

# Instruction Manual

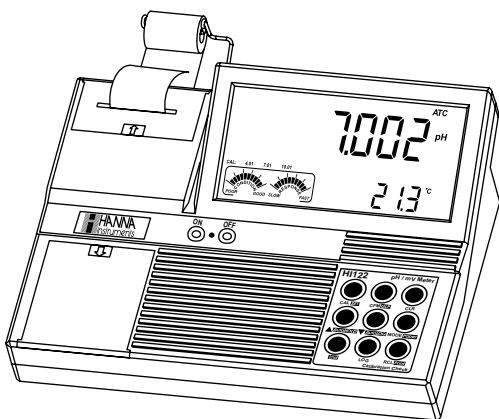
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## HI120 & HI122

### pH/mV/Temperature

### Bench Meters

### with Calibration Check



[www.hannainst.com](http://www.hannainst.com)

Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using these instruments.

This manual will provide you with the necessary information for correct use of these instruments, as well as a precise idea of their versatility.

If you need additional technical information, do not hesitate to e-mail us at [tech@hannainst.com](mailto:tech@hannainst.com) or view our worldwide contact list at [www.hannainst.com](http://www.hannainst.com).

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## PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any damage, contact your local Hanna Instruments Office.

Each instrument is supplied with:

- **HI1131P** Glass-body Combination pH Electrode
- **HI7662-T** Temperature probe
- **pH4.01 & 7.01** Buffer solutions, 20 mL each
- **HI7082S** Electrolyte solution
- 5 paper rolls (**HI122** only)
- 12VDC Power Adapter
- Instruction Manual

*Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing with the supplied accessories.*

## GENERAL DESCRIPTION

The Hanna **HI120** and **HI122** are professional bench meters for pH, ORP (Oxidation Reduction Potential) and Temperature measurements with Calibration Check. **Relative mV** feature is also provided.

Calibration Check performs a set of diagnostic tests during calibration using the history of electrode slope and offset to detect problems that can cause loss of accuracy.

Calibration Check Features are:

- Enhanced Calibration Messages
- Electrode Condition on LCD Display
- Electrode Response Time on LCD Display
- Calibration Alarm Time-Out
- Out of Calibration Range

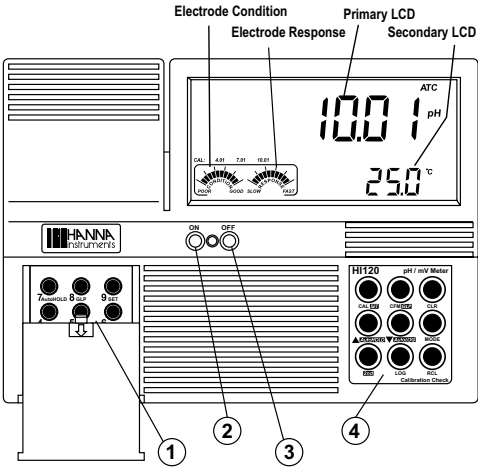
Other features include:

- Up to five-point calibration with seven memorized buffers (1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45 pH) and two custom buffers.
- pH calibration using pH buffers with 0.001 resolution.
- pH reading with manual or automatic temperature compensation.
- Up to 50 samples for Log on demand mode and up to 1000 samples for AutoLOG mode.
- Two selectable alarm limits.
- User selectable AutoLOG modes.
- Printing feature in four selectable languages (**HI122** only).
- Large easy-to-read LCD which shows the pH or mV and Temperature simultaneously, together with graphic symbols.

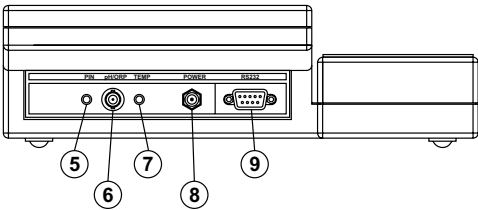
- AutoHOLD feature to freeze first stable reading on the LCD.
- GLP feature to view last calibration data for pH and Relative mV.
- PC interface.

## FUNCTIONAL DESCRIPTION HI120

**Front Panel**



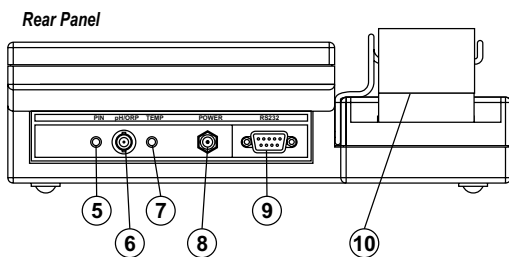
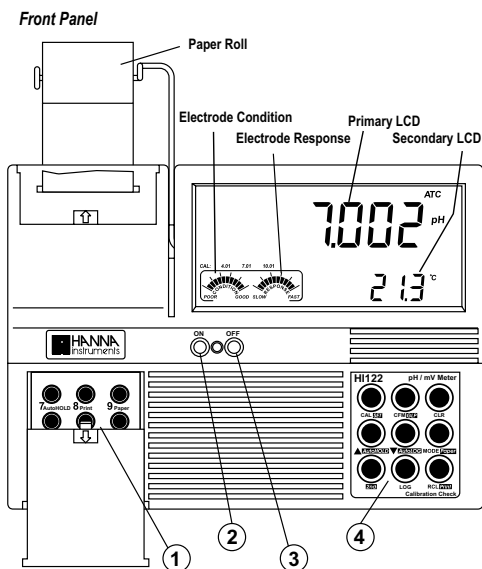
**Rear Panel**



- 1) Left Keyboard
- 2) ON switch
- 3) OFF switch
- 4) Right Keyboard
- 5) Pin input socket
- 6) BNC electrode connector
- 7) Temperature probe socket
- 8) Power adapter socket
- 9) RS232 serial communication connector

# FUNCTIONAL DESCRIPTION

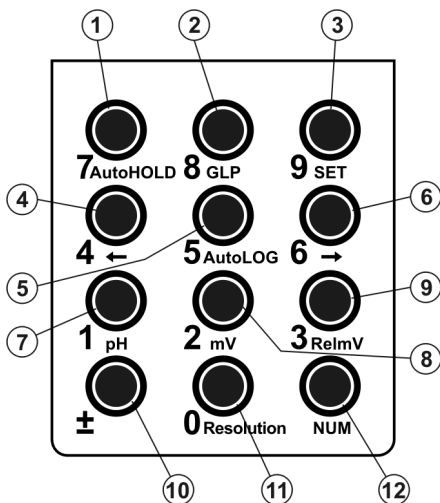
## HI122



- 1) Left Keyboard
- 2) ON switch
- 3) OFF switch
- 4) Right Keyboard
- 5) Pin input socket
- 6) BNC electrode connector
- 7) Temperature probe socket
- 8) Power adapter socket
- 9) RS232 serial communication connector
- 10) Printer

## HI120

### KEYBOARD ON THE LEFT



#### Shortcuts to alternate functions

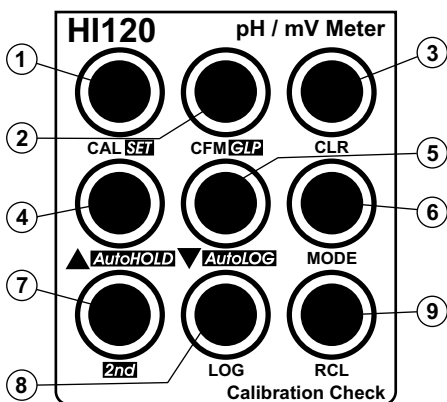
- 1) **AutoHOLD** key, to freeze the first stable reading on the LCD.
- 2) **GLP** key, to display Good Laboratory Practice Information.
- 3) **SET** key, to enter/exit SETUP mode.
- 4) **←** key, to toggle between parameters while in RECALL or SETUP modifying mode (backwards), to toggle between absolute mV and temperature while in Relative mV mode and between pH buffer and temperature while in pH calibration mode.
- 5) **AutoLOG** key, to start/stop AutoLOG mode.
- 6) **→** key, to toggle between parameters while in RECALL or SETUP modifying mode (forwards), to toggle between absolute mV and temperature while in Relative mV mode and between pH buffer and temperature while in pH calibration mode.
- 7) **pH** key, to select pH range.
- 8) **mV** key, to select mV range.
- 9) **RelmV** key, to select Relative mV range.
- 11) **Resolution** key, to select pH resolution.

#### Numerical keys

- 10) **±** key, to change sign.
- 12) **NUM** key, to activate the numerical keys (0 to 9).

## HI120

### MAIN KEYBOARD ON THE RIGHT



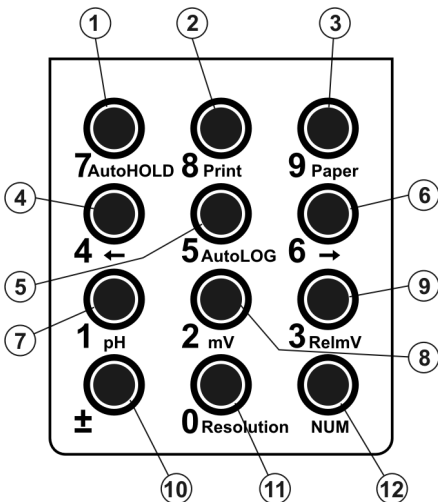
- 1) **CAL** key, to enter and exit/escape calibration mode.  
**SET** key (second function), to enter/exit SETUP mode.
- 2) **CFM** key, to confirm different values.  
**GLP** key (second function), to display Good Laboratory Practice Information.
- 3) **CLR** key, to clear calibration or logged data.
- 4) **▲** key, to manually increase temperature value or other parameters.  
**AutoHOLD** key (second function), to freeze the first stable reading on the LCD.
- 5) **▼** key, to manually decrease temperature value or other parameters.  
**AutoLOG** key (second function), to start/stop AutoLOG mode.
- 6) **MODE** key, to select the measurement unit or to switch focused data.
- 7) **2nd** key, to select second key function.
- 8) **LOG** key, to store measured data.
- 9) **RCL** key, to enter/exit view logged data mode.

*Note: To select second key function, press 2nd and then the desired key. The "2nd" tag will appear on the LCD until the desired key is pressed. To leave second key function selection, press 2nd again.*



## HI122

### KEYBOARD ON THE LEFT



#### Shortcuts to alternate functions

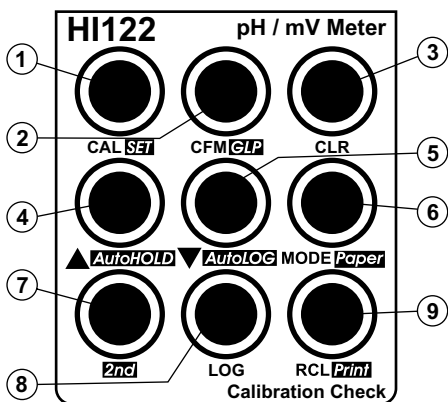
- 1) **AutoHOLD** key, to freeze the first stable reading on the LCD.
- 2) **Print** key, to obtain a printout or to cancel printing.
- 3) **Paper** key, to pull out the paper.
- 4) **←** key, to toggle between parameters while in RECALL or SETUP modifying mode (backwards), to toggle between absolute mV and temperature while in Relative mV mode and between pH buffer and temperature while in pH calibration mode.
- 5) **AutoLOG** key, to start/stop AutoLOG mode.
- 6) **→** key, to toggle between parameters while in RECALL or SETUP modifying mode (forwards), to toggle between absolute mV and temperature while in Relative mV mode and between pH buffer and temperature while in pH calibration mode.
- 7) **pH** key, to select pH range.
- 8) **mV** key, to select mV range.
- 9) **RelmV** key, to select Relative mV range.
- 11) **Resolution** key, to select pH resolution.

#### Numerical keys

- 10) **±** key, to change sign.
- 12) **NUM** key, to activate the numerical keys (0 to 9).

## HI122

### MAIN KEYBOARD ON THE RIGHT



- 1) **CAL** key, to enter and exit/escape calibration mode.  
**SET** key (second function), to enter/exit SETUP mode.
- 2) **CFM** key, to confirm different values.  
**GLP** key (second function), to display Good Laboratory Practice Information.
- 3) **CLR** key, to clear calibration or logged data.
- 4) **▲** key, to manually increase temperature value or other parameters.  
**AutoHOLD** key (second function), to freeze the first stable reading on the LCD.
- 5) **▼** key, to manually decrease temperature value or other parameters.  
**AutoLOG** key (second function), to start/stop AutoLOG mode.
- 6) **MODE** key, to select the measurement unit or to switch focused data.  
**Paper** key (second function), to pull out the paper.
- 7) **2nd** key, to select second key function.
- 8) **LOG** key, to store measured data.
- 9) **RCL** key, to enter/exit view logged data mode.  
**Print** key (second function), to obtain a printout or to cancel printing.

*Note: To select second key function, press 2nd and then the desired key. The "2nd" tag will appear on the LCD until the desired key is pressed. To leave second key function selection, press 2nd again.*

## HI120 AND HI122 SPECIFICATIONS

|                             |   |
|-----------------------------|---|
| RANGE                       | -2.00 to 16.00 pH<br>-2.000 to 16.000 pH  |
|                             | ± 999.9 mV<br>± 2000 mV   |
|                             | -20.0 to 120.0 °C (-4.0 to 248.0 °F)  |
| RESOLUTION                  | 0.01 pH<br>0.001 pH   |
|                             | 0.1 mV<br>1 mV  |
|                             | 0.1 °C (0.1 °F)   |
| ACCURACY<br>@ 25 °C / 68 °F | ± 0.2 mV (± 699.9 mV)<br>± 0.5 mV (± 999.9 mV)<br>± 1 mV (± 2000 mV)  |
|                             | ± 0.4 °C (± 0.7 °F)<br>(excluding probe error)  |
| Relative mV offset range    | ± 2000 mV   |
| pH Calibration              | Up to five-point calibration, 7 standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and 2 custom buffers |
| Temperature compensation    | Manual or Automatic from:<br>-20.0 to 120.0 °C (-4.0 to 248.0 °F)   |
| pH Electrode                | HI1131P   |
| Temperature probe           | HI7662  |
| Logging Interval            | 5 seconds to 180 minutes  |
| Printer (HI122 only)        | Dot matrix, 44 mm wide paper  |
| PC interface                | opto-isolated RS232   |
| Input impedance             | 10 <sup>12</sup> ohm  |
| Power supply                | 12 VDC adapter  |
| Dimensions                  | 280 x 203 x 84 mm (11.0 x 8.0 x 3.3")   |
| Weight                      | 1.8 Kg (4.1 lb); kit with printer: 1.9 Kg (4.2 lb)  |
| Environment                 | 0 – 50 °C (32 – 122 °F)<br>max. 95% RH non-condensing   |
| Warranty                    | 2 years   |

# OPERATIONAL GUIDE

## POWER CONNECTION

Plug the 12 VDC adapter into the power supply socket.

- Notes:**
- These instruments use non volatile memory to retain the pH, mV, temperature calibrations and all other settings, even when unplugged.
  - Make sure a fuse protects the main line.

## ELECTRODE AND PROBE CONNECTIONS

For Hanna Instruments P type pH or ORP electrodes (with internal reference) connect the electrode's BNC to the socket on the back of the instrument (#6 on page 4 and 5) and the pin to the appropriate socket (#5 on page 4 and 5).

- Notes:**
- Electrode condition and response information is displayed on the bar graph gauges during the day the calibration is performed only if Hanna Instruments P type (PIN) electrodes are used.
  - If the electrode is not recognized as a Hanna Instruments P type electrode, the bar graph gauges will blink (25 seconds OFF, 4 seconds ON, full bar graph).

For temperature measurements and automatic temperature compensation, connect the temperature probe to the appropriate socket.

## INSTRUMENT START-UP

- Turn the instrument on by pressing the ON switch.
- All LCD tags are displayed and a beep is heard while the instrument performs a self test.



- The instrument displays then the date on the primary LCD and the time on the secondary LCD, along with the “Remove protective cap” and “Unscrew electrode refilling cap” messages alternatively blinking. These messages alert the user to follow displayed instructions in order to take proper measurements and to improve electrode response.
- The instrument automatically defaults to pH or mV measurement mode, if a Hanna Instruments P type pH or ORP electrode is detected.
- If no Hanna Instruments P type electrode is detected, the instrument starts in the same range as it was at power off.

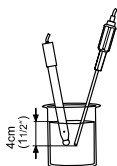
## pH MEASUREMENTS

Make sure the instrument has been calibrated before taking pH measurements.

- Press **MODE** to enter pH mode.

*Note: To change pH resolution, press MODE again or simply Resolution from the left keyboard.*

- Submerge the electrode tip and the temperature probe approximately 4 cm (1½") into the sample to be tested. Allow time for the electrode to stabilize.
- The pH is displayed on the primary LCD and the temperature on the secondary LCD.



**OUT CAL RANGE** feature warns the user if the current reading is out of the calibrated area. The calibrated area is that part of the pH range in which the calibration point assures an accurate reading. If the reading is taken out of the calibration area, the "OUT CAL RANGE" message will blink. The calibrated area is calculated according to the pH resolution used during the reading. To avoid having this message, the calibration points have to be well distributed in the desired measurement range.

If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized water or tap water and then with some of the next sample to prevent cross-contamination and to condition the electrode before immersing it into the sample solution.

The pH reading is affected by temperature. In order to measure the pH accurately, the temperature effect must be compensated for. To use the **Automatic Temperature Compensation** feature, connect and submerge the **HI7662-T** temperature probe into the sample as close as possible to the electrode and wait for a few seconds.

If the temperature of the sample is known, **manual temperature compensation** can be performed by disconnecting the temperature probe.

The display will then show the default temperature of 25 °C (77 °F) or the last temperature reading with the "°C" (or "°F") tag blinking. The temperature can be adjusted with the **ARROW** keys or the numerical keypad (from -20.0 °C to 120.0 °C or from -4.0 °F to 248.0 °F).

Press **NUM** to change the temperature value with the numerical keys. The "2nd" tag will blink.

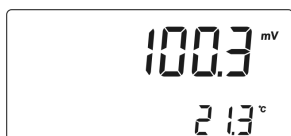
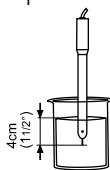
Press **CLR** if you want to delete digits of the displayed value. The remaining digits will shift to right. Introduce the desired value. If the value is out of temperature range, a long beep will be heard. Press **NUM** to confirm the new value or **CAL** to escape without changing the temperature.

## mV/ORP MEASUREMENTS

Oxidation-reduction potential (REDOX) measurements provide the quantification of the oxidizing or reducing power of the tested sample.

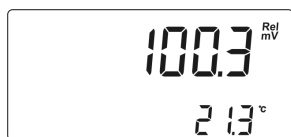
To correctly perform a redox measurement, the surface of the ORP electrode must be clean and smooth.

- Press **MODE** or simply **mV** from the left keyboard to enter mV range.
- Submerge the tip of the ORP electrode (4 cm/1½") into the sample to be tested and allow a few seconds for the reading to stabilize.
- The instruments display the mV reading on the primary LCD and the temperature on the secondary LCD.
- If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD.



## RELATIVE mV MEASUREMENTS

To enter Relative mV mode, press **MODE** or simply **RelmV** from the left keyboard. The relative mV reading will be displayed on the primary LCD and the current temperature value on the secondary LCD.



*Note: Press ← or → from the left keypad to toggle between temperature and absolute mV reading on the secondary LCD.*

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.

## TEMPERATURE MEASUREMENTS

Connect the **HI7662-T** temperature probe to the appropriate socket. Immerse the temperature probe into the sample and allow the reading on the secondary LCD to stabilize.



*Note: The temperature can be displayed in Celsius degrees ( $^{\circ}C$ ) or in Fahrenheit degrees ( $^{\circ}F$ ) (see SETUP for details, page 27).*

## **pH CALIBRATION**

Calibrate the instrument often, especially if high accuracy is required.

The instrument should be recalibrated:

- Whenever the pH electrode is replaced.
- At least once a week.
- After testing aggressive chemicals.
- If "CAL DUE" tags are blinking during measurement.
- If "OUT CAL RANGE" message blinks during pH measurement (the measurement range is not covered by current calibration).

### **PREPARATION**

Pour small quantities of the buffer solutions into clean beakers. If possible, use plastic or glass beakers to minimize any EMC interferences.

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 you are measuring in the acidic range, use pH7.01 or 6.86 as first buffer and pH4.01 or 1.68 as second buffer. If you are measuring in the alkaline range, use pH7.01 or 6.86 as first buffer and pH10.01/9.18 or 12.45 as second buffer.

For extended range measurements (acidic and alkaline), perform a five-point calibration by selecting five of the available buffers.

### **PROCEDURE**

If 0.001 pH resolution is selected, each selected standard buffer value can be updated according to the value on the production lot certificate at 25  $^{\circ}C$  (77  $^{\circ}F$ ). Press **2nd** then **SET** key when a standard pH buffer with 0.001 resolution is selected. The buffer value will start blinking and it can be changed with the **ARROW** keys in a  $\pm 0.020$  pH window.

Calibration has a choice of 7 memorized buffers: pH1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45 and 2 custom buffers.

The custom buffers are a special option that allows the user to calibrate in a buffer solution different from a standard one. Up to two custom buffers can be set in SETUP menu (see page 27). When selected during calibration, the "CUSTOM C1" or "CUSTOM C2" tags are displayed on the LCD and the custom buffer value can be changed in a  $\pm 1.0$  pH window, around the set value.

For accurate measurements it is recommended to perform a five-point calibration. However, at least a two-point calibration is suggested.

The instruments will automatically skip the buffers used during calibration and the buffers which are in a  $\pm 0.2$  pH window, around one of the calibrated buffers.

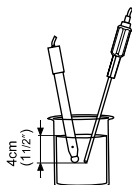
All new calibrations will override existing stored calibration data, in a  $\pm 0.2$  pH window, at these calibration points. The slopes adjacent to the calibration points will be reevaluated.

If the new calibration point has no correspondence in the existing stored calibration data, it is added to it if this is not full, or the instrument will ask which buffer will be replaced by the current buffer.

If at least a two-point calibration has been performed and an offset correction of the electrode is desired, keeping unchanged the existing slopes, perform a one-point calibration with "OFFS" option selected in SETUP menu. If "Pnt" option is selected, the slopes adjacent to the calibration points will be reevaluated.

## FIVE-POINT CALIBRATION

- Immerse the pH electrode and the temperature probe approximately 4 cm (1½") into a buffer solution of your choice (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45, custom buffer 1 or 2, if these were set) and stir gently. The temperature probe should be close to the pH electrode.
- Press **CAL**. The "CLEAR CAL IF NEW ELECTRODE" message will be displayed blinking on the LCD for a few seconds if the instrument was calibrated before and calibration was not cleared.



Press **CLR** if you are using a new electrode or want to clear calibration history, or wait a few seconds to continue.

Press **CAL** again or the **ARROW** keys to skip this message.

*Note: It is very important to clear calibration history when a new electrode is used because most errors and warning messages that appear during calibration depend on calibration history.*

- The instruments will display the measured pH on the primary LCD and the "7.01" buffer on the secondary LCD, together with "CAL" and "Cal Point 1" tags and "7.01" tag blinking.





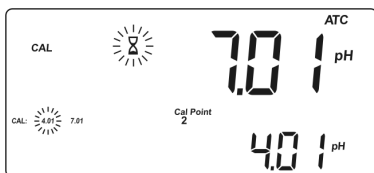
- If necessary, press the **ARROW** keys to select a different buffer value.



- The “⌘” tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, “CFM” tag blinks.
- Press **CFM** to confirm calibration.






- The calibrated value is then displayed on the primary LCD and the secondary LCD will display the second expected buffer value, together with “CAL”, “Cal Point 2” and “7.01” tags and the corresponding buffer tag blinking.



- After the 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. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The “⌘” tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, “CFM” tag blinks.



- Press **CFM** to confirm calibration.
- The calibrated value is then displayed on the primary LCD and the secondary LCD will display the third expected buffer value.
- 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. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The “⌘” tag will blink on the LCD until the reading is stable.

- When the reading is stable and close to the selected buffer, “CFM” tag blinks.
- Press **CFM** to confirm calibration.
- The calibrated value is then displayed on the primary LCD and the secondary LCD will display the fourth expected buffer value. 
- 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. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The “Σ” tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, “CFM” tag blinks.
- Press **CFM** to confirm calibration.
- The calibrated value is then displayed on the primary LCD and the secondary LCD will display the fifth expected buffer value. 
- 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. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The “Σ” tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, “CFM” tag blinks.
- Press **CFM** to confirm calibration.
- The instruments store the calibration values and return to normal measurement mode. 

#### **FOUR, THREE or TWO-POINT CALIBRATION**

- Proceed as described in “FIVE-POINT CALIBRATION” section.
- Press **CAL** after the appropriate accepted calibration point. The instruments will return to measurement mode and will memorize the calibration data.

#### **ONE-POINT CALIBRATION**

Two SETUP selectable options are available: “Pnt” and “OFFS”.

If the “Pnt” option is selected, the adjacent slopes will be reevaluated.

If the “OFFS” option is selected, an electrode offset correction is performed keeping unchanged the existing slopes.

- Proceed as described in “FIVE-POINT CALIBRATION” section.
- Press **CAL** after the first calibration point was confirmed. The instruments will memorize the one-point calibration data and will return to measurement mode.

- Notes:**
- Press **MODE** or **←/→** from the left keyboard to toggle between pH buffer and temperature reading during calibration.
  - Each time a buffer is confirmed, the new calibration parameters replace the old calibration parameters of the corresponding buffer.

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

If the existing stored calibration is full (five calibration points), the instrument ask which buffer will be replaced by current buffer.

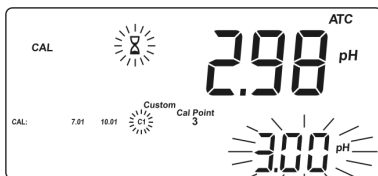


Press the **ARROW** keys to select another buffer to be replaced.  
 Press **CFM** to confirm the buffer that will be replaced.  
 Press **CAL** to leave calibration without replacing.

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

## WORKING WITH CUSTOM BUFFERS

If at least one custom buffer was set in **SETUP** menu, it can be selected for calibration by pressing the **ARROW** keys. Press **2nd** then **SET** key if you want to adjust the buffer value. The buffer value, displayed on the secondary LCD, will start blinking.



Use the **ARROW** keys to change the buffer value.

After about 5 seconds you performed the last change, the buffer value is updated. Press **2nd** then **SET** key if you want to change it again.

*Note: Custom buffer value can be adjusted in a  $\pm 1.00$  pH window, around the set value.*

## **CLEAR CALIBRATION**

Press **CLR** in any moment during calibration. The “CLEAR CAL” tag will appear and “donE” message will be displayed on the secondary LCD.

All old calibrations, starting with current selected buffer are cleared and the instrument continues calibration.

If **CLR** is pressed when “CLEAR CAL IF NEW ELECTRODE” message is displayed blinking, the calibration history is deleted and the instrument will display “hiSt” message on the primary LCD and “donE” message on the secondary LCD, along with “CLEAR CAL” tags. The calibration process will continue starting with 7.01 pH buffer as first buffer.

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

## **CLEAR CALIBRATION**

Press **CLR** in any moment during calibration. The “CLEAR CAL” tag will appear and “donE” message will be displayed on the secondary LCD.

All old calibrations, starting with current selected buffer are cleared and the instrument continues calibration.

If **CLR** is pressed when “CLEAR CAL IF NEW ELECTRODE” message is displayed blinking, the calibration history is deleted and the instrument will display “hiSt” message on the primary LCD and “donE” message on the secondary LCD, along with “CLEAR CAL” tags. The calibration process will continue starting with 7.01 pH buffer as first buffer.

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

## **ENHANCED CALIBRATION MESSAGES**

The stored calibration history to used issue error and warning messages during calibration to help ensure the highest accuracy.

As electrode aging is normally a slow process, substantial changes from previous calibrations are likely due to a temporary problem with the electrode or buffers. Calibrating under these conditions will result measurement errors.

### **ERROR MESSAGES**

Error messages appear if one or all of the calibration parameters are out of accepted windows. When these messages are displayed, calibration cannot be confirmed.

### **WRONG BUFFER**

This message appears when the difference between the pH reading and the value of the selected buffer is too big. If this error message is displayed, check if you have selected the proper calibration buffer.

## **WRONG BUFFER TEMPERATURE**

This message appears if the temperature of the buffer is outside the defined buffer temperature range.

## **WRONG & CONTAMINATED BUFFER / CHECK ELECTRODE**

This message appears if the buffer used is contaminated or the electrode is supposed to be either broken or very dirty.

## **WRONG & CHECK ELECTRODE / CLEAN ELECTRODE**

This message appears if the electrode is supposed to be broken or very dirty.

## **WRONG & OLD / CLEAR CAL & OLD**

This message appears as a result of an erroneous slope condition. If the slope between current calibration point and one of the previous calibration, that was not overridden in current calibration, exceeds slope window (80% to 110%), this message will appear. Press CLR to clear old parameters and continue calibration process or CAL to leave calibration.

## **WARNING MESSAGES**

During calibration, the Calibration Check feature analyzes the electrode calibration history and warns the user when problems have been detected. It is possible to override the warning messages and confirm the calibration but it is not recommended.

## **CLEAR CAL IF NEW ELECTRODE**

This warning is displayed any time you enter calibration and calibration is not cleared or the new calibration parameters are better than the previous ones. You can clear calibration history by pressing CLR, or continue by pressing CAL.

## **CLEAN ELECTRODE**

This warning message appears in order to alert the user that some dirt or deposits could be on the electrode. Refer to the electrode Cleaning Procedure. This ensures the removal of film, dirt or deposits on the glass bulb and reference junction.

## **CONTAMINATED BUFFER**

This warning message appears in order to alert that the buffer could be contaminated. Refresh your buffer and continue the calibration procedure.

## **CHECK ELECTRODE / CHECK BUFFER**

This warning message appears when the electrode slope exceeds the highest accepted slope limit (110%). Check your electrode and use fresh buffers.

## **CLEAN ELECTRODE / CHECK BUFFER**

This warning appears in order to alert the user that the electrode can be dirty or the buffer contaminated. Refer to the electrode Cleaning Procedure and use fresh buffers.

## ELECTRODE CONDITION & ELECTRODE RESPONSE TIME

When using an appropriate Hanna Instruments BNC electrode with pin, the instrument will assess electrode condition and response time during each calibration and will display the calibration status for the rest of the day.



The digital gauge for electrode condition is a representation of the offset and slope performance of the electrode. The response gauge is a function of the stabilization time between the first and second calibration buffers. These gauges reflect electrode performance and should be expected to slowly decrease over the life of the electrode.

The condition and response gauges show the electrode's condition at the time of calibration only and are displayed for the rest of the day the calibration is performed. For a continuous display of electrode condition at the time of calibration, daily calibration is necessary. The electrode condition and response time are also visible when viewing GLP data.

If the instrument is not calibrated, it has been calibrated only in one point, or if calibration history was deleted, the electrode condition and response gauges will be empty.



When using an appropriate Hanna Instruments BNC electrode with pin, the instrument will assess electrode condition and response time during each calibration and will display the calibration status for the rest of the day.

The electrode response is evaluated only when calibration has been performed using pH 7.01 or pH 6.86, pH 4.01 and pH 10.01 or pH 9.18 buffers. When the instrument cannot evaluate the electrode response or pH 1.68/12.45 buffer was used as calibration buffer, the response gauge will be empty.

If the electrode is in a very poor condition, the first condition segment will blink. If the electrode response is very slow, the first response segment will blink.

## RELATIVE mV CALIBRATION

- Press **CAL** when the instrument is in RELATIVE mV measurement mode. The relative mV value is displayed on the primary LCD and the absolute mV value on the secondary LCD.
- Use the **ARROW** keys or the numerical keys if you want to change the displayed relative mV value.

- Notes:**
- Press **MODE** to select another resolution if the displayed value allows it (e.g. if 199.9 is displayed, by pressing **MODE** the value will change to 1999; if 19.9 is displayed, nothing will happen if pressing **MODE**).
  - Pressing **CLR** the displayed value is set to 0.0 mV.
  - Press **NUM** from the left keyboard if you want to change the value using the numerical keys. The “2nd” tag will blink.
  - Press **CLR** to delete the last digit.
  - Press **MODE** to select another resolution (see above).
  - Press **NUM** again to leave the numerical keyboard.
- When the reading is stable, in mV range and the Relative mV offset is inside the offset window ( $\pm 2000$  mV), “CFM” tag blinks.
  - Press **CFM** to confirm relative mV calibration. The instrument will return to measurement mode.
  - If the absolute mV reading is out of range or the Relative mV offset is out of the offset window, “WRONG” tag will blink. Change the input value or the Relative mV offset to complete the calibration process.

## GOOD LABORATORY PRACTICE (GLP)

GLP is a set of functions that allows storage and retrieval of data regarding the maintenance and status of the electrode.

All data regarding pH and Rel mV calibration is stored for the user to review when necessary.

### CALIBRATION ALARM TIME OUT

For pH calibration, all the instruments allow the user to set the number of days before the next required pH calibration. This value can be set from 1 to 7 days. The default setting is **OFF** (disabled).

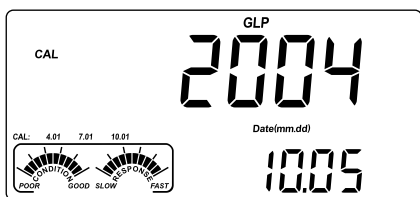
The instrument checks if the time-out has expired. If the time elapsed, “CAL DUE” tags will blink as a reminder.

*Note: If the instrument was not calibrated or all calibration parameters were cleared, “CAL” “DUE” tags will be displayed even if the feature is disabled in SETUP menu.*

### LAST pH CALIBRATION DATA

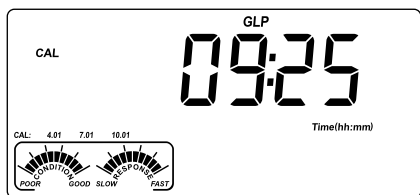
The last pH calibration data is stored automatically after a successful calibration. To view the pH calibration data, press **2nd** then **GLP** key or simply **GLP** from the left keyboard (**HI120**) when the instrument is in pH (mV) measurement mode.

The instrument will display the date (yyyy.mm.dd) of the last calibration.

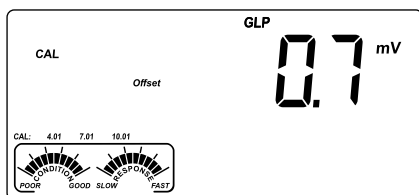


Press the **ARROW** keys to view the next calibration parameter (pressing the **▲** key):

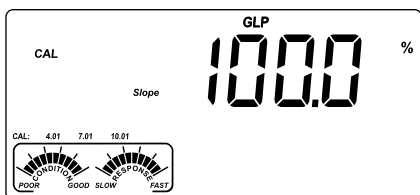
- The time (hh:mm) of the last calibration.



- The pH calibration offset.



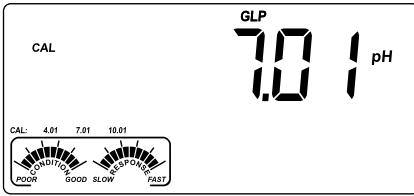
- The pH calibration slope (the GLP slope is the average of the calibration slopes; the percentage is referred to the ideal value of 59.16 mV/pH).



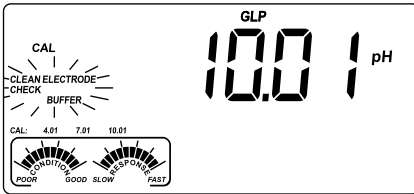


- The calibration buffers in calibrating order, with the corresponding warnings.

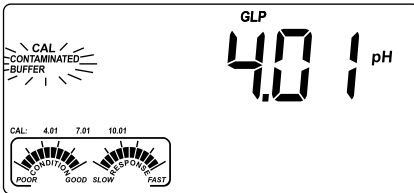
The first pH calibration buffer:



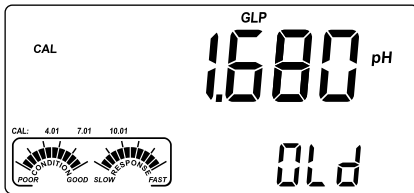
The second pH calibration buffer:



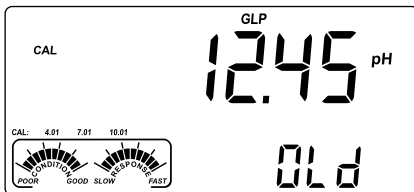
The third pH calibration buffer:



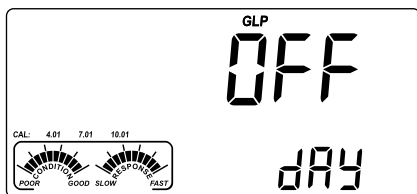
The fourth pH calibration buffer:



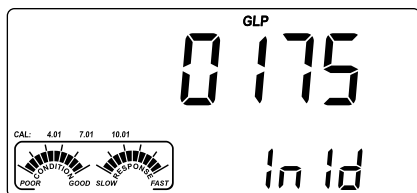
The fifth pH calibration buffer:



- Notes:**
- The “Old” message displayed beside the pH value means that this buffer was not used during last calibration. Press **2nd** then **SET** key if you want to see calibration date (or time, if old calibration was performed in the same day with current calibration).
  - Each calibration buffer is displayed with the resolution from calibration moment.
  - If “no bUF” message appears on the LCD, the instrument informs you that calibration was performed in less than five points.
- The Calibration Alarm Time Out status.  
If disabled, or the number of days until the calibration alarm will be displayed (e.g. 5 days), or from the time calibration expired (e.g. -3 days).



- The instrument ID.



## LAST RELATIVE mV CALIBRATION DATA

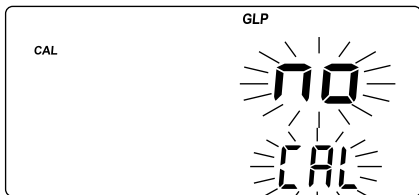
Last Relative mV calibration data is stored automatically after a successful calibration.

To view the Relative mV calibration data, press **2nd** then **GLP** key or simply **GLP** from the left keyboard (**H1120**) while in Relative mV measurement mode.

The instrument will display the Relative mV GLP information.

- The date (yyyy.mm.dd) of the last calibration as in pH GLP mode.  
Press the **ARROW** keys to view the next logged calibration parameter (pressing the **▲** key):
- The Relative mV calibration offset and time (hh:mm) as in pH GLP mode.
- The instrument ID as in pH GLP mode.

- Notes:**
- Press **2nd** then **GLP** key at any moment and the instrument will return to measurement mode.
  - If calibration has not been performed, the instrument displays “no CAL” message blinking.



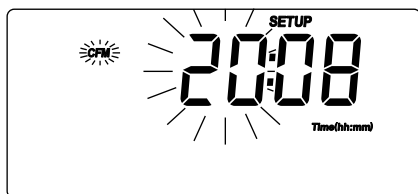
## SETUP

Setup mode allows viewing and modifying the following parameters:

- Calibration Alarm Time Out
- One-point calibration behaviour
- Custom Buffer 1
- Custom Buffer 2
- Alarm High Limit
- Alarm Low Limit
- AutoLOG Start Condition
- AutoLOG End Condition
- AutoLOG Interval
- Temperature Unit
- Current Date (yyyy.mm.dd)
- Current Time (hh:mm)
- Printing Language (**H1122** only)
- Printer Status (**H1122** only)
- Beep Status
- Baud Rate (serial communication)
- Command prefix (serial communication)
- Instrument ID

To enter SETUP mode, press **2nd** then **SET** key, or simply **SET** from the left keyboard (**HI120** only), while the instrument is in measurement mode. Select the desired setup parameter using the **ARROW** keys.

Press **CAL** if you want to change the item value. The selected item (e.g. hour, in setting up the correct time) and “CFM” tag will start blinking.

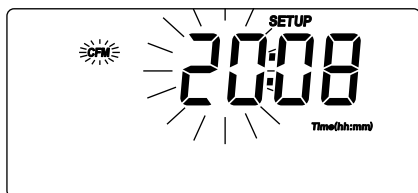


Press the **ARROW** keys to change the displayed value or simply use the numerical keys for all numerical parameters.

**Note:** To use the numerical keys, press **NUM** from the left keyboard. The “2nd” tag will blink. Set the desired number digit by digit. The new introduced digit is always the last one. All the previous digits will shift to left.

To delete digits press **CLR**. Last introduced digit will be deleted and the number will shift to right.

If there is another item to be set (e.g. minutes), press **MODE** or **←/→** from the left keyboard. The other item will start blinking.




Press the **ARROW** keys to change the displayed value or simply use the numerical keys for all numerical parameters.

Press **CFM** to confirm or **CAL** to escape.

Press the **ARROW** keys to select the next/previous parameter.

Press **2nd** then **SET** key, or simply **SET** from the left keyboard (**HI120** only) to exit SETUP menu at any time. The instrument asks for printing a Setup Report (**HI122** only). Press **CFM** to print the Setup Report or **CAL** to return to measurement mode.

The following table lists the SETUP parameters, their valid values range and the factory settings (default):

| Item  | Description              | Valid values                | Default     |
|---|--------------------------|-----------------------------|-------------|
| CAL.DUE   | Alarm Time Out           | OFF or 1 to 7 days          | OFF         |
| 1Pnt  | One-point cal. behaviour | Pnt or OFFS                 | Pnt         |
| Custom C1   | Custom Buffer 1          | -2.00 to 16.00 pH           | no          |
| Custom C2   | Custom Buffer 2          | -2.00 to 16.00 pH           | no          |
| AL.HI   | Alarm High Limit         | pH/mV/RelmV ranges          | no          |
| AL.LO   | Alarm Low Limit          | pH/mV/RelmV ranges          | no          |
| Strt  | AutoLOG Start Condition  | See Time/Date or "btm"      | "btm"       |
| End   | AutoLOG End Condition    | "dur", "SAMP", "rdG"        | "dur"       |
| Interval  | AutoLOG Interval         | 5 s to 180 min              | 5 s         |
| tEMP  | Temperature Unit         | °C or °F                    | °C          |
| Date  | Date (yyyy.mm.dd)        | 2000.01.01 to 2099.12.31    | 2004.01.01  |
| Time  | Time (hh:mm)             | 00:00 to 23:59              | 00:00       |
| LAnG  | Printing Language        | EnG, ItA, ESP, FrA          | English USA |
|  | Printer Status           | ON/OFF                      | OFF         |
| bEEP  | Beep Status              | ON/OFF                      | OFF         |
| bAUd  | Baud Rate                | 600; 1200; 2400; 4800; 9600 | 2400        |
| PrEF  | Command Prefix           | 0 to 47                     | 16          |
| In Id   | Instrument ID            | 0000 to 9999                | 0000        |

- Notes:**
- The custom buffers can be set only with 0.001 pH resolution. If 0.01 pH resolution is selected during calibration, the displayed custom buffer value is a rounded one.
  - For calibration alarm time out, custom buffers, alarm limits, start and stop condition items, if pressing **CLR** while in changing mode, the selected item will be set to default.
  - Printer status and printing language items appear only for **HI122**. The available printing languages are: **EnG** (English), **ItA** (Italiano), **ESP** (Español) and **FrA** (Français).

## ALARMS SETUP

- Select one of the alarm items. The displayed alarm value will be the previous set one.
- Press **MODE** to select the range for alarm. The corresponding range tag will blink.
- Press **CAL** to enter in changing mode. Set the new value using the **ARROW** or the numerical keys.

- Notes:**
- Press **MODE** while in changing mode to select another resolution if the displayed value allows it (e.g. if 199.9 is displayed, by pressing **MODE** the value will change to 1999; if 19.9 is displayed, nothing will happen if pressing **MODE**).
  - Pressing **CLR** the displayed value will be set to default (“no”). The first displayed value after “no”, if one of the **ARROW** keys is pressed, will be 7.00 pH or 0.0 mV, according to the selected range.
  - Press **NUM** from the left keyboard if you want to change the value using the numerical keys. The “2nd” tag will blink.
  - Press **CLR** to delete the last digit.
  - Press **MODE** to select another resolution (see above).
  - Press **NUM** or **CFM** to confirm the introduced value from the numerical keyboard.

When in normal measurement mode:

- If only “AL.LO” item is set, the instrument will beep when the reading is below alarm low value.
- If only “AL.HI” item is set, the instrument will beep when the reading is above alarm high value.
- If both alarms are set, the instrument will beep when the reading is above alarm high value or below alarm low value.

*Note: If “AL.HI” item is less than or equal to “AL.LO” item, “WRONG” tag will blink.*

## AutoLOG SETUP

### AutoLOG Start Condition

- Select the "Strt" item. The displayed AutoLOG start condition will be the previous set one. The default value is "btn" — button (start with key).
- Press and keep hold down **MODE** while in view mode, when time is displayed, to view the set date.
- If pressing CAL while in view mode, the start time will be displayed.

**Notes:**

- Pressing **CLR** while in changing mode, the start condition will be set to default ("btn").
  - The first displayed value after "btn" will be the current time/date.

### AutoLOG End Condition

- Select the "End" item. The displayed AutoLOG end condition will be the previous set one. One of the following options will be available: "dur" (duration), "SAMP" (samples number), "rdG" (reading limits).
- Pressing **MODE** while in view mode, the instrument will display one of the options: "dur", "SAMP", "rdG" & "pH", "rdG" & "mV", "rdG" & "Rel mV".

- Pressing CAL, the instrument will enter in changing mode in according with the selected option and will display one of the following messages:
  - "dur" on the secondary LCD and duration (hh:mm) on the primary LCD, along with "TIME" tag. The default value is 3 hours. The duration can be set from 1 minute to 199 hours and 59 minutes.

*Note: Pressing CLR while in changing mode, the end condition value will be set to default (3 hours).*

- "SAMP" on the secondary LCD and sample number on the primary LCD. The default value is 1000 samples.

*Note: Pressing CLR while in changing mode, the end condition value will be set to default (1000 samples).*

- "rdG" on the secondary LCD and last set limit value on the primary LCD, with the corresponding range tag blinking. The default value is 7.00 pH or 0.0 mV, in according with the selected range.

- Notes:**
- Pressing **MODE** while in view mode, another resolution is selected.
    - Pressing **CLR** while in changing mode, the end condition will be set to default (7.00 pH or 0.0 mV).

The AutoLOG will be started in according with "Strt" item, from button ("btn") by pressing **AutoLOG** or when the starting time condition is reached.

The AutoLOG will stop in according with the selected option for "AutoLOG End Condition" item or when **AutoLOG** is pressed.

## LOGGING

This feature allows the user to log pH and Rel mV, together with temperature automatically. All logged data can be transferred to a PC through the RS232 port. The maximum logging space is 1000 record locations (samples). This can be divided in 1 up to 50 lots (one lot can use all the free space). The lot ID (number) is between 1 and 99 (after 99 it restarts from 1). Only up to 50 lots can be memorized at one time, even if there is free space available.

*Note: When the logged lots are more than one, the total number of samples can be less than 1000, even with full memory, due to the fact that logging memory is divided in pages of 20 samples each.*

The appropriate logging interval can be set from 5 seconds to 180 minutes (see SETUP for details, page 27).

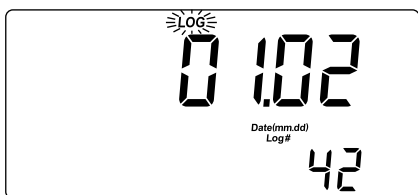
Up to 50 record locations are also provided.

### LOGGING THE CURRENT DATA (LOG ON DEMAND)

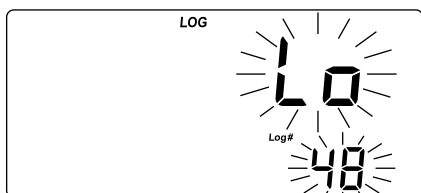
To store the current reading into memory, press LOG while in measurement mode.



The instrument will display the current date (mm.dd) on the primary LCD, the record number on the secondary LCD, the "LOG" tag blinking for a few seconds and then the free locations number.

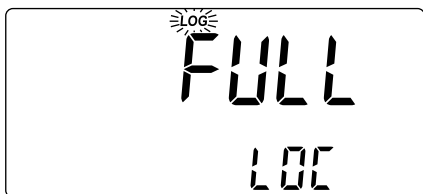


If there are less than 6 memory locations remaining, the record number and "Lo" message will blink for a few seconds to alert the user and then the free locations number is displayed on the LCD.



If the LOG space is full, "FULL LOC" message will be displayed on the LCD for a few seconds with "LOG" tag blinking, and then "FrEE 0" message.





The instrument returns to normal measurement mode.

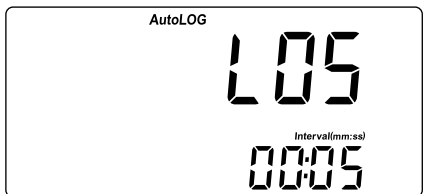
### AutoLOGGING

The setable AutoLOG modes make these instruments very useful in a wide range of applications:

- Start at button or set time/date; stop after a set duration.
- Start at button or set time/date; stop when a set value is reached.
- Start at button or set time/date; stop when a set sample number is reached.

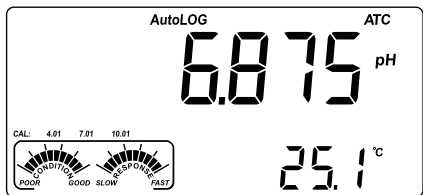
To start autologging using the keyboard, press **2nd** then **AutoLOG** key or simply **AutoLOG** from the left keyboard while the instrument is in measurement mode.

The instrument will display for a few seconds the lot number on the primary LCD and the AutoLOG interval on the secondary LCD, together with "AutoLOG" tag.



- Notes:**
- For the other AutoLOG modes, the autologging starts/stops automatically after the set start/stop condition in SETUP menu is reached and the stop condition is correct.
  - The "AutoLOG" tag will blink if one of these modes is selected and the start condition is not reached.

After data logging is started, the current value is displayed on the primary LCD and the temperature on the secondary LCD, along with "AutoLOG" tag.



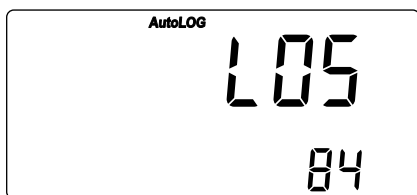
To stop autologging, press **2nd** then **AutoLOG** key again, or simply **AutoLOG** from the left keyboard.

The instrument will display for a few seconds the lot number on the primary LCD and the sample number on the secondary LCD, together with "AutoLOG" tag, and will return to measurement mode.

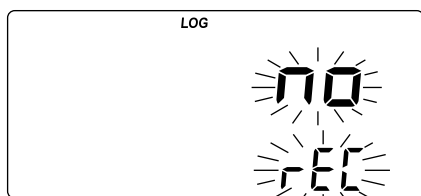
- Notes:**
- If printer is ON, each logged sample is printed only if the AutoLOG interval is at least 30 s (HI122 only).
  - If the AutoLOG pages are full, the "FULL LOC" message will be displayed on the LCD, as in Log on demand mode.

## VIEW LOGGED DATA

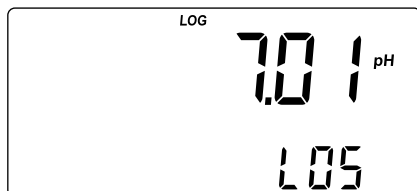
Press **RCL** to retrieve the information stored while in measurement mode. If no data were logged, the instrument displays:



Otherwise, the instrument will display the last **pH** or **Rel mV** memorized reading on the primary LCD and the lot number on the secondary LCD.



*Note: If LOG mode was invoked while the instrument was in mV/Relative mV measurement range, the corresponding memorized reading will be displayed on the primary LCD, along with "RelmV" tag.*

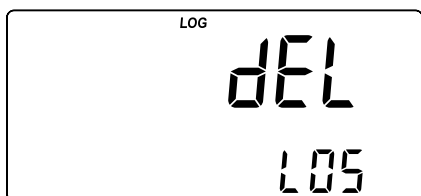


Press **2nd** then **SET** key while in RECALL mode and the instrument will toggle between the lot or record number on the secondary LCD. Use the **ARROW** keys to select another lot or record.

Press **MODE** or **→** from the left keyboard and the instrument will display the next logged parameter as shown in the table below:

| Parameter | Primary LCD    | Secondary LCD          |
|-----------|----------------|------------------------|
| mV        | mV reading     | Temperature            |
| TIME      | Hour & minutes | Seconds                |
| DATE      | Year           | Month & day            |
| OFFSET    | Offset value   | Lot (or record) number |
| SLOPE     | Slope Value    | Lot (or record) number |

- Notes:**
- If pressing **←** from the left keyboard, the previous logged parameter will be displayed.
  - If in Rel mV RECALL mode regarding the slope, the instrument will display “----” message on the primary LCD.
  - The record number refers to an identification number inside a lot.



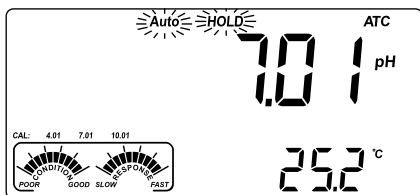
Last displayed parameter is “dEL” message on the primary LCD and the lot number on the secondary LCD.

- Notes:**
- The “LdM” message on the secondary LCD shows that data has been stored in Log on demand mode.
  - Pressing **2nd** then **SET** key, the instrument toggles between lot number, record number (Log on demand only) or all lots.
  - Press **CLR** to delete the selected lot/record or all lots.
- Note: Positions remain free in the Log on demand lot by deleting the last logged samples or all the lot.*
- If “dEL ALL” option was selected, all logged data is deleted and the instrument returns to measurement mode.

Press **RCL** at any time to return to measurement mode.

## AutoHOLD

To freeze the first stable reading on the LCD, press **2nd** then **AutoHOLD** key, or simply **AutoHOLD** from the left keyboard while the instrument is in measurement mode. The “Auto” “HOLD” tags will be displayed blinking on the LCD until the reading will stabilize.



When the reading is stable, the “Auto” “HOLD” tags stop blinking and the reading is frozen.

Press **2nd** then **AutoHOLD** key again, or simply **AutoHOLD** from the left keyboard to return to normal measurement mode.

**Note:** Pressing **MODE** or the specific range keys from the left keyboard, the instrument will skip to the displayed range, without leaving AutoHOLD mode. The **LOG** key also holds AutoHOLD mode.

Pressing **2nd** then **SET**, **GLP** or **RCL** key, the instrument leaves AutoHOLD mode and performs the selected function.

## PRINTING (HI122 only)

A complete set of information based on the measured, set or recorded data can be printed.

Data can be printed on demand (for current reading in measurement mode, GLP and SETUP modes) by pressing **2nd** then **Print** key, or simply **Print** from the left keyboard, or automatic (for AutoLOG and Log on demand modes). Automatic data printing is possible in AutoLOG mode only if the printer is ON and the AutoLOG interval is greater than 30 seconds.

*Note: To cancel printing, press 2nd then Print key again or simply Print from the left keyboard.*

When in pH measurement mode, the printout provides the following information:

|      |            |
|------|------------|
| Date | 2004/10/15 |
| Time | 14:24:55   |
| pH   | 7.00       |
| mV   | 0.0        |
| °C   | 25.0       |

*Note: For Relative mV measurement mode, the Rel. mV value will be printed.*

When in GLP mode, the printout provides the following information:

- For pH range:

```
GLP pH
Instr ID    0002
Date       2004/10/15
Time       15:30:05
Cal Time Out OFF
Offset     0.6mV
Slope      99.7%
Cal Buffers
pH         7.01
pH         4.01
pH         10.01
```

- For Rel mV range:

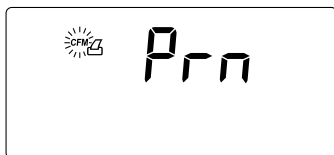
```
GLP Rel mV
Instr ID    0002
Date       2004/10/15
Time       14:20:05
Off.RelmV   0.3
```

When in SETUP mode, the following information can be printed:

- If **2nd** then **Print** key are the first keys pressed after entering SETUP mode, a SETUP table of contents will be printed:

```
INSTRUMENT SETUP
Calibration
Alarm Time Out
One-point cal
behaviour
pH Custom Buf.1
pH Custom Buf.2
Beep Alarms:
Alarm high
Alarm low
AutoLOG:
Start condition
End condition
Interval
Current Date
Current Time
Printing
Language
Printer ON/OFF
Beep ON/OFF
Baud rate
Command prefix
Instrument ID
Active Keys:
▲ -next item
▼ -prev. item
CAL-enter in
modifying mode
SET-exit SETUP
MODE-select
parameter
See also items
Help printings
```

- When exiting SETUP mode, the instrument asks if a SETUP REPORT shall be printed. The "Prn" message will be displayed on the LCD, together with "☞" tag and "CFM" tag blinking.



- Press **CFM** to print the SETUP REPORT or **CAL** to escape without printing.

```

SETUP REPORT
Instr ID      0002
Cal Time Out OFF
One-Cal Point
              Pnt
Custom Buffer
Cb1           3.00
Cb2 Not defined
Date 2004/10/15
Time 16:25:31
Printer      ON
Language     ENG
Beep         OFF
ALARM HIGH LIMIT
pH           no
mV           no
Rel mV       no
ALARM LOW LIMIT
pH           no
mV           no
Rel mV       no
AUTOLOG:
Interval     00:30
START Condition:
Date 2004/10/15
Time 16:20:00
END Condition:
Sample No    20
  
```

When in SETUP mode, if pressing **CAL**, then **Print** for a chosen parameter, a help printout will come out, providing the following information (e.g. AutoLOG Interval):

```

SET AUTOLOG
INTERVAL
(5s to 180min)
Active Keys:
▲ -increment
▼ -decrement
CAL-exit,no save
MODE-select
parameter
CFM-save & exit
  
```

When in LOG mode, a printout will automatically come out, providing the following information:

- For pH/mV Log on demand:

```
LOG ON DEMAND
Instr ID    0002
Date       2004/10/15
Time       17:38:25
Sample No   5
pH         7.01
mV         0.0
°C         25.0
Offset     0.9mV
Slope      99.7%
```

- For AutoLOG mode:

```
START AUTOLOG
Instr ID    0002
Lot         L03
Date       2004/10/15
Time       18:05:01
Interval    00:30
Slope      99.7%
Offset     0.1mV

Sample No   1
pH         7.02
mV        -0.5
°C         25.0

Sample No   2
pH         7.01
mV        -0.2
°C         25.0

Sample No   3
pH         6.97
mV         1.9
°C         24.9

STOP AUTOLOG
Date       2004/10/15
Time       18:06:51
```

*Note: If selecting a different printing language, all data will be printed in the selected language.*

## TEMPERATURE CALIBRATION (for technical personnel only)

All the instruments are factory calibrated for temperature.

Hanna Instruments' temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

If the temperature measurements are inaccurate, temperature recalibration should be performed.

For an accurate recalibration, contact your local Hanna Instruments Office, or follow the instructions below.

- 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.
- Use a calibrated thermometer with a resolution of 0.1 °C or 0.1 °F as a reference thermometer. Connect the **HI7662-T** temperature probe to the appropriate socket.
- With the instrument off, press and hold down the **CAL & ▲** keys, then power on the instrument. The "CAL" tag will appear and the secondary LCD will show 0.0 °C or 32.0 °F. The primary LCD will display the measured temperature or the "----" message, if the measured temperature is out of range.
- Immerse the temperature probe into the vessel with ice and water as close as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
- Use the **ARROW** keys to set the reading on the secondary LCD to that of ice and water, measured by the reference thermometer. When the reading is stable and close to the selected calibration point, "CFM" tag will blink.



- Press **CFM** to confirm. The secondary LCD will display 50.0 °C or 122.0 °F.



- 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.
- Use the **ARROW** keys to set the reading on the secondary LCD to that of the hot water.
- When the reading is stable and close to the selected calibration point, "CFM" tag will blink.



- Press **CFM** to confirm. The instrument returns to measurement mode.



*Note: If the reading is not close to the selected calibration point, “WRONG” tag will blink. Change the temperature probe and restart calibration.*

## mV CALIBRATION (for technical personnel only)

All the instruments are factory calibrated for mV.

Hanna Instruments’ ORP electrodes are interchangeable and no mV calibration is needed when they are replaced.

If the measurements are inaccurate, mV recalibration should be performed. For an accurate recalibration, contact your local Hanna Instruments Office, or follow the instructions below.

A two or three-point calibration can be performed at 0.0 mV, 600.0 mV and 1800.0 mV.

- Attach to the BNC connector (#6 on page 4 and 5) a mV simulator with an accuracy of  $\pm 0.1$  mV.
- With the instrument off, press and hold down the **CFM & LOG** keys, then power on the instrument. The “CAL” tag will appear and the secondary LCD will show 0.0 mV.
- Set 0.0 mV on the simulator. When the reading is stable and close to the selected calibration point, “CFM” tag will blink.
- Press **CFM** to confirm. The secondary LCD will display 600 mV.
- Set 600.0 mV on the simulator. When the reading is stable and close to the selected calibration point, “CFM” tag will blink.
- Press **CFM** to confirm. The secondary LCD will display 1800 mV.
- Set 1800.0 mV on the simulator. When the reading is stable and close to the selected calibration point, “CFM” tag will blink.
- Press **CFM** to confirm. The instrument returns to measurement mode.

- Notes:**
- If the reading is not close to the selected calibration point, “WRONG” tag will blink. Verify calibration condition or contact your vendor if you can not calibrate.
  - Press **CAL** in any moment of the calibration process. The instrument will return to measurement mode. If calibration process is stopped after 600 mV is confirmed, the 600 mV range is calibrated and calibration parameters are memorized.

## PC INTERFACE

Data transmission from the instrument to the PC can be done with the **HI92000** Windows® compatible software (optional). **HI92000** also offers graphing and on-line help feature.

Data can be exported to the most popular spreadsheet programs for further analysis.

To connect your instrument to a PC, use the optional Hanna Instruments **HI920010** cable connector. Make sure that your instrument is switched off and plug one connector to the instrument's RS232C socket and the other to the serial port of your PC.

To allow our users access to the latest version of Hanna Instruments PC compatible software, we made the products 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.

- Notes:**
- Other cables than **HI920010** may use a different configuration. In this case, communication between instrument and PC may not be possible.
  - If you are not using Hanna Instruments **HI92000** software, please see the following instructions.

### SENDING COMMANDS FROM PC

It is also possible to remotely control the instrument with any terminal program. Use **HI920010** cable to connect the instrument to a 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 the scheme is:

<command prefix> <command> <CR>

where: <command prefix> is a selectable ASCII character between 0 and 47 (default 16).  
<command> is the command code.

*Note: Either small or capital letters can be used.*

### SIMPLE COMMANDS

|            |   |
|------------|---|
| <b>MOD</b> | Is equivalent to pressing <b>MODE</b>               |
| <b>CAL</b> | Is equivalent to pressing <b>CAL</b>                |
| <b>CFM</b> | Is equivalent to pressing <b>CFM</b>                |
| <b>UPC</b> | Is equivalent to pressing the <b>UP</b> arrow key   |
| <b>DWC</b> | Is equivalent to pressing the <b>DOWN</b> arrow key |
| <b>LOG</b> | Is equivalent to pressing <b>LOG</b>                |
| <b>RCL</b> | Is equivalent to pressing <b>RCL</b>                |
| <b>ALG</b> | Is equivalent to pressing <b>AutoLOG</b>            |
| <b>SET</b> | Is equivalent to pressing <b>SET</b>                |
| <b>PRT</b> | Is equivalent to pressing <b>PRINT (HI122 only)</b> |
| <b>CLR</b> | Is equivalent to pressing <b>CLR</b>                |
| <b>OFF</b> | Is equivalent to pressing <b>OFF</b>                |
| <b>AHD</b> | Is equivalent to pressing <b>AutoHOLD</b>           |

**CHR xx** Change the instrument's range according to the parameter 's value (xx):

- xx=00 pH range/0.001 resolution
- xx=01 pH range/0.01 resolution
- xx=03 mV range
- xx=04 Relative mV range

The meter 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

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

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

**Note:** The temperature is sent with two decimals and in Celsius degrees, even if the set temperature unit was Fahrenheit degrees.

**DA?** Requests the date.

**TI?** Requests the time.

**MDR** Requests the instrument's model name and firmware code.

**GLP** Requests the calibration data record.

**PAR** Requests the setup parameters setting.

**NSL** Requests the number of logged samples.

**?ML** Requests the information about AutoLOG.

**/MLPxxx** Selects the lot.

**?DM** Downloads the selected AutoLOG.

**LODPxxx** Requests the xxx<sup>th</sup> record logged data.

**LODPALL** Requests all Log on demand.

- Notes:**
- "Err8" is sent if the instrument is not in measurement mode.
  - "Err7" is sent if a different range is requested during AutoLOGGING mode (for **CHR xx** command only).
  - "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.
  - Invalid commands will be ignored.

## pH BUFFER TEMPERATURE DEPENDENCE

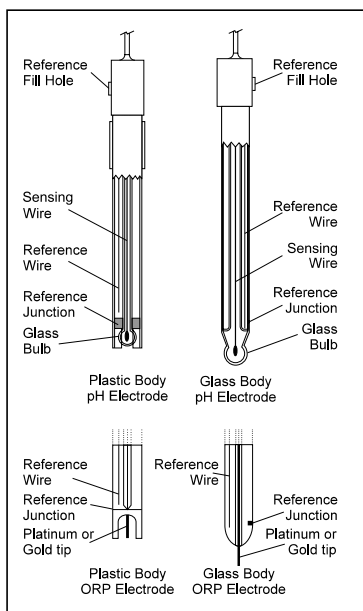
Temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions.

During calibration the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature.

| TEMP |     | pH BUFFERS |       |       |       |       |        |        |
|------|-----|------------|-------|-------|-------|-------|--------|--------|
| °C   | °F  | 1.679      | 4.010 | 6.862 | 7.010 | 9.177 | 10.010 | 12.454 |
| 0    | 32  | 1.670      | 4.007 | 6.982 | 7.130 | 9.459 | 10.316 | 13.379 |
| 5    | 41  | 1.670      | 4.002 | 6.949 | 7.098 | 9.391 | 10.245 | 13.178 |
| 10   | 50  | 1.671      | 4.000 | 6.921 | 7.070 | 9.328 | 10.180 | 12.985 |
| 15   | 59  | 1.673      | 4.001 | 6.897 | 7.046 | 9.273 | 10.118 | 12.799 |
| 20   | 68  | 1.675      | 4.004 | 6.878 | 7.027 | 9.222 | 10.062 | 12.621 |
| 25   | 77  | 1.679      | 4.010 | 6.862 | 7.010 | 9.177 | 10.010 | 12.450 |
| 30   | 86  | 1.683      | 4.017 | 6.851 | 6.998 | 9.137 | 9.962  | 12.286 |
| 35   | 95  | 1.688      | 4.026 | 6.842 | 6.989 | 9.108 | 9.919  | 12.128 |
| 40   | 104 | 1.693      | 4.037 | 6.837 | 6.983 | 9.069 | 9.881  | 11.978 |
| 45   | 113 | 1.700      | 4.049 | 6.834 | 6.979 | 9.040 | 9.847  | 11.834 |
| 50   | 122 | 1.707      | 4.062 | 6.834 | 6.978 | 9.014 | 9.817  | 11.697 |
| 55   | 131 | 1.715      | 4.076 | 6.836 | 6.979 | 8.990 | 9.793  | 11.566 |
| 60   | 140 | 1.724      | 4.091 | 6.839 | 6.982 | 8.969 | 9.773  | 11.442 |
| 65   | 149 | 1.734      | 4.107 | 6.844 | 6.987 | 8.948 | 9.757  | 11.323 |
| 70   | 158 | 1.744      | 4.123 | 6.850 | 6.993 | 8.929 | 9.746  | 11.211 |
| 75   | 167 | 1.755      | 4.139 | 6.857 | 7.001 | 8.910 | 9.740  | 11.104 |
| 80   | 176 | 1.767      | 4.156 | 6.865 | 7.010 | 8.891 | 9.738  | 11.003 |
| 85   | 185 | 1.780      | 4.172 | 6.873 | 7.019 | 8.871 | 9.740  | 10.908 |
| 90   | 194 | 1.793      | 4.187 | 6.880 | 7.029 | 8.851 | 9.748  | 10.819 |
| 95   | 203 | 1.807      | 4.202 | 6.888 | 7.040 | 8.829 | 9.759  | 10.734 |

During calibration the instrument will display the pH buffer value at 25 °C (77 °F).

## ELECTRODE CONDITIONING & MAINTENANCE



### PREPARATION PROCEDURE

Remove the protective cap of the pH electrode.

DO NOT BE ALARMED IF SALT DEPOSITS ARE PRESENT. This is normal with electrodes. They will disappear when rinsed with water.

During transport, tiny bubbles of air may form inside the glass bulb affecting proper functioning of the electrode. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction is dry, soak the electrode in **HI70300** or **HI80300** Storage Solution for at least one hour.

#### For refillable electrodes:

If the filling solution (electrolyte) is more than 2½ cm (1") below the fill hole, add **HI7082** or **HI8082** 3.5M KCl Electrolyte Solution for double junction or **HI7071** or **HI8071** 3.5M KCl + AgCl Electrolyte Solution for single junction electrodes.

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

#### For AmpHel® electrodes:

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

## MEASUREMENT

Rinse the pH electrode tip with distilled water. Immerse the tip (bottom 4 cm /1½") in the sample and stir gently for a few seconds.

For a faster response and to avoid cross-contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements.

Make sure the sleeve holes of the ORP probe are completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

## STORAGE PROCEDURE

To minimize clogging and assure a quick response time, the glass bulb and the junction of pH electrode should be kept moist and not allowed to dry out. Replace the solution in the protective cap with a few drops of **HI70300** or **HI80300** Storage Solution or, in its absence, Filling Solution (**HI7071** or **HI8071** for single junction and **HI7082** or **HI8082** for double junction electrodes). Follow the Preparation Procedure on page 45 before taking measurements.

*Note: NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER.*

## PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for connection to the instrument must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode. Rinse off any salt deposits with water.

### pH Probe Maintenance

For refillable electrodes:

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.

Follow the Storage Procedure above.

### pH CLEANING PROCEDURE

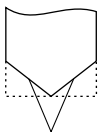
- *General* Soak in Hanna Instruments **HI7061** or **HI8061** General Cleaning Solution for approximately ½ hour.
- *Protein* Soak in Hanna Instruments **HI7073** or **HI8073** Protein Cleaning Solution for 15 minutes.
- *Inorganic* Soak in Hanna Instruments **HI7074** Inorganic Cleaning Solution for 15 minutes.
- *Oil/grease* Rinse with Hanna Instruments **HI7077** 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 **HI70300** or **HI80300** Storage Solution for at least 1 hour before taking measurements

## PRINTER MAINTENANCE (HI122 only)

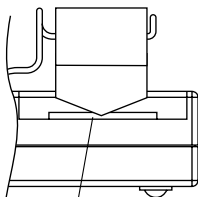
**HI122** instrument uses plain paper rolls 44 mm width. To insert a new paper roll, follow the procedure below:

- For an easier insertion, cut the paper edge as shown in the next figure:
- Put the paper roll on the paper holder attached to the printer.



**CUT**

- Insert the paper edge into the printer slot as shown below:

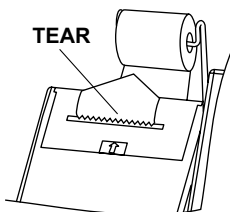


**INSERT**

- Simply press **Paper** from the left keyboard to feed the printer. Allow about 5 cm (2") to exit from the printer.



- Tear the paper out for its edge to be straight, as shown below:



**TEAR**

The paper is now properly inserted and the printer is ready to print.

## TROUBLESHOOTING GUIDE

| SYMPTOM  | PROBLEM   | SOLUTION   |
|--|---|--|
| Slow response/<br>excessive drift.   | Dirty pH electrode.   | Soak the electrode tip in HI7061 solution for 30 minutes and then clean the electrode.   |
| Readings fluctuate up and down (noise).  | Clogged/dirty junction. Low electrolyte level (refillable electrodes only). | Clean the electrode. Refill with fresh solution (for refillable electrodes only).  |
| The display shows blinking dashes during pH measurements.                        | Out of range in the pH scale.   | Make sure the pH sample is in the specified range. Recalibrate. Check the electrolyte level and the general state of the pH electrode. |
| The display shows blinking reading during measurement.                           | Reading out of range.   | Electrode not connected.   |
| Out of range in the mV scale.  | Dry membrane/junction.  | Soak in HI70300 Storage solution for at least one hour.  |
| The meter does not work with the temperature probe.                              | Out of order temperature probe.   | Replace the probe.   |
| The meter fails to calibrate or gives faulty readings.                           | Broken or out of order pH electrode.  | Replace the electrode.   |
| Explicit warnings are displayed during pH calibration.                           | Dirty/broken pH electrode, contaminated reference or buffers.               | Follow displayed instructions.   |
| The electrode condition and response gauges are not displayed after calibration. | Electrode without pin or pin is not connected.                              | Use Hanna Instruments P type pH electrode and check the pin connection.  |

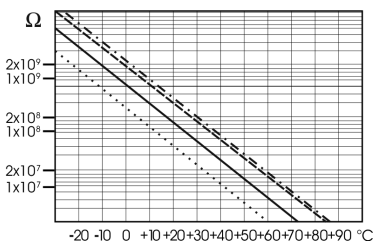


## TROUBLESHOOTING GUIDE (cont.)

| SYMPTOM   | PROBLEM  | SOLUTION  |
|---|--|---|
| The electrode condition and response gauges are empty | The meter has not been calibrated on the current day. Only one-point calibration has been performed. | Perform a two-point calibration procedure. Calibrate using pH7.01 and pH4.01 buffers. |
| The meter displays empty Electrode Response scale.    | Not enough data available to evaluate the response time.   | Repeat calibration more carefully.  |
| At startup the meter displays all LCD permanently.    | One of the keys is blocked.  | Check the keyboard or contact the vendor.   |
| Long beep heard when pressing a key.                  | Key without function in current mode. End of range reached with the ARROW keys.                      | Don't press keys without function in current mode.                                    |
| Digits can not be introduced with the numeric keys.   | Maximum value reached for corresponding range.   | Delete digits.  |
| "Prn Error" message displayed.                        | Printer error.   | Turn off the meter and then turn it on. If the error persists, contact the vendor.    |
| "Err xx" error message displayed.                     | Internal error.  | Turn off the meter and then turn it on. If the error persist, contact the vendor.     |

## TEMPERATURE CORRELATION FOR pH SENSITIVE GLASS

The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. It takes more time for the reading to stabilize if the resistance is higher. In addition, the response time will suffer to a greater degree at temperatures below 25 °C (77 °F).



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

For these reasons high humidity environments, short circuits and static discharges are detrimental to a stable pH reading.

The pH electrode's life also depends on the temperature. 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' 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 <sup>-1</sup> Na <sup>+</sup>                    | 13.00 | 0.10  |
|  | 13.50 | 0.14  |
|  | 14.00 | 0.20  |
| 1.0 Mol L <sup>-1</sup> Na <sup>+</sup>                    | 12.50 | 0.10  |
|  | 13.00 | 0.18  |
|  | 13.50 | 0.29  |
|  | 14.00 | 0.40  |

## ACCESSORIES

### pH BUFFER SOLUTIONS

|          |  |
|----------|--|
| HI70004P | pH4.01 Buffer Sachets, 20 mL, 25 pcs.                  |
| HI70007P | pH7.01 Buffer Sachets, 20 mL, 25 pcs.                  |
| HI70010P | pH10.01 Buffer Sachets, 20 mL, 25 pcs.                 |
| HI7001L  | pH1.68 Buffer Solution, 500 mL bottle                  |
| HI7004L  | pH4.01 Buffer Solution, 500 mL bottle                  |
| HI7006L  | pH6.86 Buffer Solution, 500 mL bottle                  |
| HI7007L  | pH7.01 Buffer Solution, 500 mL bottle                  |
| HI7009L  | pH9.18 Buffer Solution, 500 mL bottle                  |
| HI7010L  | pH10.01 Buffer Solution, 500 mL bottle                 |
| HI7001L  | pH1.68 Buffer Solution in FDA approved bottle, 500 mL  |
| HI8004L  | pH4.01 Buffer Solution in FDA approved bottle, 500 mL  |
| HI8006L  | pH6.86 Buffer Solution in FDA approved bottle, 500 mL  |
| HI8007L  | pH7.01 Buffer Solution in FDA approved bottle, 500 mL  |
| HI8009L  | pH9.18 Buffer Solution in FDA approved bottle, 500 mL  |
| HI8010L  | pH10.01 Buffer Solution in FDA approved bottle, 500 mL |

### ELECTRODE STORAGE SOLUTIONS

|          |   |
|----------|---|
| HI70300L | Storage Solution, 460 mL bottle                 |
| HI80300L | Storage Solution in FDA approved bottle, 460 mL |

### ELECTRODE CLEANING SOLUTIONS

|          |  |
|----------|--|
| HI70000P | Electrode Rinse Sachets, 20 mL, 25 pcs.                    |
| HI7073L  | Protein Cleaning Solution, 460 mL bottle                   |
| HI7074L  | Inorganic Cleaning Solution, 460 mL bottle                 |
| HI7077L  | Oil & Fat Cleaning Solution, 460 mL bottle                 |
| HI8073L  | Protein Cleaning Solution in FDA approved bottle, 460 mL   |
| HI8077L  | Oil & Fat Cleaning Solution in FDA approved bottle, 460 mL |

## ELECTRODE REFILL ELECTROLYTE SOLUTIONS

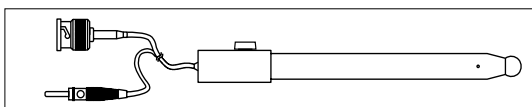
|        |   |
|--------|---|
| HI7071 | 3.5M KCl + AgCl Electrolyte, 4x30 mL, for single junction electrodes                        |
| HI7072 | 1M KNO <sub>3</sub> Electrolyte, 4x30 mL  |
| HI7082 | 3.5M KCl Electrolyte, 4x30 mL, for double junction electrodes                               |
| HI8071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

## ORP PRETREATMENT SOLUTIONS

|         |  |
|---------|--|
| HI7091L | Reducing Pretreatment Solution, 460 mL bottle  |
| HI7092L | Oxidizing Pretreatment Solution, 460 mL bottle |

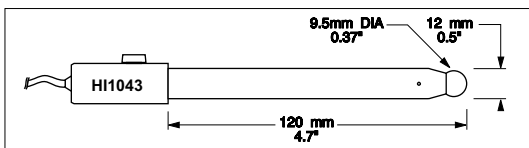
## pH ELECTRODES

All electrodes with code ending with P are supplied with BNC & pin connectors and 1 m (3.3') cable, as shown below:



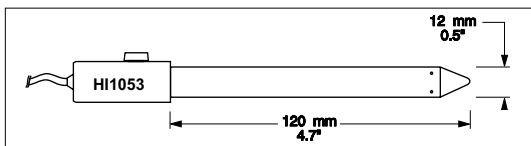
### HI1043P

Glass-body, double junction, refillable, combination pH electrode.  
Use: strong acid/alkali.



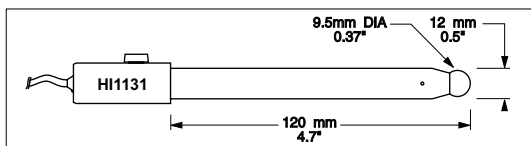
### HI1053P

Glass-body, triple ceramic, conic shape, refillable, combination pH electrode.  
Use: emulsions.



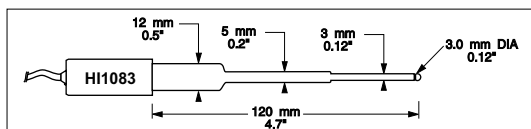
### HI1131P

Glass-body, double junction, refillable, combination pH electrode.  
Use: general purpose.



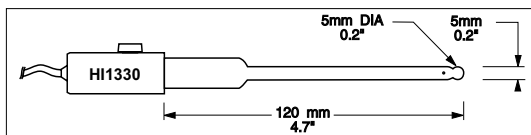
### HI1083P

Glass-body, micro, Viscolene, non-refillable, combination pH electrode.  
Use: biotechnology, micro titration.



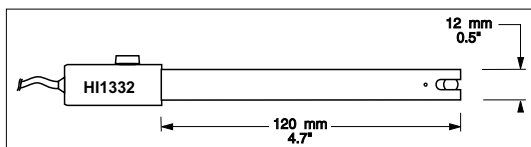
### HI1330P

Glass-body, semimicro, single junction, refillable, combination pH electrode.  
Use: laboratory, vials.



### HI1332P

Plastic-body (Ultem®), double junction, refillable, combination pH electrode.  
Use: general purpose.

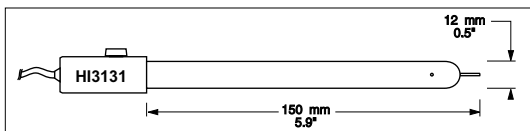


## ORP ELECTRODES

### HI3131P

Glass-body, refillable, combination platinum **ORP** electrode.

Use: titration.



Consult the Hanna General Catalog for more electrodes with BNC and pin connectors.

## OTHER ACCESSORIES

|          |   |
|----------|---|
| HI710005 | Voltage adapter from 115 VAC to 12 VDC (USA plug)   |
| HI710006 | Voltage adapter from 230 VAC to 12 VDC (European plug)  |
| HI710012 | Voltage adapter from 240 VAC to 12 VDC (UK plug)  |
| HI710013 | Voltage adapter from 230 VAC to 12 VDC (South African plug)   |
| HI710014 | Voltage adapter from 230 VAC to 12 VDC (Australian plug)  |
| HI8427   | pH and ORP electrode simulator with 1 m (3.3') coaxial cable ending in female BNC connectors        |
| HI931001 | pH and ORP electrode simulator with LCD and 1m (3.3') coaxial cable ending in female BNC connectors |
| HI7662-T | Temperature probe with 1 m (3.3') cable   |
| HI710032 | Pack of 10 plain paper spare rolls (HI122)  |
| HI710033 | Replacement ink cartridge (HI122)   |
| HI740157 | Plastic electrode refilling pipette (20 pcs.)   |
| HI92000  | Windows® compatible software  |
| HI920010 | 9 to 9-pin RS232 cable  |

## 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 meters' performance. For yours and the meter's safety do not use or store the meter in hazardous environments.

## 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](http://www.hannainst.com).



## WARRANTY

H1120 and H1122 are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. Electrodes and probes are guaranteed 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 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.

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