HI8004L	pH 4.01 buffer solution in FDA approved bottle, 500 mL
HI8006L	pH 6.86 buffer solution in FDA approved bottle, 500 mL
HI8007L	pH 7.01 buffer solution in FDA approved bottle, 500 mL
HI8009L	pH 9.18 buffer solution in FDA approved bottle, 500 mL
HI8010L	pH 10.01 buffer solution in FDA approved bottle, 500 mL

Electrode Storage Solution

HI703004L	Pool Line Storage solution for pH/ORP electrodes, 500 mL
HI80300L	Storage solution in FDA approved bottle, 500 mL

Electrode Cleaning Solutions

HI70000P	Electrode rinse solution, 20 mL sachet (25 pcs.)
HI7006014P	Pool Line General purpose electrode cleaning solution, 20 mL sachet (25 pcs.)
HI70614L	Pool Line Cleaning solution for pH/ORP electrodes, 500 mL
HI7073L	Protein Cleaning Solution, 500 mL
HI7074L	Inorganic cleaning solution, 500 mL
HI70774L	Pool Line Oil & fat electrode cleaning solution, 500 mL
HI8061L	General purpose solution in FDA approved bottle, 500 mL
HI8073L	Protein cleaning solution in FDA approved bottle, 500 mL
HI8077L	Oil & Fat cleaning solution in FDA approved bottle, 500 mL

Electrode Refill Electrolyte Solutions

HI7071	3.5M KCl + AgCl Electrolyte, 4x30 mL, for single junction electrodes
HI7072	1M KNO ₃ Electrolyte, 4x30 mL
HI7082	3.5M KCl Electrolyte, 4x30 mL, for double junction electrodes
HI8071	3.5M KCl + AgCl Electrolyte in FDA approved bottle, 4x30 mL, for single junction electrodes
HI8072	1M KNO ₃ Electrolyte in FDA approved bottle, 4x30 mL
HI8082	3.5M KCl Electrolyte in FDA approved bottle, 4x30 mL, for double junction electrodes
HI8093	1M KCl + AgCl Electrolyte in FDA approved bottle, 4x30 mL

ORP Pretreatment Solutions

HI7091L	Reducing pretreatment solution, 500 mL + 14g (set)
HI7092L	Oxidizing pretreatment solution, 500 mL

ORP Solutions

HI700224P	Pool Line 470 mV ORP test solution, 20 mL sachet (25 pcs.)
HI7020L	200-275 mV ORP test solution, 500 mL
HI7021L	240 mV ORP test solution, 500 mL
HI70224L	Pool Line 470 mV ORP test solution, 500 mL

pH Electrodes

HI1043B	Glass body, double junction, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1053B	Glass body, triple ceramic, conic shape, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1083B	Glass body, micro, Viscolene, non refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1131B	Glass body, double junction, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1330B	Glass body, semimicro, single junction, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1331B	Glass body, semimicro, single junction, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI2031B	Glass body, semimicro, conic, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable
HI1332B	Plastic body (PEI), double junction, refillable, combination pH electrode with a BNC connector and 1 m (3.3') cable

ORP Electrodes

HI3131B	Glass body, refillable, combination platinum ORP electrode with a BNC connector and 1 m (3.3') cable. (Use: titration)
HI3230B	Plastic body (PEI), gel filled, combination platinum ORP electrode with a BNC connector and 1 m (3.3') cable
HI4430B	Plastic body (PEI), gel filled, combination gold ORP electrode with a BNC connector and 1 m (3.3') cable

Extension Cable for Screw-Type Electrodes (Screw to BNC Adapter)

HI7855/1	Extension cable 1 m (3.3') long
HI7855/3	Extension cable 3 m (9.9') long

Other Accessories

HI720191	Rugged carrying case
HI740157P	Plastic electrode refilling pipet (20 pcs.)
HI76405	Electrode holder
HI7662	Temperature probe
HI8427	pH and ORP electrode simulator with 1 m (3.3') coaxial BNC/BNC cable
HI9310014	Pool Line pH/mV precision simulator with LCD and 1 m (3.3') coaxial BNC/BNC cable
HI92000	Windows [®] compatible software application
HI920015	Micro USB cable

CERTIFICATION

All Hanna Instruments conform to the CE European Directives.



Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead hand it over to the appropriate collection point for the recycling of electrical and electronic equipment which will conserve natural resources.

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling. Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, the place of purchase or go to www.hannainst.com.



RECOMMENDATIONS FOR USERS

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the meter's performance. For your and the meter's safety do not use or store the meter in hazardous environments.

WARRANTY

HI981914 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. Electrodes and probes are warranted for six months. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered.

If service is required, contact your local Hanna Instruments Office. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization (RGA) number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection.

Hanna Instruments reserves the right to modify the design, construction or appearance of its products without advance notice.

World Headquarters

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