HI98199

Multiparameter Meter pH/mV, EC, Dissolved Oxygen & Temperature

INSTRUCTION MANUAL

HANNA® instruments

Dear Customer,

Thank you for choosing a Hanna Instruments product.
Please read this instruction manual carefully before using this meter.
This manual will provide you with the necessary information for correct use of this meter, as well as a precise idea of its versatility.
If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

TABLE OF CONTENTS

1. PRELIMINARY EXAMINATION

Remove the meter from the packing material and examine it carefully. For further assistance, please contact your local Hanna Instruments Office or email us at tech@hannainst.com.
Each HI98199 is delivered in a rugged carrying case and is supplied with:

- HI829113 Digital pH probe with 4 m (13') cable
- HI700601 General purpose cleaning solution
- HI7004 pH 4.01 buffer solution
- HI7007 pH 7.01 buffer solution
- HI920015 Micro USB cable 1.8 m (6')
- 100 mL Beaker (2 pcs.)
- 1.5V AA batteries (4 pcs.)
- Instruction manual
- Instrument quality certificate
- Probe quality certificate

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

2. GENERAL DESCRIPTION & INTENDED USE

HI98199 is a versatile meter that can monitor pH, EC and dissolved oxygen when paired with the respective probe in a compact, rugged, IP67 waterproof body.
The main features of the HI98199 are:

- Auto-recognition for connected probe.
- Messages and warnings clearly displayed on the backlit LCD.
- Available log space for up to 45000 samples.
- A dedicated **HELP** key for assistance anytime.

3. SPECIFICATIONS

pH / mV (HI829113 pH Probe)	Range	0.00 to 14.00 pH / ±600.0 mV
	Resolution	0.01 pH / 0.1 mV
	Accuracy	±0.02 pH / ±0.5 mV
	Calibration	automatic one, two, or three points of five standard buffers (pH 4.01, 6.86, 7.01, 9.18, 10.01) or one custom buffer
EC (HI763093 EC Probe)	Range	0 to 200 mS/cm
	Resolution	**manual**: 1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm **automatic**: 1 µS/cm from 0 to 9999 µS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm; 0.1 mS/cm from 100.0 to 200.0 mS/cm **automatic mS/cm**: 0.001 mS/cm from 0.000 to 9.999 mS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm; 0.1 mS/cm from 100.0 to 200.0 mS/cm
	Accuracy	±1.5% of reading or ±2 µS/cm whichever is greater
	Calibration	automatic single-point, with six standard solutions (84 µS/cm, 1413 µS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm) or custom point
TDS (HI763093 EC Probe)	Range	0.0 to 200.0 ppt (g/L) (the maximum value depends on the TDS factor)
	Resolution	**manual**: 1 ppm (mg/L); 0.001 ppt (g/L); 0.01 ppt (g/L); 0.1 ppt (g/L); 1 ppt (g/L) **automatic**: 1 ppm (mg/L) from 0 to 9999 ppm (mg/L); 0.01 ppt (g/L) from 10.00 to 99.99 ppt (g/L); 0.1 ppt (g/L) from 100.0 to 200.0 ppt (g/L) **automatic ppt (g/L)**: 0.001 ppt (g/L) from 0.000 to 9.999 ppt (g/L); 0.01 ppt (g/L) from 10.00 to 99.99 ppt (g/L); 0.1 ppt (g/L) from 100.0 to 200.0 ppt (g/L)
	Accuracy	±1% of reading or ±1 ppm (mg/L) whichever is greater
	Calibration	based on conductivity calibration

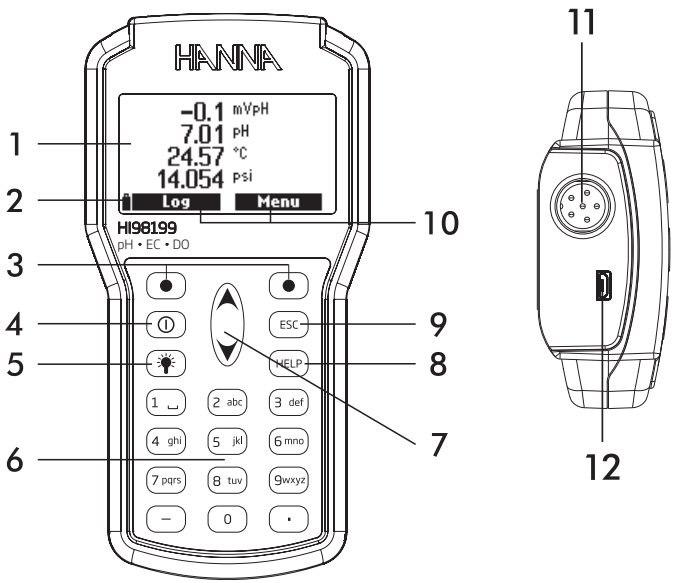
Resistivity (HI763093 EC Probe)	Range	0 to 999999 Ω•cm; 0 to 1000.0 kΩ•cm; 0 to 1.0000 MΩ•cm
	Resolution	1 Ω•cm; 0.1 kΩ•cm; 0.0001 MΩ•cm
	Calibration	based on conductivity calibration
Salinity (HI763093 EC Probe)	Range	0.00 to 70.00 PSU
	Resolution	0.01 PSU
	Accuracy	±2% of reading or ±0.01 PSU whichever is greater
	Calibration	based on conductivity calibration
Seawater σ (HI763093 EC Probe)	Range	0.0 to 50.0 σ_t, σ_0, σ_{15}
	Resolution	0.1 σ_t, σ_0, σ_{15}
	Accuracy	±1 σ_t, σ_0, σ_{15}
	Calibration	based on conductivity calibration
Dissolved Oxygen (HI764103 DO Probe)	Range	0.0 to 500.0%; 0.00 to 50.00 ppm (mg/L)
	Resolution	0.1%; 0.01 ppm (mg/L)
	Accuracy	0.0 to 300.0%: ±1.5% of reading or ±1.0% whichever is greater 300.0 to 500.0%: ±3% of reading 0.00 to 30.00 ppm (mg/L): ±1.5% of reading or ±0.10 ppm (mg/L), whichever is greater 30.00 ppm (mg/L) to 50.00 ppm (mg/L): ±3% of reading
	Calibration	automatic one or two points at 0, 100% or one custom point
Atmospheric Pressure (HI764103 DO Probe)	Range	450 to 850 mmHg; 17.72 to 33.46 in Hg; 600.0 to 1133.2 mbar; 8.702 to 16.436 psi; 0.5921 to 1.1184 atm; 60.00 to 113.32 kPa
	Resolution	0.1 mmHg; 0.01 in Hg; 0.1 mbar; 0.001 psi; 0.0001 atm; 0.01 kPa
	Accuracy	±3 mmHg within ±15 °C from the temperature during calibration
	Calibration	automatic at one custom point

Temperature	Range	-5.00 to 55.00 °C; 23.00 to 131.00 °F; 268.15 to 328.15 K
	Resolution	0.01 °C; 0.01 °F; 0.01 K
	Accuracy	±0.15 °C; ±0.27 °F; ±0.15 K
	Calibration	automatic at one custom point
Additional Specifications	Temperature Compensation	automatic from -5 to 55 °C (23 to 131 °F)
	Logging Memory	45000 records (continuous logging or log-on-demand)
	Logging Interval	one second to three hours
	PC Connectivity	via USB (with Hanna PC software)
	Environment	0 to 50 °C (32 to 122 °F); RH 100% IP67
	Battery Type / Life	1.5V AA batteries (4) / approximately 400 hours of continuous use without backlight (50 hours with backlight)
	Dimensions / Weight	185.0 x 93.0 x 35.2 mm (7.3 x 3.6 x 1.4") / 400 g (14.2 oz.)

4. DESCRIPTION

FRONT VIEW

TOP VIEW



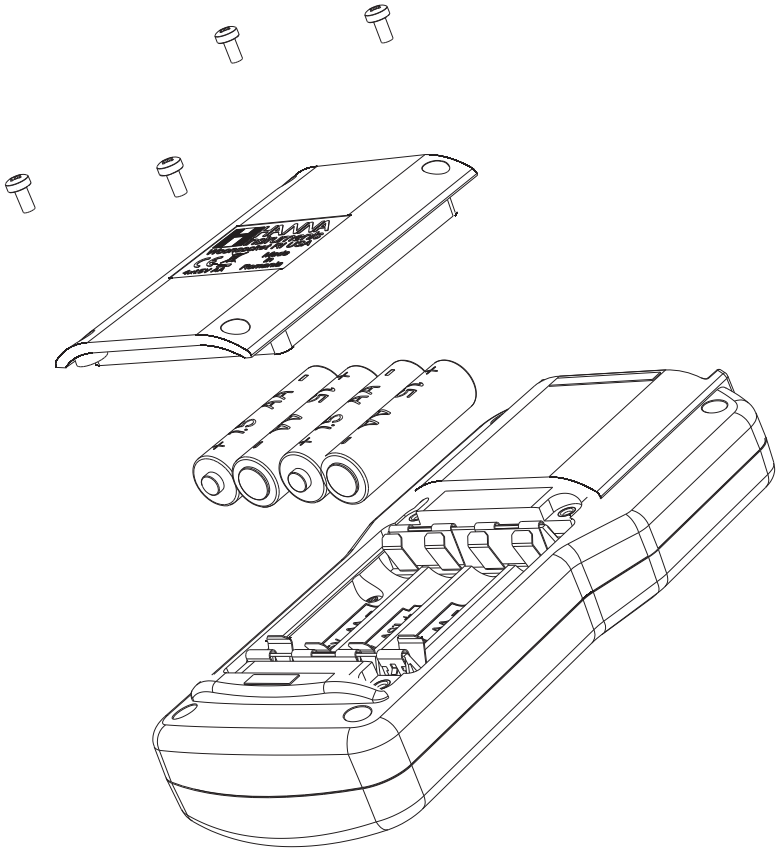
1. Graphic LCD
2. Battery level indicator
3. (●) Press the functional keys to perform the function displayed above them on the LCD.
4. (⏻) Power button
5. (☀) Press to turn the backlight ON and OFF
6. Alphanumeric keypad
7. (▲▼) Press to move up or down in a menu or help screen.
8. (HELP) Press to display the help screen.
9. (ESC) Press to exit the current screen.
10. Virtual option keys. Press the functional key on the keypad to perform the action.
11. Electrode DIN connector
12. Mini USB connector

5. GENERAL OPERATIONS

5.1. BATTERY REPLACEMENT

To replace the batteries, follow the next steps:

1. Turn OFF the instrument.
2. Remove the four screws on the back of the instrument to open the battery compartment.
3. Remove the old batteries.
4. Insert four new 1.5V AA batteries in the battery compartment while paying attention to the correct polarity.
5. Close the battery compartment using the four screws.



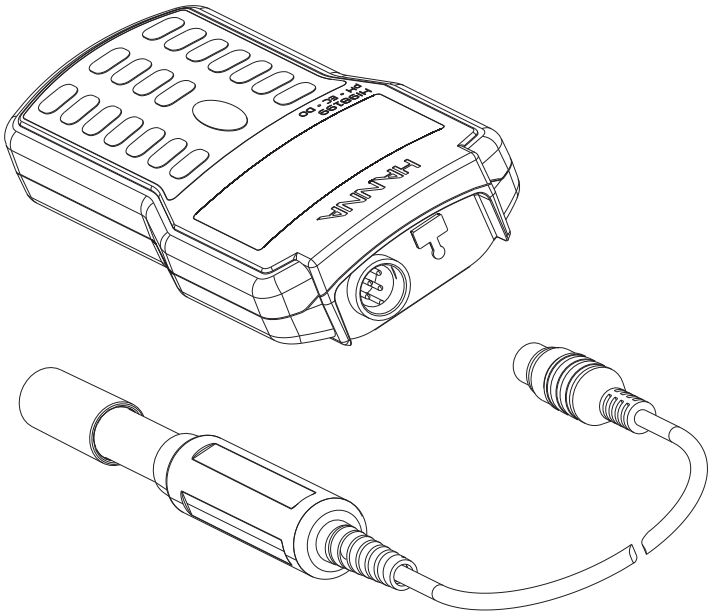
BATTERY LIFE

The battery life of the HI98199 meter is dependent on the probe, backlight usage and logging interval. The backlight will consume the most power.

	pH	DO	EC
Backlight Off, 1 sec log	380 hours	380 hours	320 hours
Backlight Off, 4 min log	500 hours	500 hours	410 hours
Backlight Off, 10 min log	550 hours	550 hours	420 hours
Backlight On, 4 min log	50 hours	52 hours	42 hours
Backlight On, 10 min log	55 hours	56 hours	45 hours

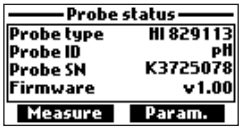
5.2. CONNECTING THE PROBE

Connect the appropriate sensor to the DIN connector on the top of meter. The meter will automatically detect the connected sensor when the meter is powered on.



5.3. TURNING THE METER ON

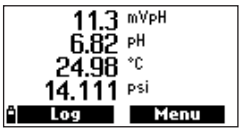
Turn the instrument **ON** by pressing the **ON/OFF** key. At start-up the display will show the Hanna Instruments logo, meter name, and firmware version.
If a probe is connected, the meter displays the **Probe status**. The probe status screen identifies the probe and allows access to Parameters or Measure menus.



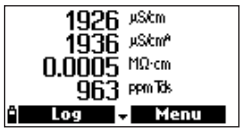
5.4. MEASUREMENT MODE

In measurement mode HI98199 will measure data for all enabled parameters simultaneously.

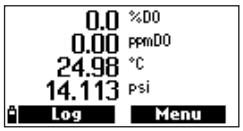
- Select the number of parameters that are to be shown on the screen at one time, press the corresponding alphanumeric key (i.e. for 2 parameters press the number 2). The meter will automatically resize the font.
- Use the ▲/▼ keys to scroll through the enabled parameters.



HI829113 pH probe



HI763093 EC probe



HI764103 DO probe

6. PROBE CONDITIONING & MAINTENANCE

6.1. pH PROBE (HI829113)

- Remove the protective cap. Do not be alarmed if salt deposits are present, this is normal. Rinse the probe with water.
- Shake the electrode down as you would do with a clinical thermometer to eliminate any air bubbles inside the glass bulb.
- If the bulb and/or junction are dry, soak the electrode in HI70300 storage solution for a minimum of 30 minutes. Rinse with water.
- Calibrate before using.
- When the electrode is not in use, add a few drops of HI70300 storage solution to the protective cap and replace the cap. To ensure a quick response, the glass bulb and the junction should be kept moist and not allowed to dry out.

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

6.2. DO PROBE (HI764103)

The HI764103 is shipped dry. To hydrate the probe and prepare it for use:

- Remove the black & red plastic cap. This cap is used for shipping purposes only and can be thrown away.
- Insert the O-ring in the membrane.
- Rinse the supplied membrane (HI76409A) with electrolyte while shaking it gently. Refill with clean electrolyte.
- Gently tap the membrane over a surface to ensure that no air bubbles remain trapped. To avoid damaging the membrane, do not touch it with your fingers.
- With the sensor facing down, screw the cap clockwise to the end of the threads. Some electrolyte will overflow.

The same procedure is used to replace the electrolyte monthly and membrane every 2 months.

6.3. EC PROBE (HI763093)

Rinse the probe with clean water after measurements. If more cleaning is required, remove the probe sleeve and clean the probe with a cloth or a nonabrasive detergent. Make sure to reinsert the sleeve onto the probe properly and in the right direction. After cleaning the probe, recalibrate the instrument.

7. PARAMETER SETUP MENU

Press **Menu** to enter the main setup menu.

From the main menu, use the ▲/▼ keys to highlight **Parameter Setup** and then press **Select**. The following options will be displayed:

7.1. SELECTING PARAMETERS

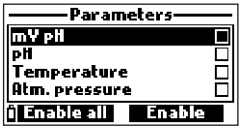
From the Parameter setup menu, use the ▲/▼ keys to highlight **Select parameters** and then press **Select**.

The available parameters will vary depending on the connected probe. Use the ▲/▼ keys to scroll through the menu. Press the right softkey to enable or disable a single parameter, or the left softkey to enable or disable all parameters. A checked box means that the parameter is enabled.

> ***Warning:*** *If the selected parameters are modified, the previously saved logs for the connected probe will be updated.*

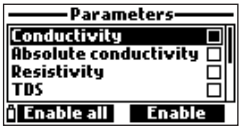
HI829113 digital pH probe

Parameters: mV pH, pH, Temperature, Atm. pressure



HI763093 digital EC probe

Parameters: Conductivity, Absolute conductivity, Resistivity, TDS, Salinity, Seawater, Temperature, Atm. pressure



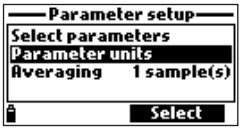
HI764103 digital DO probe

Parameters: %DO saturation, DO concentration, Temperature, Atm. pressure

Note: *If the password protection is enabled, you will be required to enter the password before any parameters can be modified.*

7.2. PARAMETER UNITS

From the Parameter setup menu, use the ▲/▼ keys to highlight **Parameter Units** and then press **Select**.

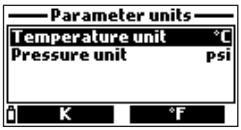


The available parameters units will vary depending on the connected probe.

TEMPERATURE UNIT

Option: °C, °F, K

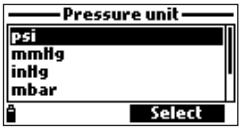
Press the functional key to select the desired temperature unit.



PRESSURE UNIT

Option: psi, mmHg, inHg, mbar, atm, kPA

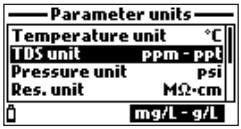
Press the **Modify** key to change the pressure unit. Use the ▲/▼ arrow key to select the pressure unit. Press **Select** to confirm or **ESC** to return to the menu without saving.



TDS UNIT (HI763093 EC PROBE ONLY)

Option: ppm-ppt or mg/L-g/L

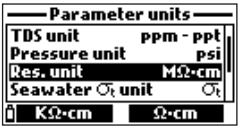
Press the functional key to select the desired TDS unit.



RESISTIVITY UNIT (HI763093 EC PROBE ONLY)

Option: MΩ • cm, Ω • cm, KΩ • cm

Press the functional key to select the desired resistivity unit.

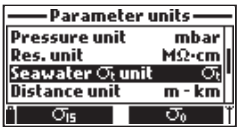


SEAWATER σ UNIT (HI763093 EC PROBE ONLY)

Option: σ_t, σ_0, σ_{15}

Press the functional key to select the desired seawater unit.

The measurement is calculated from the conductivity measurement and depends on water pressure, temperature and salinity. Users can select the reference temperature: t (current temperature), 0 (0 °C) or 15 (15 °C).



EC RESOLUTION UNIT (HI763093 EC PROBE ONLY)

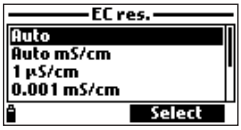
Option: Auto, Auto mS/cm, 1 µS/cm, 0.001 mS/cm, 0.01 mS/cm, 0.1 mS/cm, 1 mS/cm

Press the **Modify** key to change the EC resolution. Use the ▲/▼ arrow key to select the resolution. Press **Select** to confirm or **ESC** to return to the menu without saving.

Auto allows the meter to choose the range that will optimize the measurement.

Auto mS/cm allows the meter to choose the range that will optimize the measurement, reading will be in mS/cm only.

1 µS/cm, 0.001 mS/cm, 0.01 mS/cm, 0.1 mS/cm or 1 mS/cm the meter will display the measurement in the selected resolution.

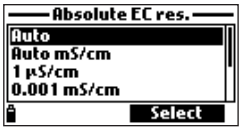


ABSOLUTE EC RESOLUTION UNIT (HI763093 EC PROBE ONLY)

Option: Auto, Auto mS/cm, 1µS/cm, 0.001 mS/cm, 0.01 mS/cm, 0.1 mS/cm, 1 mS/cm

Press the **Modify** key to change the value. Use the ▲/▼ arrow key to select the value. Press **Select** to confirm or **ESC** to return to the menu without saving.

Absolute conductivity displays the conductivity measurement without temperature compensation. A small letter "A" is added to the measurement unit to indicate no temperature compensation.



TDS RESOLUTION UNIT (HI763093 EC PROBE ONLY)

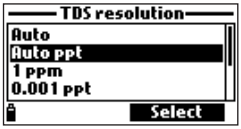
Option: Auto, Auto ppt, 1 ppm, 0.001 ppt, 0.01 ppt, 0.1 ppt, 1 ppt

Press the **Modify** key to change the TDS resolution. Use the ▲/▼ arrow key to select the resolution. Press **Select** to confirm or **ESC** to return to the menu without saving.

Auto allows the meter to choose the range that will optimize the measurement.

Auto ppt allows the meter to choose the range that will optimize the measurement, reading will only be in ppt.

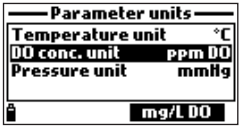
1 ppm, 0.001 ppt, 0.01 ppt, 0.1 ppt or 1 ppt the meter will display the measurement in the selected resolution.



DO CONCENTRATION UNIT (HI764103 DO PROBE ONLY)

Option: ppm or mg/L

Press the functional key to select the desired dissolved oxygen measurement unit.



7.3. PARAMETER COEFFICIENTS (EC & DO probes only)

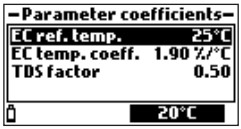
From the **Parameter** setup menu, use the ▲/▼ keys to highlight Parameter coefficients and then press **Select**.

> ***Warning:*** *The previously saved logs for the connected probe will be updated with the selected coefficients.*

EC REFERENCE TEMPERATURE (HI763093 EC PROBE ONLY)

Option: 25 °C or 20 °C

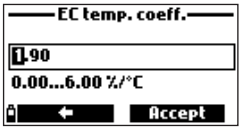
Press the functional key to select the EC reference temperature.



EC TEMPERATURE COEFFICIENT (HI763093 EC PROBE ONLY)

Option: 0.00 to 6.00 %/°C

For freshwater samples temperature coefficient is approximately 1.90 %/°C. If the actual temperature coefficient of your sample is known, press **Modify** to enter **EC temp. coeff.** screen. Use the alphanumeric keypad to enter the value, press **Accept** to save or **ESC** to return to the menu.



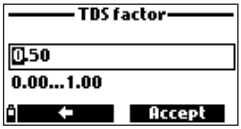
TDS FACTOR (HI763093 EC PROBE ONLY)

Option: 0.00 to 1.00

TDS is calculated from the conductivity of the solution based on the following equation:

$$TDS = \text{factor} \times EC_{25}$$

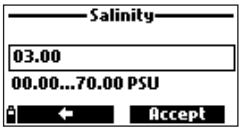
Typical TDS factor for strong ionic solution is 0.50, while weak ionic solutions (i.e. fertilizer) is 0.70. Press **Modify** to enter **TDS factor** screen. Use the alphanumeric keypad to enter the value, press **Accept** to save or **ESC** to return to the menu.



SALINITY (HI764103 DO PROBE ONLY)

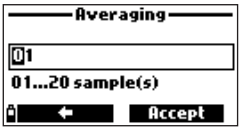
Option: 0.00 to 70.00 PSU

Press **Modify** to enter **Salinity** screen. Use the alphanumeric keypad to enter the value, press **Accept** to save or **ESC** to return to the menu.



7.4. AVERAGING

From the Parameter setup menu, use the ▲/▼ keys to highlight **Averaging** and then press **Select**.



Option: 1 to 20 readings

Press **Modify** to enter the **Averaging** screen. Use the alphanumeric keypad to enter the value, press **Accept** to save or **ESC** to return to the menu.

Averaging is a software filter used to minimize sensor noises and provide a more stable reading. Averaging is particularly useful to get a representative reading from flowing water. Averaging will affect all measurements. Readings are taken every second. During logging, the first sample will be delayed by a few seconds if averaging is used.

8. CALIBRATION

Press **Menu** to enter the main setup menu, use the ▲/▼ keys to highlight **Calibration** and then press **Select**.

8.1. pH PROBE CALIBRATION (HI829113)

All calibration data is stored on the probe, allowing probes to be connected to different meters without recalibration.

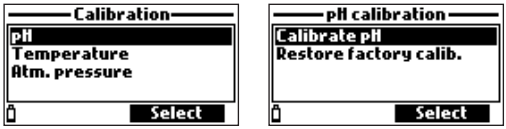
It is recommended to calibrate the instrument frequently, especially if high accuracy is required. More frequent calibrations may be required depending on the type of sample being tested, i.e. turbid biologically active water samples will require more frequent cleanings and calibrations than cleaner waters.

The probe should be recalibrated:

- Whenever the probe is replaced.
- At least once a week.
- After testing aggressive samples.
- After cleaning the sensor.
- If "Outside Cal Range" message blinks during measurement (the measurement is outside the current calibration range).
- If enabled, when the "CAL DUE" calibration time out message is displayed.

pH CALIBRATION

From the **Calibration** menu, use the ▲/▼ keys to highlight **pH** and then press **Select**.



Calibrate pH allows the user to perform a new calibration using up to three buffers. When a three-point calibration is performed the existing data is overwritten. A single or two-point calibration will use existing calibration data, if available. Use the ▲/▼ keys to highlight **Calibrate pH** and then press **Select**.

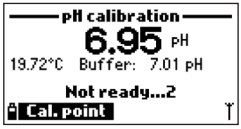
PREPARATION

Pour small quantities of the buffer solutions into clean beakers. If possible, use plastic beakers to minimize any EMC interferences. For accurate calibration and to minimize cross-contamination, use two beakers for each buffer solution: one for rinsing the electrode and one for calibration.

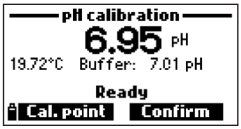
PROCEDURE

The measured pH value is displayed, along with the temperature and the buffer value on the second level.

- To change the buffer value, press the **Cal. point**, use the ▲/▼ keys to select the new buffer, press **Select** to use the highlighted value.
- Submerse the tip of the pH electrode approximately 3 cm (1¼") into the first buffer rinse solution and stir gently.
- Submerse the tip of the pH electrode approximately 3 cm (1¼") into the first buffer solution and stir gently. The "Not Ready" message is displayed.



- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.

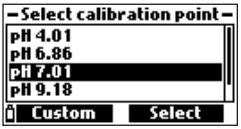


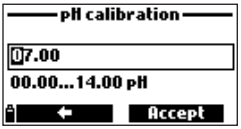
- Press **Confirm** to accept the calibration point.
- To save a one or two-point calibration, press **ESC** after the calibration buffer has been confirmed.
- Repeat the steps above to add a second or third point to the calibration.
- Press **OK** to return to the **Calibration** menu.
- Press **Measure** to return to the measurement screen.

CUSTOM BUFFER CALIBRATION

To select the custom buffer:

- Press **Cal. Point**, then **Custom**.
- Use the alphanumeric keypad to enter the value at the current temperature, then press **Accept**.

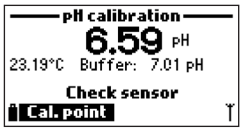


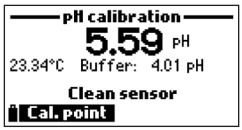


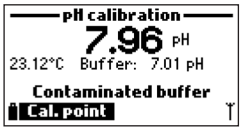
Note: *The custom buffer can only be used as the first calibration point.*

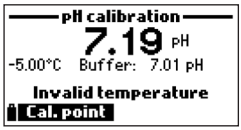
pH CALIBRATION ERROR MESSAGES

If the meter does not accept a pH calibration point, a short message is displayed to indicate the possible error source.









Problems which arise during calibration can have different sources: the sensor, measuring temperature, buffer solutions etc. Special note should be taken of the symptoms of the problem as these are useful for locating the source of the problem.

- "Input out of scale": the pH value is out of range. The pH sensor may require replacement.
- "Check sensor": the electrode may be broken, very dirty or the user has attempted to calibrate the same buffer value twice.
- "Wrong buffer": the displayed pH reading is too far from the selected buffer value. This is often seen immediately after a buffer calibration has been completed but before the pH sensor has been moved to the next buffer. Check if the correct calibration buffer has been selected.
- "Invalid temperature": the buffer temperature is outside the acceptable range.
- "Wrong buffer" / "Contaminated buffer" / "Check electrode": the buffer is contaminated or the sensor is broken or very dirty.
- "Check sensor" / "Clean sensor": the electrode is broken or very dirty.
- "Wrong" / "Clear old calibration": erroneous slope condition. These messages appear if the slope difference between the current and previous calibration exceeds the slope window (80% to 110%). Press the **Clear** softkey to clear the previous calibration data and continue the calibration, or press **ESC** to quit the pH calibration mode.

RESTORING FACTORY CALIBRATION

When a new pH probe is being used, some of the error and warning messages are based on the previous calibration. Restoring factory calibration will delete the user calibration and restore the factory default calibration. Use the ▲/▼ keys to highlight **Restore factory calib.** and then press **Select**.

8.2. DO PROBE CALIBRATION (HI764103)

It is recommended to calibrate the instrument frequently, especially if high accuracy is required. More frequent calibrations may be required depending on the type of sample being tested, i.e. turbid biologically active water samples will require more frequent cleanings and calibrations than cleaner waters.

The probe should be recalibrated:

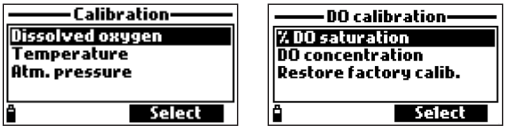
- Whenever the probe or membrane is replaced.
- At least once a week.
- After testing aggressive samples.
- After cleaning the sensor.
- If "Outside Cal Range" message blinks during measurement (the measurement is outside the current calibration range).
- If enabled, when the "CAL DUE" calibration time out message is displayed.

It is recommended to calibrate dissolved oxygen at the measurement site to prevent changes in altitude and barometric pressure.

Note: *If %DO saturation is calibrated, the DO concentration range will also be calibrated and vice versa.*

% DO SATURATION

From the **Calibration** menu, use the ▲/▼ keys to highlight **Dissolved oxygen** and then press **Select**.



- To change the calibration point, press the **Cal. point**, use the ▲/▼ keys to select the new value, press **Select** to use the highlighted value.
- To calibrate at 100 %, fill the calibration beaker with approximately 4 mm (5/32") of water and screw it onto the probe. The membrane should not be wet.

- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.
- Press **Accept** to accept the calibration point.
- To save a one-point calibration press **ESC** after the calibration point has been confirmed.

- Submerse the probe into HI7040 Zero Oxygen solution and stir gently for 2 to 3 minutes. The "Not Ready" message is displayed.
- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.
- Press **Confirm** to accept the calibration point.
- Press **OK** to return to the "Calibration" menu.
- Press **Measure** to return to the measurement screen.

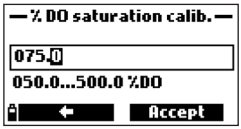
Note: *The user can perform a single-point calibration by pressing ESC after the first point is accepted. If the DO input is not within the acceptable range, the message "Invalid input" is displayed.*

SINGLE-POINT CUSTOM % SATURATION CALIBRATION

To select the custom value:

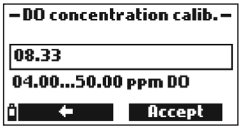
- Press **Cal. Point**, then **Custom**.
- A text box will be displayed. Use the alphanumeric keypad to enter the value, then press **Accept**.

Note: *Only a one-point calibration is available when using a custom calibration point.*



DO PROBE CONCENTRATION (HI764103)

From the **Calibration** menu, use the ▲/▼ keys to highlight **DO** concentration and then press **Select**.



- From the "DO calibration" menu, select the "DO concentration" option, insert the known concentration. Allow the sensors to reach thermal equilibrium with the solution. Stir or agitate, if possible, to keep fresh solution in front of the membrane and press **OK**.
- When the reading is stable, the stability timer will count down and **Confirm** will appear. Press **Confirm** to accept the value.
- When the messages "Storing" and "Calibration completed" appear, the calibration is completed. To return to the "Calibration" menu, press **OK**.
- To return to the main menu, press **ESC** twice.

RESTORING FACTORY CALIBRATION

When a new DO probe or membrane is being used some of the warning messages are based on the previous calibration. Restoring factory calibration will delete the user calibration and restore the factory default calibration. Use the ▲/▼ keys to highlight **Restore factory calib**. and then press **Select**.

8.3. EC PROBE CALIBRATION (HI763093)

It is recommended to calibrate the instrument frequently, especially if high accuracy is required. More frequent calibrations may be required depending on the type of sample being tested, i.e. turbid biologically active water samples will require more frequent cleanings and calibrations than cleaner waters.

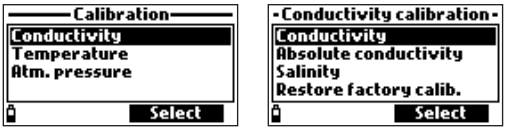
The probe should be recalibrated:

- Whenever the probe is replaced.
- At least once a week.
- After testing aggressive samples.
- After cleaning the sensor.
- If "Outside Cal Range" message blinks during measurement (the measurement is outside the current calibration range).
- If enabled, when the "CAL DUE" calibration time out message is displayed.

Before performing a conductivity calibration inspect the EC sensor for debris or blockages. The EC electrodes are situated inside the two small channels found in the bottom of the conductivity sensor. Clean using the small brush from the probe maintenance kit. Flush with water before calibration.

CONDUCTIVITY

From the **Calibration** menu, use the ▲/▼ keys to highlight **Conductivity** and then press **Select**.



- Pour small quantities of the calibration solution into clean beakers. To minimize cross-contamination, use two beakers: the first one for rinsing the sensor and the second one for calibration.
- To change the calibration solution, press the **Cal. point**, use the ▲/▼ keys to select the new buffer, press **Select** to use the highlighted value.
- Submerse the EC electrode into the calibration rinse solution and move it up and down gently to fill the EC sensor channels with solution.
- Submerse the EC electrode into calibration solution, tap the electrode gently to remove any trapped air bubbles. The "Not Ready" message is displayed.
- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.
- Press **Confirm** to accept the calibration point.
- Press **OK** to return to the **Calibration** menu.
- Press **Measure** to return to the measurement screen.

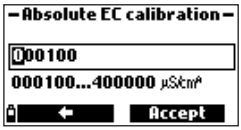
CUSTOM CALIBRATION POINT

To select the custom value:

- Press **Cal. Point** then **Custom**.
- A text box will be displayed. Use the alphanumeric keypad to enter the value, then press **Accept**.

ABSOLUTE CONDUCTIVITY

From the **Calibration** menu, use the ▲/▼ keys to highlight **Absolute Conductivity** and then press **Select**.



- A text box will be displayed. Use the alphanumeric keypad to enter the value, then press **Accept**.
- Pour small quantities of the calibration solution into clean beakers. To minimize cross-contamination, use two beakers: the first one for rinsing the sensor and the second one for calibration.
- Submerse the EC electrode into the calibration rinse solution and move it up and down gently to fill the EC sensor channels with solution.
- Submerse the EC electrode into calibration solution, tap the electrode gently to remove any trapped air bubbles. The "Not Ready" message is displayed.
- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.
- Press **Confirm** to accept the calibration point.
- Press **OK** to return to the **Calibration** menu.
- Press **Measure** to return to the measurement screen.

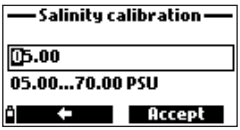
SALINITY

Solutions with known PSU values can be used to calibrate the sensor.

From the **Calibration** menu, use the ▲/▼ keys to highlight **Salinity** and then press **Select**.

- A text box will be displayed. Use the alphanumeric keypad to enter the value, then press **Accept**.
- Pour small quantities of the calibration solution into clean beakers. To minimize cross-contamination, use two beakers: the first one for rinsing the sensor and the second one for calibration.
- Submerse the EC electrode into the calibration rinse solution and move it up and down gently to fill the EC sensor channels with solution.
- Submerse the EC electrode into calibration solution, tap the electrode gently to remove any trapped air bubbles. The "Not Ready" message is displayed.
- Once the reading has stabilized, the countdown timer will count down until the display shows the "Ready" message.

- Press **Confirm** to accept the calibration point.
- Press **OK** to return to the **Calibration** menu.
- Press **Measure** to return to the measurement screen.

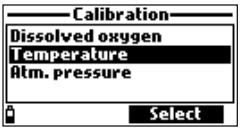


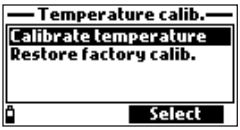
RESTORING FACTORY CALIBRATION

When a new EC probe is being used some of the warning messages are based on the previous calibration. Restoring factory calibration will delete the user calibration and restore the factory default calibration. Use the ▲/▼ keys to highlight **Restore factory calib.** and then press **Select**.

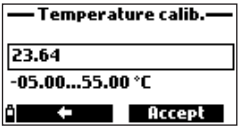
8.4. TEMPERATURE CALIBRATION

The probe is factory calibrated for temperature readings. The user can perform a single point temperature calibration or restore factory calibration.
This procedure requires a reference temperature measuring instrument.
From the **Calibration** menu, use the ▲/▼ keys to highlight **Temperature** and then press **Select**.





- Insert the probe in an isothermal bath with reference instrument and allow the probe to come to thermal equilibrium.
- Use the alphanumeric keypad to enter the known temperature and then press **Accept** to confirm.



- The stability timer will count down and the message "Ready" and **Confirm** will be displayed.
- Press **Confirm** to store the calibration point.
- After confirmation, the following messages are displayed "Storing" and "Calibration completed".
- Press **OK** to return to the **Calibration** menu.
- Press **Measure** to return to the measurement screen.

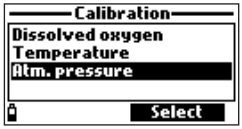
RESTORING FACTORY CALIBRATION

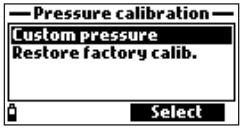
Restoring factory calibration will delete the user calibration and restore the factory default calibration. Use the ▲/▼ keys to highlight **Restore factory calib.** and then press **Select**.

8.5. ATMOSPHERIC PRESSURE CALIBRATION

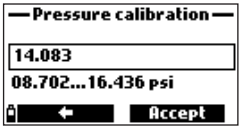
The HI98199 is factory calibrated for atmosphere pressure. The user can perform a single point calibration or restore the factory calibration.

From the **Calibration** menu, use the ▲/▼ keys to highlight **Atm. Pressure** and then press **Select**.





- Select the **Custom pressure** option.
- Use the alphanumeric keypad to enter the known value from the reference meter and then press **Accept** to confirm.



- The stability counter will count down and the message "Ready" and **Confirm** will be displayed. Press **Confirm** to store the calibration point.
- After confirmation, the following messages are displayed: "Storing" and "Calibration completed".
- Press **Measure** to return to the measurement screen.
- Press **OK** to return to the **Calibration** menu.

RESTORING FACTORY CALIBRATION

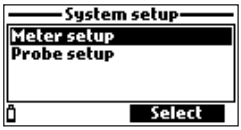
Restoring factory calibration will delete the user calibration and restore the factory default calibration. Use the ▲/▼ keys to highlight **Restore factory calib.** and then press **Select**.

9. SYSTEM SETUP

Press Menu to enter the main setup menu, use the ▲/▼ keys to highlight **System setup** and then press **Select**.

9.1. METER SETUP

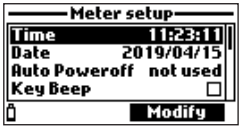
From the System setup menu, use the ▲/▼ keys to highlight **Meter setup** and then press **Select**.



Note: *If the password protection is enabled, you will be required to enter the password before any settings can be modified.*

TIME

Press **Modify** and set the time using the alphanumeric keypad.

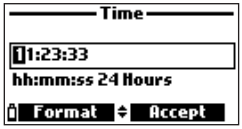


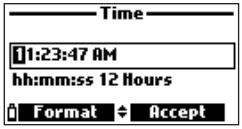
Press **Accept** to save the time. When using the 12 hour format, press A or P on the keypad for AM or PM, after you set the time.

TIME FORMAT

Option: AM/PM or 24-hour

Press **Format** to select the desired time format.



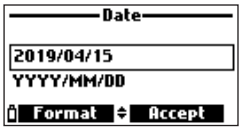


DATE

Press **Modify** and set the date using the alphanumeric keypad.
Press **Accept** to save the date.

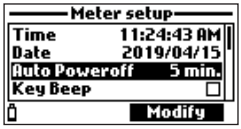
DATE FORMAT

Option: DD/MM/YYYY, MM/DD/YYYY, YYYY/MM/DD, YYYY-MM-DD, MM-DD-YYYY, DD-MM-YYYY
Press **Format** to set the desired date format.

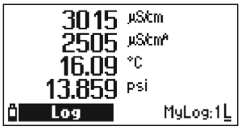


AUTO POWEROFF

Option: Not used (disabled), 5, 10, 15, 20, 30, 60 minutes



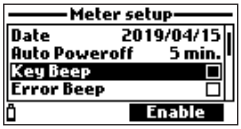
If enabled, the meter will enter sleep mode after the elapsed time if continuous logging is running and the log interval is at least 30 seconds. Press **Wake Up** to reactivate the display.



KEY BEEP

Option: Enable or Disable

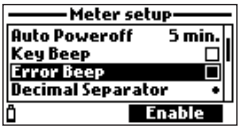
If enabled, an acoustic signal sounds every time a key is pressed. A checked box indicates this function has been enabled.



ERROR BEEP

Option: Enable or Disable

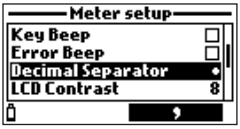
If enabled, an acoustic signal sounds every time an incorrect key is pressed, or when an error occurs.
A checked box indicates this function has been enabled.



DECIMAL SEPARATOR

Option: Comma (,) or Period (.)

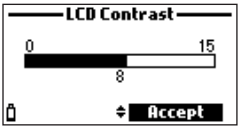
Press the functional key to select the desired decimal separator.
The decimal separator is used on the measurement screen and CSV files.



LCD CONTRAST

Option: 0 to 15

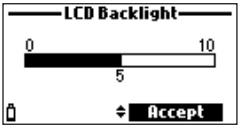
Press **Modify** key to change the display's contrast.
Use the ▲/▼ keys to change the contrast level. Press **Accept** to save the new value.



LCD BACKLIGHT INTENSITY

Option: 0 to 10

Press the **Modify** key to access the backlight intensity.
Use the ▲/▼ keys to change the level. Press **Accept** to save the new value.



METER PASSWORD

The meter password protects against unauthorized configuration changes and data loss. When enabled, many settings and functions cannot be modified or viewed without entering the correct password. Once entered, the password will not be required until the meter is turned ON again.
To enable the password proceed as follows:

1. Highlight "Meter Password" and press **Modify**.
2. Enter the desired password (of 6 digits) in the text box and press **Accept**. While typing, the characters are masked with a "*".

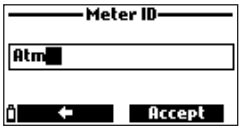
3. Reenter the password. Press **Accept** to confirm.
4. The meter returns to the "Meter Setup" menu. The checkbox corresponding to the meter password is checked.

To disable the password protection, highlight "Meter Password" and press **Modify**, enter the password and then press **Disable**. "No password" appears in the text box. Press **Accept** to confirm.

METER ID

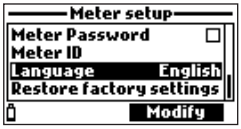
Option: up to 14 characters

This option is used to set the instrument's ID (identification number). Press the **Modify** key to access the meter ID screen.
Use the alphanumeric keypad to enter the meter ID. Press the **Accept** key to confirm the value or **ESC** to return to the Setup menu without saving.



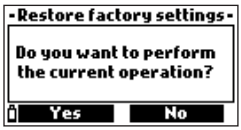
LANGUAGE

Press the **Modify** key to change the Language. Use the ▲/▼ keys to select the desired language. Please contact your local Hanna Instrums Office for available languages.



RESTORING FACTORY SETTINGS

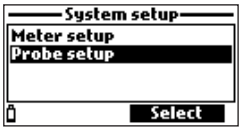
This function restores measurement settings to their original factory values. This includes measurement units, coefficients, other measurement configurations and all logged data.



- Select the "Restore factory settings" and press **Select**.
- The meter will ask for confirmation. Press **Yes** to confirm or **No** to escape.

9.2. PROBE SETUP

From the System setup menu, use the ▲/▼ keys to highlight **Probe setup** and then press **Select**.

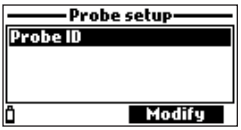


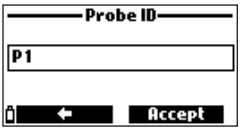
PROBE ID

Option: up to 14 characters

This option is used to set the probe's ID (identification number). Press the **Modify** key to access the probe ID screen.

Use the alphanumeric keypad to enter the probe ID. Press the **Accept** key to confirm the value or **ESC** to return to the Setup menu without saving.



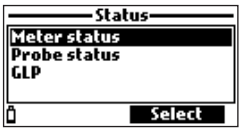


10. STATUS

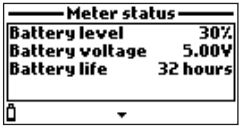
Press **Menu** to enter the main setup menu, use the ▲/▼ keys to highlight **Status** and then press **Select**.

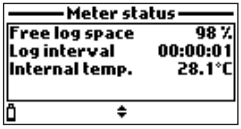
10.1. METER STATUS

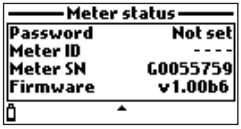
From the Status menu, use the ▲/▼ keys to highlight **Meter** status and then press **Select**.



Press the ▲/▼ keys to scroll through the status screens.
Press **ESC** to return to the **Status** menu.

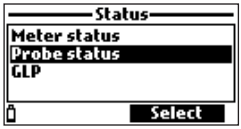


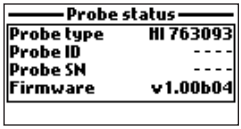




10.2. PROBE STATUS

From the Status menu, use the ▲/▼ keys to highlight Probe status and then press Select.



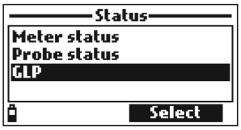


Press **ESC** to return to the **Status** menu.

Note: *The probe status screen will automatically be displayed when the probe sensor status has changed. If this occurs, the "Measurement Screen" and "Parameter Selection" softkeys are available.*

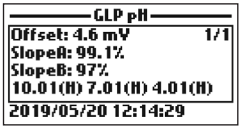
10.3. GLP DATA

From the Status menu, use the ▲/▼ keys to highlight **GLP** and then press **Select**. GLP (Good Laboratory Practice) is a set of functions that allows the user to store or recall data regarding the probe calibration. This feature also allows the user to associate readings with specific calibrations.
The complete list of available parameters appears. Select the desired parameter to view the stored GLP information.



pH

- From the GLP menu, use the ▲/▼ keys to highlight **pH** option and then press **Select**.
- Data regarding the last pH calibration will be displayed: offset, acidic slope, basic slope, buffers used, time and date of the calibration.
- Use the ▲/▼ keys to scroll through the stored data for the last 5 calibrations.
- Press **ESC** to return to the GLP menu.



Notes: *A "C" label near the buffer value indicates a custom point, while an "H" indicates a Hanna Instruments standard buffer value.*
If no pH calibration has been performed or if the factory calibration was restored, the offset and slope values are set to default, and the message "Factory calibration" is displayed. Press ***ESC*** *to return to the previous screen.*

DISSOLVED OXYGEN

- From the GLP menu, use the ▲/▼ keys to highlight **Dissolved oxygen** option and then press **Select**.
- Data regarding the last DO calibration will be displayed: calibration points, % saturation or concentration, time and date.
- Use the ▲/▼ keys to scroll through the stored data for the last 5 calibrations.

Note: *A "C" label near the calibration point indicates a custom point, while an "H" indicates a Hanna Instruments standard value. When the % DO range is calibrated, also the DO concentration range is calibrated, and vice versa. If no DO calibration has been performed or if the factory calibration was restored, the offset and slope values are set to default, and the message "Factory calibration" is displayed. Press* ***ESC*** *to return to the previous screen.*

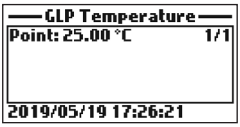
CONDUCTIVITY

- From the GLP menu, use the ▲/▼ keys to highlight **Conductivity** option and then press **Select**.
- Data regarding the last conductivity calibration will be displayed: calibration point, cell constant value, calibration type (conductivity, absolute conductivity or salinity), time and date of the calibration.
- Use the ▲/▼ keys to scroll through the stored data for the last 5 calibrations.

Note: *A "C" label near the calibration point indicates a custom point, while an "H" indicates a Hanna Instruments standard value. If no EC calibration has been performed or if the factory calibration was restored the offset and slope values are set to default, and the message "Factory calibration" is displayed. Press ESC to return to the previous screen.*

TEMPERATURE

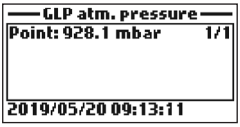
- From the GLP menu, use the ▲/▼ keys to highlight **Temperature** option and then press **Select**.
- Data regarding the last temperature calibration will be displayed: calibrated point, time and date.
- Use the ▲/▼ keys to scroll through the stored data for the last 5 calibrations.



Notes: *If no user temperature calibration has been performed or if the factory calibration was restored, the offset value is set to default, and the message "Factory calibration" is displayed. Press ESC to return to the previous screen.*

ATMOSPHERIC PRESSURE

- From the GLP menu, use the ▲/▼ keys to highlight **Atm. pressure** option and then press **Select**.
- Data regarding the last atmospheric pressure calibration will be displayed: custom calibration point, time and date.
- Use the ▲/▼ keys to scroll through the stored data for the last 5 calibrations.



Notes: *If no atmospheric pressure calibration has been performed or if the factory calibration was restored, the offset value is set to default and the message "Factory calibration" is displayed. Press* ***ESC*** *to return to the previous screen.*

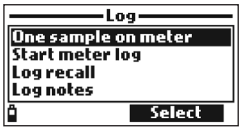
11. LOGGING

Press the **Log** key to access the Log menu. Use the ▲/▼ keys to select the available option.

11.1. ONE SAMPLE ON METER

This option will store one set of data points on the meter.

- The meter will suggest a lot to store the data in. Press **OK** to add the data to the selected lot.
- To select a new lot press **Options**.
- If no logs have been saved, press **New** to create a lot. Use the alphanumeric keypad to enter the lot name and press **Accept**.

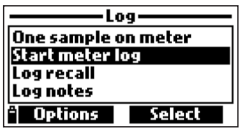


- After the data has been saved to the lot, press **Yes** to add a remark to data point. Press **No** to return to the main screen.

11.2. START METER LOG

This option will start an interval log.

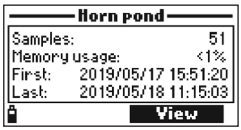
- Use the ▲/▼ arrow keys to select **Start Meter Log**.
- To view the log interval press **Options**. To change the log interval press **Modify**. The log interval can be set from 1 second to 3 hours, use the alphanumeric keypad to modify the log interval.
- To start the interval log, press **Select** to start the log or to add a note to the lot.
- To stop the interval log, press **Select** when **Stop meter log** is displayed.



11.3. LOG RECALL

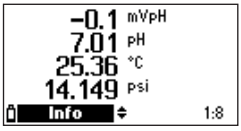
- Use the ▲/▼ arrow keys to select **Log recall**. The meter will show the available lots.
- Use the ▲/▼ keys to select the desired lot and then press **View**.
- The meter displays a summary of all data related to the selected lot: number of samples, memory space used, time and date of the first and last readings.

- Press **View** to display the sample details for each point. Use the ▲/▼ keys to change the sample number in the selected lot. The sample number is shown on the top right corner of the display.

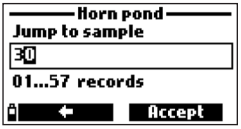


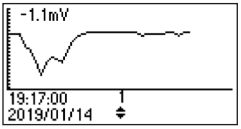
__Notes:__ The values displayed for DO concentration, compensated conductivity and TDS are dependent on the coefficients defined in Parameter Coefficients in Setup menu (EC Reference Temperature, EC Temperature Coefficient, TDS factor and Salinity). If parameter units or coefficients are altered, stored logs on this meter will be altered reflecting these changes. Save logs to a PC before altering parameters or coefficients. Details are available only for the enabled parameters.

- Press **Info** to view information for the current sample (time & date, remark or serial number).
- Press **Data** to return to the previous screen or **Jump** to select a different sample in the same lot. When **Jump** is pressed, a text box appears to insert the desired sample number.
- Press **ESC** to return to the menu.
- Choose **Plot** and the meter will create a list with all available parameters that can be plotted.
- Use the ▲/▼ keys to select the desired parameter. Press **Select** to view the graph.



- Use the ▲/▼ keys to move the cursor in the graph and highlight a sample. The sample data are displayed below the graph.
- Press **ESC** to return to the parameter list.
- Press **ESC** again to return to the menu.

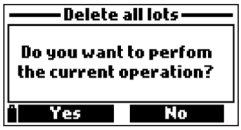




__Note:__ The number of lot samples that can be plotted is limited by the display resolution. To view a complete graph download data to PC.

DELETE ALL LOTS

- From "Meter log recall" choose **Delete all lots** and the meter will ask for confirmation. Press **Yes** to delete or **No** to return to the previous screen.
- To return to the "Log recall" menu, press **ESC**.



11.4. LOG NOTES

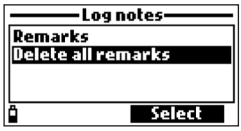
REMARKS

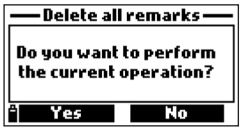
A remark can be associated with each sample.
The meter can store up to 20 remarks.

- To add a remark, select **Log notes** from the Log menu, and then select **Remarks**.
- The display shows a list of stored remarks.
- Press **New** to create a new remark, and use the keypad to enter the new remark in the text box.
- Press **Delete** to delete the selected remark from the meter. If the deleted remark is used in an existing lot, the information will still be available in the lot data.

DELETE ALL REMARKS

- Select **Delete all remarks** to delete all remarks. The meter will ask for confirmation. Press **Yes** to delete or **No** to return to the previous screen.





12. PC CONNECTION MODE

The logged data from a probe or meter can be transferred to a PC using the HI9298194 Windows® compatible application software.
HI9298194 allows data to be imported into most spreadsheet programs (e.g. Excel©, Lotus 1-2-3©).

12.1. SOFTWARE INSTALLATION

- Type http://software.hannainst.com/
- Download the file HI9298194 application software.
- Extract and run the executable file to install the application.

12.2. METER TO PC CONNECTION

- With the meter OFF, disconnect the probe.
- Connect the USB cable to the meter and to a USB port.
- Turn the meter ON and the message "PC connected" will be displayed.

- Run the HI9298194 application software.
- Press **Setting** button on the top of the screen and select the measurement units.
- To access the meter data select the **Meter** button on the toolbar at the top of the screen. The PC-meter connection will be established and the following meter data will be displayed: status information (software version and date, SN, ID, battery level and available memory space), as well as a summary of logged data lots. The logged lots can be saved to the PC by pressing the "Download lot" button after the desired lot is selected.
- Once the lot has been downloaded, all the logged samples can be viewed.

13. TROUBLESHOOTING / ERROR MESSAGES

HI98199 displays error messages to aid in troubleshooting. Warnings are displayed for noncritical issues, while Errors are displayed for critical issues. See the calibration chapter for messages that can occur during calibration.

Other messages are listed below.

- "Log space full": appears when the meter memory is full and additional data cannot be logged. Delete one or more lots from the meter.

- "Power fault. Check the probe cable": appears when powering up the meter with a probe connected and the meter detects a high load on the probe connection. Check the probe cable. If the problem persists, contact your local Hanna Instruments Office.

- "Language data not available": appears when powering up the meter, if the language file is not seen by the meter. Restart the meter. If the problem persists, contact your local Hanna Instruments Office.

- ''Dead meter battery!'': appears if the batteries are too low to power the meter and will automatically turn off. Replace the alkaline batteries to continue.

- "User data corrupted!": appears when powering up the meter if data stored on the meter is corrupted. Restart the meter. If the problem persists, contact your local Hanna Instruments Office.

- "Warning x": other warnings that may appear at power-on are identified using a numeric code. Restart the meter. If the problem persists, contact your local Hanna Instruments Office. Some meter/probe features can be accessed but outside optimum specifications.
- "Errors x": Critical errors that may appear are identified using a numeric code, and the meter is automatically switched off. Contact your local Hanna Instruments Office.

14. ACCESSORIES

Code	Description
HI829113	Digital pH probe with 4 m (13') cable
HI763093	Digital EC probe with 4 m (13') cable
HI764103	Digital DO probe with 4 m (13') cable
HI710034	Orange protective silicone rubber boot
HI920015	Micro USB cable, PC to meter
HI7004L	pH 4.01 buffer solution, 500 mL
HI7006L	pH 6.86 buffer solution, 500 mL
HI7007L	pH 7.01 buffer solution, 500 mL
HI7009L	pH 9.18 buffer solution, 500 mL
HI7010L	pH 10.01 buffer solution, 500 mL
HI7061L	Electrode cleaning solution for general use
HI70670L	Cleaning solution for salt deposits
HI70671L	Cleaning & disinfection solution for algae, fungi and bacteria
HI70300L	Electrode storage solution
HI7040L	Zero oxygen solution
HI7042S	Electrolyte solution for DO sensor, 30 mL
HI76409A/P	Spare membrane with O-Ring (5 pcs.)
HI7030L	12880 μS/cm conductivity calibration solution, 500 mL
HI7031L	1413 μS/cm conductivity calibration solution, 500 mL
HI7033L	84 μS/cm conductivity calibration solution, 500 mL
HI7034L	80000 μS/cm conductivity calibration solution, 500 mL
HI7035L	111800 μS/cm conductivity calibration solution, 500 mL
HI7039L	5000 μS/cm conductivity calibration solution, 500 mL

CERTIFICATION

All Hanna Instruments conform to the **CE European Directives.**

CE RoHS compliant

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

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling.

Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, the place of purchase or go to www.hannainst.com.

Recommendations for users

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

Warranty

HI98199 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. Electrodes and probes are warranted for a period of 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 (see engraved on the back of the instrument) 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.

World Headquarters

Hanna Instruments Inc.
Highland Industrial Park
584 Park East Drive
Woonsocket, RI 02895 USA
www.hannainst.com

HANNA® instruments

MAN98199

Printed in ROMANIA