Pool
Line

HI981954

Multiparameter Portable Meter
pH/mV, ORP, EC, TDS, Resistivity, Salinity, Seawater σ, Atmospheric Pressure & Temperature

HANNA®
instruments

Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using this instrument.

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

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

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1. PRELIMINARY EXAMINATION

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

HI981954 is delivered in a rugged carrying case and is supplied with:

- HI7698195 multiparameter probe
- HI7698194-1 pH/ORP sensor
- HI7698194-3 EC/TDS/Salinity/Resistivity sensor
- HI9828-20 Quick calibration standard solution (230 mL)
- HI7698295 protective probe shield
- HI76981952 probe maintenance kit
- HI7698290 calibration beaker
- HI920015 micro USB cable
- 1.5V AA batteries (4 pcs.)
- Instrument quality certificate
- Probe quality certificate
- Instruction manual

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

2. GENERAL DESCRIPTION

Part of Hanna Instruments pool-line family, HI981954 is a waterproof portable logging multiparameter system (meter and probe), that monitors up to 11 different water quality parameters (5 measured, 6 calculated) such as pH, ORP, conductivity, and temperature.

The HI7698195 microprocessor-based intelligent multisensor probe can use the HI7698194-1 sensor for pH and ORP (or the HI7698194-0 sensor for pH) measurements, and the HI7698194-3 sensor for conductivity and associated parameters. The probe also has an integrated temperature sensor that allows for automatic temperature compensation of pH, conductivity and is supplied with a removable protective shield.

The HI981954 features a graphic, backlit display that automatically sizes the digits to fit the screen with on-screen graphing capability. Each parameter is fully configurable.

HI981954 is a rugged instrument, the ideal solution for a variety of water quality measurements.

The meter is enclosed in an IP67 rated waterproof casing and can withstand immersion in water at a depth of 1 m for up to 30 minutes. The probe features an IP68 rating for continuous immersion in water.

Main Features
- Rugged, water-resistant meter and waterproof probe
- Monitors up to 11 different water quality parameters
- Graphical display of logged data on backlit LCD screen
- Auto recognition of the probe and field-replaceable, color-coded sensors
- Quick calibration feature
- Auto-ranging for EC readings
- Log-on-demand and automatic logging on meter for all parameters
- Dedicated help key for context sensitive help
- USB interface for PC communication
- Long battery life with alkaline batteries
- Good Laboratory Practice feature. Automatically stores the last 5 calibrations

3. SPECIFICATIONS

3.1. METER SPECIFICATIONS

pH / mV	Range	0.00 to 14.00 pH; $\pm$ 600.0 mV	
	Resolution	0.01 pH; 0.1 mV	
	Accuracy	$\pm$ 0.02 pH; $\pm$ 0.5 mV	
	Calibration	Automatic at 1, 2 or 3 points with automatic recognition of 5 standard buffers (pH 4.01, 6.86, 7.01, 9.18, 10.01) and 1 custom buffer	
ORP	Range	$\pm$ 2000.0 mV	
	Resolution	0.1 mV	
	Accuracy	$\pm$ 1.0 mV	
	Calibration	Automatic at 1 custom point (relative mV)	
Conductivity	Range	0 to 200 mS/cm (absolute EC up to 400 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 400.0 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 400.0 mS/cm
	Accuracy	$\pm$1 % of reading or $\pm$1 μS/cm whichever is greater	
	Calibration	Automatic single point, with 6 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 1 custom point	
Total Dissolved Solids (TDS)	Range	0 to 400000 ppm (mg/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 400.0 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 400.0 ppt (g/L)
	Accuracy	$\pm$1 % of reading or $\pm$1 ppm (mg/L) whichever is greater	
	Calibration	Based on conductivity or salinity calibration	

Resistivity	Range	0 to 999999 $\Omega\cdot$cm; 0 to 1000.0 k$\Omega\cdot$cm; 0 to 1.0000 M$\Omega\cdot$cm
	Resolution	Depending on resistivity reading
	Calibration	Based on conductivity calibration
Salinity	Range	0.00 to 70.00 PSU
	Resolution	0.01 PSU
	Accuracy	$\pm$2% of reading or $\pm$0.01 PSU whichever is greater
	Calibration	Based on conductivity calibration
Seawater Sigma	Range	0.0 to 50.0 σ_t, σ_0, σ_{15}
	Resolution	0.1 σ_t, σ_0, σ_{15}
	Accuracy	$\pm$1.0 σ_t, σ_0, σ_{15}
	Calibration	Based on conductivity or salinity calibration
Atmospheric Pressure	Range	450.0 to 850.0 mmHg; 17.72 to 33.46 inHg; 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 inHg; 0.1 mbar; 0.001 psi; 0.0001 atm; 0.01 kPa
	Accuracy	$\pm$3.0 mmHg within $\pm$15 °C from calibration temperature
	Calibration	Automatic at 1 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	$\pm$ 0.15 °C; $\pm$ 0.27 °F; $\pm$0.15 K
	Calibration	Automatic at 1 custom point
Temperature Compensation		Automatic from -5 to 55 °C (23 to 131 °F)
Logging Memory		45,000 records (continuous logging or log-on-demand of all parameters)
Logging Interval		1 second to 3 hours
PC Interface		HI9298194 software
Protection Rating		IP67 (water-resistant)
Environment		0 to 50 °C (32 to 122 °F); RH 100 %
Battery Type		1.5V, AA alkaline batteries (4 pcs.)
Battery Life		360 hours of continuous use without backlight
Dimensions		185 x 93 x 35.2 mm (7.3 x 3.6 x 1.4")
Weight		400 g (14.2 oz.)

3.2. PROBE SPECIFICATIONS

Sensor Inputs	Two (pH or pH/ORP, EC)
Sample Environment	Fresh, brackish, seawater
Protection Rating	IP68 (waterproof)
Operating Temperature	-5 to 55 °C (23 to 131 °F)
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Maximum Depth	20 m (66')
Dimensions	342 mm (13.5"), Ø 46 mm (1.8") (without cable)
Weight	570 g (20.1 oz.) (with batteries and sensors)
Cable Specification	Multistrand-multiconductor shielded cable with internal strength member rated for 68 kg (150 lb) intermittent use
Wetted Materials	Body ABS Threads Nylon Shield ABS/316 SS Temperature probe 316 SS O-rings EPDM

3.3. SENSOR SPECIFICATIONS

	Description		pH sensor
	Measurement Type		pH, mV (pH)
	Measurement Range		0.00 to 13.00 pH ; $\pm$600.0 mV
	Temperature Range		-5.0 to 55.0 °C (23.0 to 131.0 °F)
	Color Code		Red
HI7698194-0	Materials	Tip	glass (pH)
		Glass Type	LT (low temperature)
		Junction	Ceramic
		Body	PEI
		Electrolyte	Gel
		Reference	Double
	Maintenance Solution		HI703004 Storage solution
	Immersion Depth		20 m (65')
	Dimensions		118 x 15 mm

HI7698194-1			
	Description		pH/ORP sensor
	Measurement Type		pH, mV (pH/ORP)
	Measurement Range		0.00 to 13.00 pH; ±600.0 mV; ±2000.0 mV
	Temperature Range		-5.0 to 55.0 °C (23.0 to 131.0 °F)
	Color Code		Red
	Materials	Tip	Glass (pH); Pt (ORP)
		Glass Type	LT (low temperature)
		Junction	Ceramic
		Body	PEI
		Electrolyte	Gel
		Reference	Double
	Maintenance Solution		HI703004 Storage solution
	Immersion Depth		20 m (65')
	Dimensions		118 x 15 mm
HI7698194-3	Description		EC sensor
	Measurement Type		EC
	Measurement Range		0.0 to 200.0 mS/cm; 0.0 to 400 mS/cm (absolute)
	Temperature Range		-5.0 to 55.0 °C (23.0 to 131.0 °F)
	Color Code		Blue
	Materials	Electrodes	Stainless steel (AISI 316)
		Body	ABS/EPOXY
	Immersion Depth		20 m (65')
	Dimensions		111 x 17 mm

4. DISPLAY & KEYBOARD DESCRIPTION

Front View
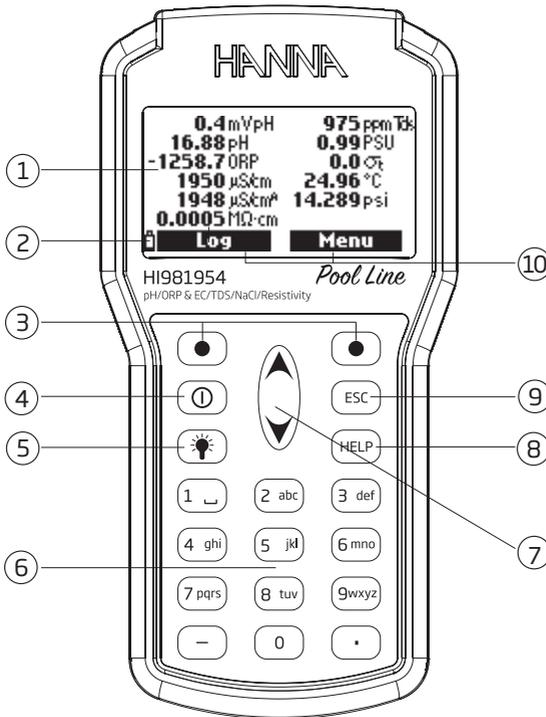
1. Liquid Crystal Display (LCD)
2. Battery level indicator
3. Functional keys (soft keys), press to perform the function displayed above them on the screen
4. Power (On / Off) key, press to turn the meter on and off
5. Lamp key, press to turn the backlight on and off
6. Alphanumeric keypad, press to insert alphanumeric codes
7. Arrow keys, to scroll the displayed options and messages
8. HELP key, press to display the context sensitive help menu
9. ESC key, press to return to the previous screen
10. Soft key functions defined on display

Top View
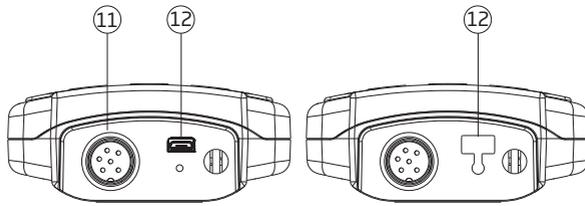
11. DIN connector for probe connection
12. Micro USB connector with protective cap

HI7698195 Multisensor Probe
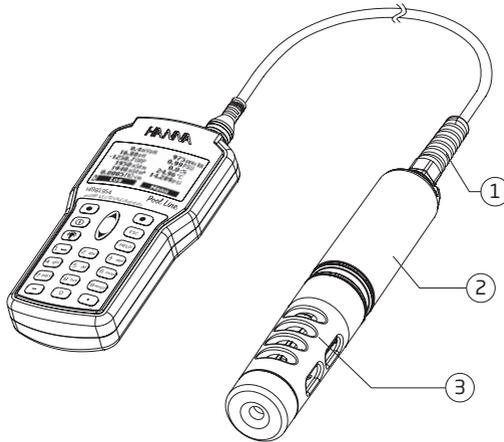
1. Strain relief
2. Probe body
3. Protective shield

5. SENSOR PREPARATION & INSTALLATION

5.1. SENSOR TYPES & DESCRIPTIONS

1.   2.

1. HI7698194-0 Combination pH sensor features a glass pH sensitive bulb and a silver/silver chloride double junction reference with gelled electrolyte.
   HI7698194-1 Combination pH/ORP sensor features a glass sensitive bulb for pH readings, a platinum sensor for redox measurements and a silver/silver chloride double junction reference with gelled electrolyte.
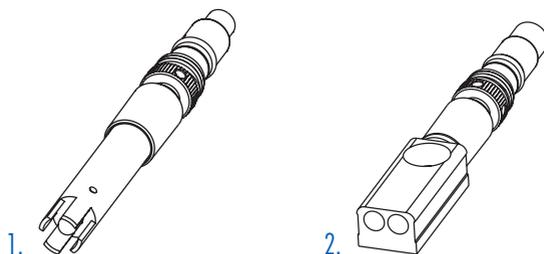2. HI7698194-3 four ring-electrode conductivity (EC/TDS/Salinity/Resistivity) sensor. The sensor is immune to polarization or surface coatings.

5.2. SENSOR PREPARATION & CONDITIONING

EC Sensor

The EC sensor does not need to be soaked or hydrated before use. Use the small brush included in the probe maintenance kit to clean and loosen any debris before using.

pH/ORP Combination Sensor or pH Sensor

To prepare for installation:
1. Remove the shipping cap from the pH sensor.
2. If the shipping cap does not contain any liquid, pour HI703004 Storage solution into shipping cap.
3. Place it back on the sensor and soak for at least 1/2 hour before use. If HI703004 Storage solution is not available, pH 4.01 buffer may be used.

ORP Activation:

For improved redox measurements, the surface of the sensor must be clean and smooth. A pretreatment procedure should be performed to ensure quick response. The pretreatment of the sensor is determined by the pH and the ORP potential values of the sample. Use the pH / mV table to determine the treatment required. First locate the typical sample pH. If the corresponding ORP value (mV) is higher than the values in the table below, an oxidizing pretreatment is necessary. If the value is lower, a reducing pretreatment is necessary.

For reducing pretreatment: immerse the electrode for at least five minutes in HI7091.
For oxidizing pretreatment: immerse the electrode for at least five minutes in HI7092.

pH	mV	pH	mV	pH	mV	pH	mV	pH	mV
0	990	1	920	2	860	3	800	4	740
5	680	6	640	7	580	8	520	9	460
10	400	11	340	12	280	13	220	14	160

5.3. SENSOR INSTALLATION

The HI7698195 probe sensor connector sockets are identified with color-coded triangles:
• CONN1 - red connector (one triangle): pH or pH/ORP sensor
• CONN2 - blue connector (two triangles): EC sensor
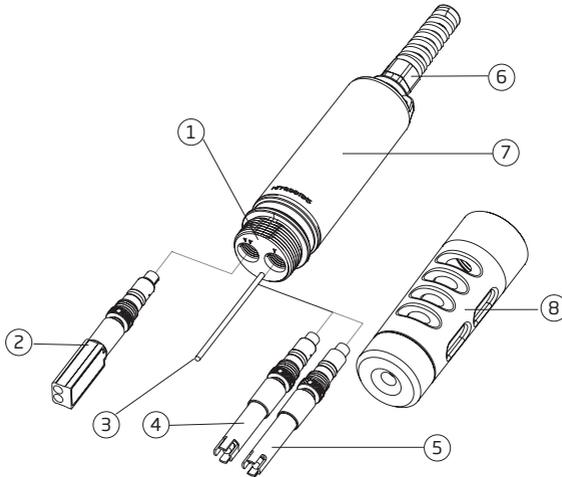
1. Sensor sockets
2. EC/TDS/Salinity/Resistivity sensor
3. Temperature sensor
4. pH sensor
5. pH/ORP combination sensor
6. Strain relief
7. Probe body
8. Protective shield

To install the sensors follow the steps below:
1. Remove the protective shield from the probe and set it aside.
2. Use the supplied silicone grease sachet and sparingly lubricate the o-ring with a thin film of the grease. Do not substitute other grease or lubricants as it may cause the o-ring to swell.
3. Insert the sensor into the correctly color-coded opening while positioning the connector key toward the center of the probe. Make sure the connector is seated correctly (the sensor will no longer move freely) before tightening the locking threads with your fingers.

4. Continue to tighten the locking threads with the small hex key supplied in the maintenance kit until the sensor is secured tightly against the probe body.

5. The sensors have to be conditioned and calibrated before use.

6. Screw the protective shield onto the probe body, to protect the sensors.

Note: To maintain a waterproof probe, if a sensor is not installed a plug must be inserted.

5.4. SENSOR MAINTENANCE

For correct sensor maintenance:

1. Unscrew the protective shield from the probe body and set it aside.
2. Use the calibration beaker for cleaning.
3. Use HI76981952 probe maintenance kit. See ACCESSORIES section for details.

General Maintenance

• Inspect all sensor connectors for corrosion and replace sensors if necessary.

• Inspect sensor o-rings for nicks or other damage and replace sensor if necessary.

 Use only the supplied grease as some lubricants can cause the o-rings to expand.

• After prolonged storage or cleaning, calibration of the sensors is required.

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

• Check GLP data under "Status" to ensure the sensor is still functioning properly.

pH & pH/ORP Sensor

• Remove the sensor protective cap. Do not be alarmed if any salt deposits are present. This is normal with pH/ORP electrodes and they will disappear when rinsed with water.

• Shake down the sensor as 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 HI703004 Storage solution for at least 30 minutes.

• To ensure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry. Store the sensor with a few drops of HI703004 Storage solution or pH 4.01 buffer in the protective cap. Tap water may also be used for a very short period (few days).

 Never use distilled or deionized water to store pH sensors.

• Inspect the sensor for scratches or cracks. If any are present, replace the sensor.

• Rinse the sensor in flowing water then clean the sensor by soaking it for 1 minute in HI70670 Cleaning solution for mineral deposits or HI70671 Cleaning & disinfection solution for algae, fungi and bacteria. After cleaning soak the sensor in HI703004 Storage solution for 30 minutes before taking measurements.

EC Sensor

After every series of measurements, rinse the probe with tap water.
If a more thorough cleaning is required:
• Clean the sensor with brush found in the maintenance kit to loosen any debris.
• Use a mild detergent to remove oily coatings.
• Ensure that the two cylindrical holes in the sensor are free of foreign material.
• Flush with purified water after cleaning.

6. GENERAL OPERATIONS

6.1. BATTERY CAPACITY & REPLACEMENT

HI981954 is supplied with 4 Alkaline, 1.5 V AA batteries.

The battery level indicator on the LCD indicates the remaining battery life. If the battery capacity is less than 10%, the indicator is displayed blinking and the batteries should be replaced with new ones. The instrument is equipped with the BEPS (Battery Error Prevention System) feature, which automatically turns the instrument off when the batteries reach 0%.

To replace the batteries:

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. Do not mix old and new Alkaline batteries.
5. Close the battery compartment using the four screws.

   Note: If the battery capacity is less than 25%, the backlight is no longer available.
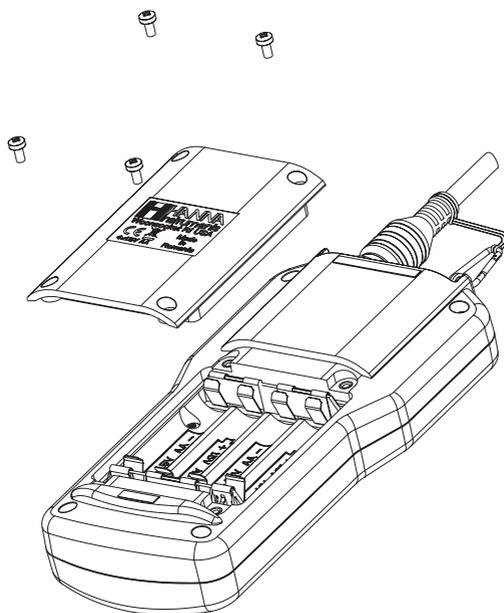
Meter Battery Life

The battery life is dependent on the backlight usage, logging interval, and sensor configuration. The backlight will consume the most power.

	pH/ ORP, EC
Backlight OFF, 1 s log	280 hours
Backlight OFF, 4 min log	360 hours
Backlight OFF, 10 min log	400 hours
Backlight ON, 4 min log	50 minutes
Backlight ON, 10 min log	50 minutes

6.2. CONNECTING THE PROBE

The multiparameter probe is connected to the meter through a waterproof Quick DIN connector, making attaching and removing the probe an easy process. When connected, the probe is automatically detected.

• With the meter off, connect the probe to the DIN connector on the top of the meter.
• Align the pins and key then push the plug into the socket.
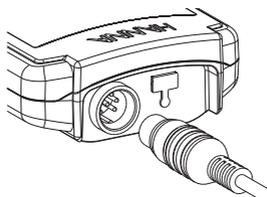
6.3. TURNING THE METER ON

After connecting the sensors to the probe and connecting the probe to the meter, turn the meter on by pressing the **On/Off** key.
At start-up the display will show the Hanna Instruments logo, meter name and firmware version.

After the initialization has been completed if the probe is connected, the meter displays the Probe Status screen. The probe status screen identifies the probe and attached sensors.

```
————Probe status————
Probe type        HI 7698195
CONN1             pH & ORP
CONN2                    EC

▯ Measure  ▾  Param.
```

Press **Measure** to view the measurement screen. **Log** and **Menu** functional keys are displayed.
Press **Param.** to open the Parameters menu. This screen can also be accessed from the main menu.
Press the down arrow key to view additional information about the probe.

6.4. BASIC OPERATIONS

The main operating modes are setup, measurement and logging.
The instrument can be configured to display measurement data for all enabled parameters (up to 11).
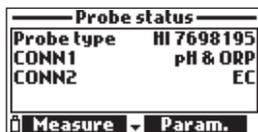The display has a feature that automatically sizes the digits to fit the screen. With fewer measurements the digits will be largest.

```
   0.4 mVpH          0.4 mVpH          0.4 mVpH      975 ppm Tds
  6.88 pH           6.88 pH           16.88 pH          0.99 PSU
-1225.5 mVORP     -1257.1 mVORP     -1258.7 ORP        0.0 σt
                   1948 µS/cm         1950 µS/cm       24.96 °C
                   1946 µS/cmª        1948 µS/cmª    14.289 psi
                                    0.0005 MΩ·cm
▯ Log  ▾ Menu     ▯ Log  ▾ Menu     ▯ Log     Menu
```
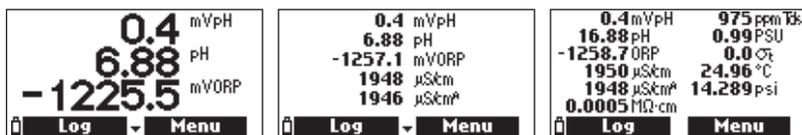
Press the keys on the alphanumeric keypad (1 - 7) to select number of parameters displayed at one time.
Use the arrow keys to scroll through the enabled parameters if they do not fit on one screen.

   Note: Pressing 7 will display up to 11 parameters simultaneously.

Press **Log** to display the Log menu. Log a single sample or start an interval log. See LOGGING section for detailed description.
Press **Menu** to select the measurement parameters (see PARAMETER SETUP section).
To calibrate the sensors, see CALIBRATION section.
To change system settings, see SYSTEM SETUP section.
To view the meter and probe status or GLP information, see STATUS section.

6.5. FUNCTIONAL DIAGRAM OF THE INSTRUMENT

Menu and **Log** functional keys help user navigate through all measurement operations. The following diagrams present an overview of possible functions.
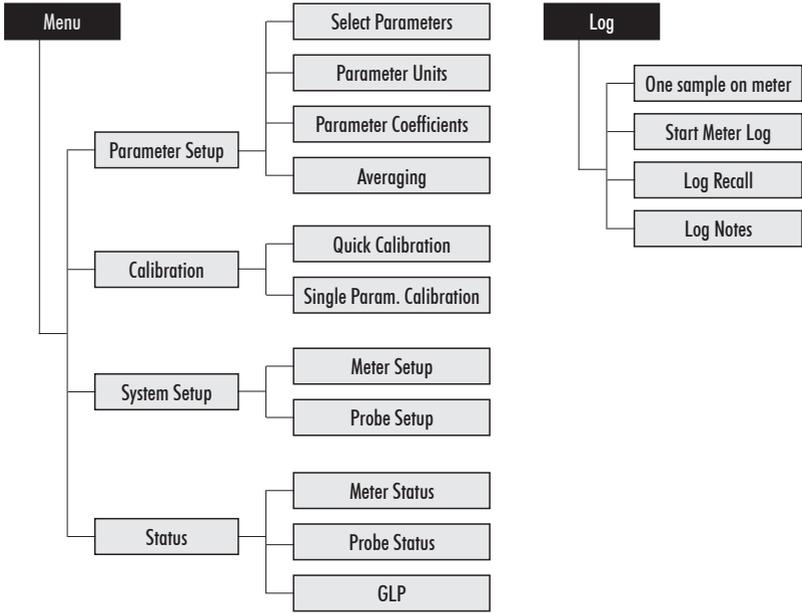
6.6. HELP

To view the context sensitive help, press the **HELP** key. Use the arrow keys to scroll through the text. To return to the previous screen, press the **HELP** or **ESC** key.

7. PARAMETER SETUP

From the measurement screen press **Menu**. Use the arrow keys to highlight "Parameter Setup" and press **Select**. Use the arrow keys to highlight the desired option and press **Select**.

```
┌──────Menu──────┐      ┌──Parameter setup──┐
│Parameter setup │      │Select parameters  │
│Calibration     │      │Parameter units    │
│System setup    │      │Parameter coefficients│
│Status          │      │Averaging  1 sample(s)│
│         Select │      │          Select   │
└────────────────┘      └───────────────────┘
```

Warning: Logged data saved on the meter will be changed to selected parameter units or coefficients.

7.1. PARAMETER SELECTION

Use the arrow keys to scroll through the list of available parameters.
Press the corresponding functional key to enable or disable the highlighted parameters (or Enable / Disable all option). A checked box indicates that the parameter is enabled.

```
┌──────Parameters──────┐
│mV pH              ☑ │
│pH                 ☑ │
│ORP                ☑ │
│Conductivity       ☑ │
│Disable all    Disable│
└──────────────────────┘
```
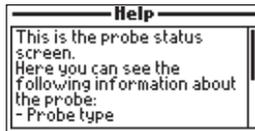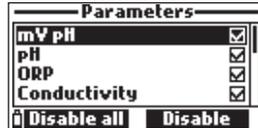
Note: When the password protection is enabled, authentication will be required before any parameter modification.

7.2. PARAMETER UNITS

Temperature Unit
Option: °C, °F, K
Press the functional key to select the desired temperature unit.

```
┌──Parameter units──┐
│Temperature unit °C│
│TDS unit   ppm - ppt│
│Pressure unit   psi│
│Res. unit    MΩ·cm │
│    K          °F  │
└───────────────────┘
```
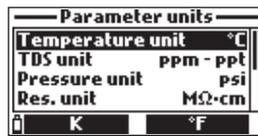
TDS Unit
Option: ppm - ppt or mg/L - g/L
Press the functional key to select the desired TDS unit.

```
┌──Parameter units──┐
│Temperature unit °C│
│TDS unit   ppm - ppt│
│Pressure unit   psi│
│Res. unit    MΩ·cm │
│       mg/L - g/L  │
└───────────────────┘
```
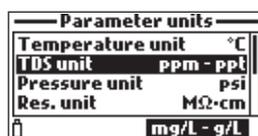
Pressure Unit

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

Press **Modify** and use the arrow keys to select the desired pressure unit.

Press **Select** to confirm or the **ESC** key to return to the previous screen.

```
┌──── Parameter units ────┐   ┌──── Pressure Unit ────┐
│ Temperature unit     °C │   │ psi                   │
│ TDS unit      ppm - ppt │   │ mmHg                  │
│ Pressure unit       psi │   │ inHg                  │
│ Res. unit        MΩ·cm  │   │ mbar                  │
│ ▐          Modify       │   │ ▐              Select  │
└─────────────────────────┘   └───────────────────────┘
```
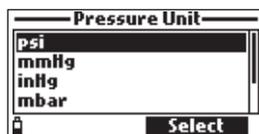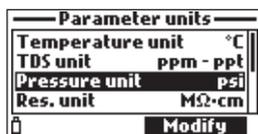
Resistivity Unit

Option: Ω·cm, kΩ·cm, MΩ·cm

Resistivity is calculated from the conductivity measurement.

Press the functional key to select the desired resistivity unit.

```
┌──── Parameter units ────┐
│ TDS unit      ppm - ppt │
│ Pressure unit       psi │
│ Res. unit        MΩ·cm  │
│ Seawater σt unit    σt  │
│ ▐ KΩ·cm        Ω·cm     │
└─────────────────────────┘
```

Seawater Sigma (σ) Unit

Option: σ_t, σ_0, σ_{15}

Seawater sigma is calculated from the conductivity measurement and depends on water pressure, temperature, and salinity.

Press the functional key to select the desired reference temperature (current temperature, 0 °C or 15 °C).
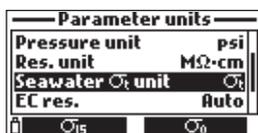
```
┌──── Parameter units ────┐
│ Pressure unit       psi │
│ Res. unit        MΩ·cm  │
│ Seawater σt unit    σt  │
│ EC res.           Auto  │
│ ▐ σ15          σ0       │
└─────────────────────────┘
```

EC Resolution
Option: Auto, Auto mS/cm, 1 μS/cm, 0.001 mS/cm, 0.01 mS/cm, 0.1 mS/cm, 1 mS/cm
Press **Modify** and use the arrow keys to select the desired EC resolution.
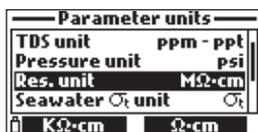Press **Select** to confirm or the **ESC** key to return to the previous screen.
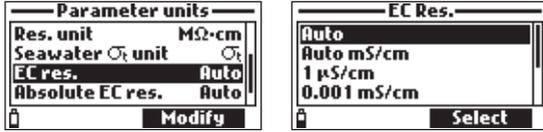
Auto:	The meter automatically chooses the range (μS/cm or mS/cm) to optimize the measurement.
Auto mS/cm:	The meter automatically chooses the resolution to optimize the measurement, readings will be in mS/cm only.
Specified numeric resolution:	The meter will not autorange, the measurement will be displayed with the selected resolution only.

Absolute EC Resolution
Option: Auto, Auto mS/cm, 1 μS/cm, 0.001 mS/cm, 0.01 mS/cm, 0.1 mS/cm, 1 mS/cm
Press **Modify** and use the arrow keys to select the desired absolute EC resolution.
Press **Select** to confirm or the **ESC** key to return to the previous screen.
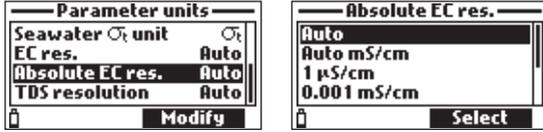
Auto:	The meter automatically chooses the range (μS/cm or mS/cm) to optimize the measurement.
Auto mS/cm:	The meter automatically chooses the resolution to optimize the measurement, readings will be in mS/cm only.
Specified numeric resolution:	The meter will not autorange, the measurement will be displayed with the selected resolution only.

Note: A small letter "A" added to µS/cm or mS/cm unit refers to an absolute conductivity value (i.e. a conductivity reading with no temperature compensation).

TDS Resolution

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

Press **Modify** and use the arrow keys to select the desired TDS resolution.

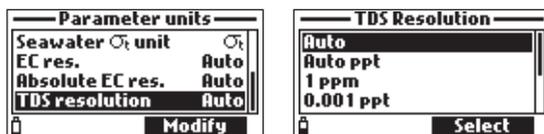Press **Select** to confirm or the **ESC** key to return to the previous screen.

```
——— Parameter units ———        ——— TDS Resolution ———
Seawater σₜ unit        σₜ       Auto
EC res.              Auto        Auto ppt
Absolute EC res.     Auto        1 ppm
TDS resolution       Auto        0.001 ppt
                  Modify                      Select
```

Auto:	The meter automatically chooses the range (ppm or ppt) to optimize the measurement.
Auto ppt:	The meter automatically chooses the resolution to optimize the measurement, readings will be in ppt only.
Specified numeric resolution:	The meter will not autorange, the measurement will be displayed with the selected resolution only.

7.3. PARAMETER COEFFICIENTS

EC Reference Temperature

Option: 20 °C or 25 °C

This value is used for temperature compensated conductivity. All EC measurements will be referenced to the conductivity of a sample at this temperature.

Press the functional key to select the desired EC reference temperature.

```
—Parameter coefficients—
EC ref. temp.        25°C
EC temp. coeff.  1.90 %/°C
TDS factor           0.50

                     20°C
```

EC Temperature Coefficient (Beta, ß)

Option: 0.00 to 6.00 %/°C

The temperature coefficient ß is defined by the following equation (using 25 °C as an example):

$$EC_{25} = EC_x / (1 + ß(T_x - 25))$$

ß is a function of the solution being measured. For freshwater samples ß is approximately 1.90%/°C. If the actual temperature coefficient of the sample is known, press **Modify** to enter the value.

Press **Accept** to confirm the value or the **ESC** key to return to the previous screen.
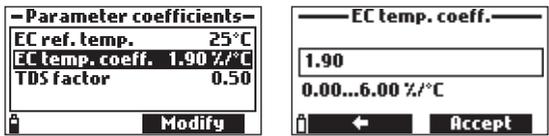
TDS Factor

Option: 0.00 to 1.00

TDS is a calculated value based on the conductivity of the solution (TDS $=$ factor x EC_{25}). A typical TDS factor for strong ionic solutions is 0.50, while for weak ionic solutions is 0.70 (e.g fertilizers).

Press **Modify** to enter the value.

Press **Accept** to confirm the value or the **ESC** key to return to the previous screen.
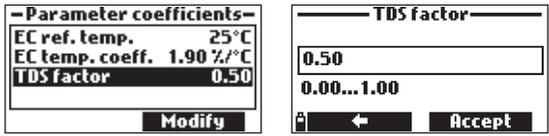
7.4. AVERAGING

Option: 1 to 20 samples

Averaging is a software filter to minimize sensor noise and provide more stable readings. It is particularly useful to get a representative reading of the "average" value from flowing water. Averaging will affect all measurements. If a fast response is needed, this value should be kept low.

Press **Modify** to select the number of samples to average.

Press **Accept** to confirm the value or the **ESC** key to return to the previous screen.
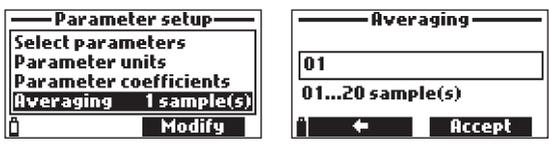
Note: When logging the first sample using averaging, it will be delayed by a few seconds.

8. CALIBRATION

In the measurement screen press **Menu**. Use the arrow keys to highlight "Calibration" and press **Select**. Use the arrow keys to highlight the desired option and press **Select**.

```
┌────────Menu────────┐
│Parameter setup     │
│Calibration         │
│System setup        │
│Status              │
│▯          Select   │
└────────────────────┘
```

All calibration data is stored in the non volatile probe memory, allowing probes to be connected to different meters without recalibration.

Options:
- **Quick calibration**: Single point pH and conductivity calibration.
- **Single parameter calibration**: Calibrate each parameter individually (pH, ORP, conductivity, temperature, pressure).

```
┌──────Calibration──────┐
│Quick calibration      │
│Single param. calibration│
│                       │
│▯           Select     │
└───────────────────────┘
```
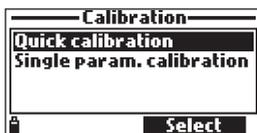
Note: The password will be required if password protection is enabled.

Calibration Guidelines

To optimize measurements, it is advisable to establish the optimum calibration period required for the measurement environment. Calibration requirements vary with deployment conditions, for example very turbid biologically-active waters may require more frequent cleanings and calibrations than cleaner waters. General calibration guidelines are listed below:
- Set up a routine service schedule where measurement integrity is validated. This is especially important for new installation sites or long deployments.
- Inspect sensor connectors for corrosion and replace damaged sensors.
- Inspect sensor o-rings for damage and if necessary replace and lubricate with the grease supplied in the probe maintenance kit.
- Do not handle the sensing surfaces of the sensors.
- Avoid rough handling and abrasive environments that can scratch the reactive surfaces of the sensors.
- Avoid long-term exposure of sensors to bright sunlight. If possible, calibrate in a shaded area.
- Discard standards after use. Do not return the used standards to the bottles of "fresh" solution.
- For measurements across a temperature gradient (when water temperature is drastically different from the standards), permit the sensors to reach thermal equilibrium before conducting calibrations or making measurements. The heat capacity of the probe is much greater than the air and the small beakers of calibration standards.

8.1. QUICK CALIBRATION

The quick calibration provides a single point calibration for pH and conductivity sensors. The user can select to calibrate one or both sensors. HI9828-0 calibration solution is used for both pH and conductivity. If a sensor is already calibrated or to skip a calibration, press **Skip**.

1. Remove the shield from the probe and rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with HI9828-0 calibration solution.
3. Immerse the sensors in the calibration solution. Raise and lower the probe several times. Discard the solution.
4. Fill the calibration beaker 2/3 full with HI9828-0 calibration solution.
5. Slowly place the sensors into the solution and dislodge bubbles that may adhere to the sensors.
6. Wait a few minutes for the system to stabilize. From the "Calibration" menu select "Quick calibration" and press **Select**. A two item calibration menu will appear (pH, conductivity) and "pH" will start to blink along with the "Not ready" message.
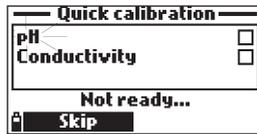
7. The "Ready" message will appear when the pH reading has stabilized. Press **Confirm** to store the calibration point. The "Storing" message will appear as the calibration proceeds to the next sensor. A checkmark will appear in the box next to "pH" to indicate a successful calibration.
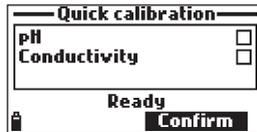
8. "Conductivity" will start to blink along with the "Not ready" message.
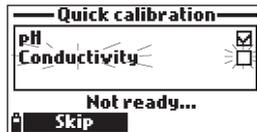
9. The "Ready" message will appear when the EC reading has stabilized. Press **Confirm** to store the calibration point. The "Storing" message and a checkmark will appear in the box next to "Conductivity" to indicate a successful calibration.
10. "Calibration completed" is displayed. Press **OK** to return to "Calibration" menu.
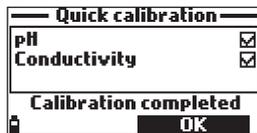
8.2. pH CALIBRATION

To optimize the pH measurement follow the general guidelines mentioned in the introduction of the CALIBRATION section.
From the "Calibration" menu select "Single param. calibration" and then "pH".
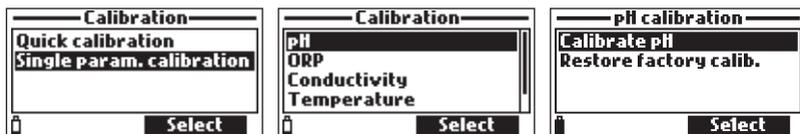
Options:

- **Calibrate pH**: Perform a new calibration using up to 3 buffers (pH 4.01, 6.86, 7.01, 9.18, 10.01 or one custom buffer). When a three-point calibration is performed, new data overwrites the old one. With a single or two-point calibration the meter will also use information from the previous calibration, if available.
- **Restore factory calib.**: Restore the factory calibration if a new pH sensor has been installed. Some messages displayed during calibration are based on previous calibration data. A user calibration should follow immediately.

pH Calibration Procedure

1. Remove the shield from the probe and rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with the first buffer solution.
3. Immerse the sensors in the buffer solution. Raise and lower the probe several times. Discard the solution.
4. Fill the calibration beaker 2/3 full with the first buffer solution.
5. Slowly place the sensors in the selected buffer. Dislodge bubbles that may adhere to the sensors.
6. Wait a few minutes for the measurement to stabilize. Use the arrow keys to select "Calibrate pH" and press **Select** to start the calibration. The temperature, pH buffer value and the "Not ready" message are displayed.

7. If necessary, press **Cal. point** to select the correct buffer. To use a custom buffer, press **Custom**. A text box window will appear. Use the keypad to enter the value of the buffer (0.00 to 14.00 pH) at the current temperature. Press **Accept** to confirm the buffer value.
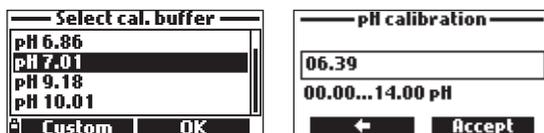
8. Once the reading has stabilized the countdown timer will count down until the display shows the "Ready" message. Press **Confirm** to accept the calibration point.
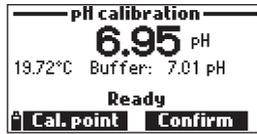
Note: To save a one or two-point calibration press the ESC key after the buffer is confirmed. The message "Storing" followed by "Calibration completed" will be displayed.

9. After the calibration point is confirmed, to avoid cross-contamination immerse the sensors in the next calibration buffer rinse solution and stir gently.
10. Repeat the calibration procedure outlined above with the second and third buffers.
11. After the third buffer has been confirmed, the message "Storing" followed by "Calibration completed" will be displayed. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

pH Calibration Error Messages

The HI981954 displays a series of messages if an error has occurred during calibration.
• "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.
• "Check sensor" / "Clean sensor": the electrode is broken or very dirty.
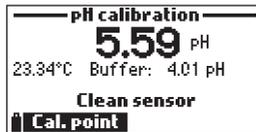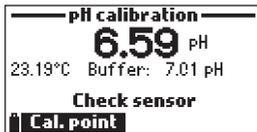
• "Invalid temperature": the buffer temperature is outside the acceptable range.
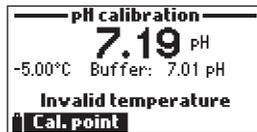
• "Wrong buffer": the displayed pH reading is too far from the selected buffer value. This is often seen immediately after a buffer calibration has been completed but before the pH sensor has been moved to the next buffer. Check if the correct calibration buffer has been selected.

• "Wrong buffer" / "Contaminated buffer" / "Check electrode": the buffer is contaminated or the sensor is broken or very dirty.
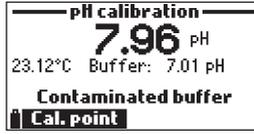
• "Wrong" / "Clear old calibration": erroneous slope condition. These messages appear if the slope difference between the current and previous calibration exceeds the slope window (80% to 110%). Press **Clear** to cancel the old data and continue the calibration procedure, or press **ESC** to quit the pH calibration mode.

8.3. ORP CALIBRATION

The Oxidation-Reduction Potential (ORP), displayed in mV, is the voltage that results from the difference in potential between the platinum ORP sensor and the Ag/AgCl reference electrode. ORP values are not temperature compensated, although ORP values can change with temperature (e.g. reference electrode potential changes, sample equilibrium changes). It is important to report ORP values together with the reference electrode used and the temperature.

The inert platinum ORP surface provides an electron exchange site with the sample (or standard) and its surface. The electron exchange is typically very fast in well-poised solutions (standards for example), but may be more lengthy in natural water samples.

• Calibration is typically not required for a new ORP sensor, but the process does establish a baseline that can be used as a comparison for future validations.

• Calibration is used to compensate for changes due to contamination of the platinum surface and drift in the reference electrode.

A relative mV calibration can also be made to remove the voltage attributable to the Ag/AgCl reference electrode (to display the ORP versus a SHE (standard hydrogen electrode)). This is an arithmetic correction and is accurate only at the standard temperature. (For example, HI70224 test solution reads 470 mV at 25 °C versus the Ag/AgCl reference. The ORP mV versus a SHE would be 675 mV. Add 205 mV to the observed value.)

From the "Calibration" menu select "Single param. calibration" and then "ORP".

Options:
• **Custom ORP**: Perform a single point calibration using a custom point.
• **Restore factory calib.**: Restore the factory calibration if a new sensor has been installed.
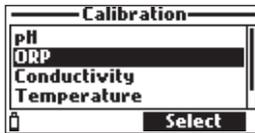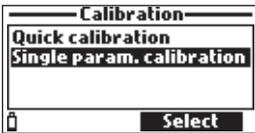
The calibration should be performed at temperatures between 20-26 °C.

Custom ORP Calibration Procedure

1. Remove the shield from the probe. Rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with the ORP test solution with a known concentration.
3. Immerse the sensors in the solution. Raise and lower the probe several times then discard this solution.
4. Fill the calibration beaker 2/3 full with the ORP test solution with a known concentration.
5. Slowly place the sensors in the solution. Dislodge bubbles that may adhere to the sensors.

6. Wait a few minutes for the measurement to stabilize. Use the arrow keys to select "Custom ORP" and press **Select** to start the calibration. A text box window will appear. Use the keypad to enter the value of the solution at the current temperature. Press **Accept** to confirm calibration point.

```
━━━ ORP calibration ━━━

 0037.0

 -2000.0...2000.0 mVORP

           ←      Accept
```

7. 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.
8. The message "Storing" followed by "Calibration completed" will be displayed. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

8.4. CONDUCTIVITY CALIBRATION

Conductivity calibrations are used to correct for variations in cell factors. Oily coatings and biological contaminations can cause changes in the cell geometry. The EC electrodes are located inside two small channels on the bottom of the sensor. They can be cleaned with the small brush from the maintenance kit. A mild detergent can be used to remove oily coatings. Flush the electrodes with water thoroughly after cleaning.

From the "Calibration" menu select "Single param. calibration" and then "Conductivity".

Options:

• **Conductivity**: Perform a one-point calibration using a standard solution. The calibration is temperature compensated.
• **Absolute conductivity**: Perform a one-point calibration with a known conductivity solution that is not temperature compensated.
• **Salinity**: Perform a one-point calibration with a known salinity solution (PSU).
• **Restore factory calib.**: Restore the factory calibration if a new sensor has been installed.

```
- Conductivity calibration -
Conductivity
Absolute conductivity
Salinity
Restore factory calib.
                  Select
```
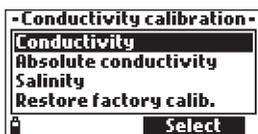
Note: To improve accuracy, choose a calibration standard near the sample conductivity.

Conductivity Calibration Procedure

1. Remove the shield from the probe. Rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with the conductivity standard solution.
3. Immerse the sensors in solution. Raise and lower the probe several times. Discard this solution.
4. Fill the calibration beaker 2/3 full with the conductivity standard solution.

5. Slowly place the sensors in the solution. Dislodge bubbles that may adhere to the sensors.
6. Use the arrow keys to select "Conductivity" and press **Select** to start the calibration.
7. If necessary, press **Cal. point** to select the correct standard. To use a custom standard, press **Custom**. A text box window will appear. Use the keypad to enter the value of the standard (100 to 200000 μS/cm) at the current temperature. Press **Accept** to confirm the standard value.

— Select calibration point —	- Conductivity calibration -
84 µS/cm	
1.413 mS/cm	001997
5.000 mS/cm	
12.880 mS/cm	000100...200000 µS/cm
Custom Select	← Accept

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

- Conductivity calibration -	- Conductivity calibration -
5089 µS/cm	**5089** µS/cm
25.61°C Point: 5.000 mS/cm	25.61°C Point: 5.000 mS/cm
Not ready...	Ready
Cal. point	Cal. point Confirm

9. Press **Confirm** to save the calibration. The message "Storing" followed by "Calibration completed" will be displayed.
10. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

Absolute Conductivity (EC) Calibration Procedure

1. Remove the shield from the probe. Rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with conductivity standard solution with known concentration.
3. Immerse the sensors in solution. Raise and lower the probe several times. Discard this solution.
4. Fill the calibration beaker 2/3 full with conductivity standard solution with known concentration.
5. Slowly place the sensors in the solution. Dislodge bubbles that may adhere to the sensors.
6. Wait a few minutes for the measurement to stabilize. Use the arrow keys to select "Absolute Conductivity" and press **Select** to start the calibration. A text box window will appear. Use the keypad to enter the value of the standard at the current temperature. Press **Accept** to confirm the standard value.

— Absolute EC calibration —
005001
000000...400000 µS/cm*
←   Accept

7. The stability timer will count down until the display shows the "Ready" message.
8. Note the temperature and adjust the conductivity value if needed.
9. Press **Confirm** to save the calibration. The message "Storing" followed by "Calibration completed" messages will be displayed.
10. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

Salinity Calibration Procedure

The measurement of salinity is based on the Practical Salinity Scale which uses the EC measurement. If the user has a standard with known PSU value it may be used to calibrate the conductivity sensor.

1. Remove the shield from the probe. Rinse the probe with purified water.
2. Fill the calibration beaker 2/3 full with salinity standard of a known value.
3. Immerse the sensors in solution. Raise and lower the probe several times. Discard this solution.
4. Fill the calibration beaker 2/3 full with the salinity standard.
5. Slowly place the sensors in the solution. Dislodge bubbles that may adhere to the sensors.
6. Wait a few minutes for the measurement to stabilize. Use the arrow keys to select "Salinity" from the Conductivity Calibration list and press **Select** to start the calibration. A text box window will appear. Use the keypad to enter the value of the standard (5.00 to 70.00 PSU) at the current temperature. Press **Accept** to confirm the standard value.
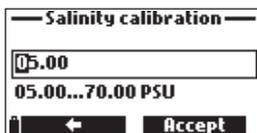
```
——Salinity calibration——
05.00
05.00...70.00 PSU
        ←        Accept
```

7. The stability timer will count down until the display shows the "Ready" message.
8. Note the temperature and adjust the salinity value if needed.
9. Press **Confirm** to save calibration. "Storing" followed by "Calibration completed" is displayed.
10. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

Notes: These procedures calibrate the slope value. To calibrate the offset, set the calibration point at 0 µS/cm and repeat the procedure.

Salinity Calibration Error Messages

- "Invalid temperature": temperature input is not within the acceptable range (0 to 50 °C).
- "Wrong standard": conductivity input is not within the acceptable range.

```
-Conductivity calibration-
       2787  µS/cm
25.26°C  Point:   1.413 mS/cm
        Wrong standard
   Cal. point
```

8.5. TEMPERATURE CALIBRATION

From the "Calibration" menu select "Single param. calibration" and then "Temperature".
Options:
- **Calibrate temperature**: The user can perform a one-point calibration.
- **Restore factory calib.**: Clears previous user calibration.
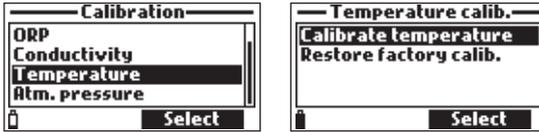
Procedure

1. Remove the shield from the probe. Rinse the probe with purified water.
2. Place the probe in an isothermal bath with a reference instrument.
3. Allow the probe to come to thermal equilibrium.
4. Use the arrow keys to select "Calibrate Temperature" and press **Select** to start the calibration.
5. A text box window will appear. Use the keypad to enter the calibration temperature (-5.00 to 50.00 °C). Press **Accept** to confirm the value.
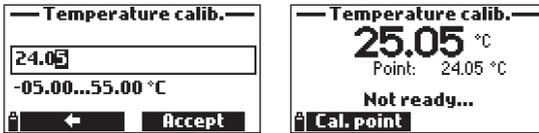
6. The stability timer will count down until the display shows the "Ready" message.
7. Press **Confirm** to store the calibration point. The message "Storing" followed by "Calibration completed" is displayed.
8. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

8.6. ATMOSPHERIC PRESSURE CALIBRATION

From the "Calibration" menu select "Single param. calibration" and then "Atm. pressure".
Options:
- **Custom pressure**: The user can perform a one-point calibration.
- **Restore factory calib.**: Clears previous user calibration.

Atmospheric Pressure Calibration Procedure

1. Use a reference barometer to obtain the true local barometric pressure reading.
2. Use the arrow keys to select "Custom Pressure" and press **Select** to start the calibration.
3. A text box window will appear. Use the keypad to enter the calibration pressure (600.0 to 1133.2 mbar). Press **Accept** to confirm the standard value.

```
── Pressure calibration ──
 0932.3
 0600.0...1133.2 mbar
 ▮ ◀──         Accept
```

4. The stability timer will count down until the display shows the "Ready" message. Press **Confirm** to store the calibration point.
5. After confirmation, the "Storing" and "Calibration completed" messages are displayed.
6. Press **OK** to return to the calibration menu or **Measure** to return to the measurement screen.

9. SYSTEM SETUP

From the main menu, select "System setup" and then "Meter setup" or "Probe setup".
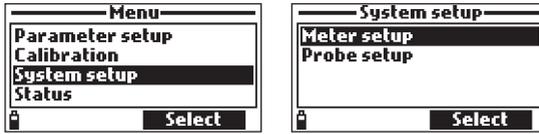
Note: When the password protection is enabled, authentication will be required before any modification.

9.1. METER SETUP

There are 12 items in the Meter Setup menu.
Pressing the corresponding numerical value will bring the user directly to that position in the list.

1. Time
2. Date
3. Auto Poweroff
4. Key Beep
5. Error Beep
6. Decimal Separator
7. LCD Contrast
8. LCD Backlight
9. Meter Password
10. Meter ID
11. Language
12. Restore Factory Settings

Time

Option: 12 or 24 hours
The meter uses a real time clock for logging.
Press **Modify** and set the time using the keypad.
Press **Format** to change between 12 and 24 hour formats.
When the 12 hour format is used, select AM/PM, then either A or P key to change.
Press **Accept** to save the option or press **ESC** key to return to the menu.
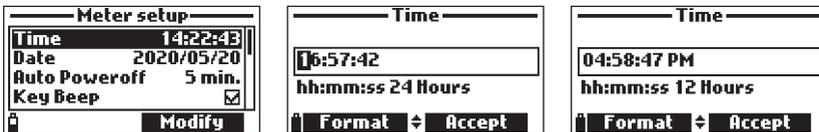
Date

Option: DD/MM/YYYY, MM/DD/YYYY, YYYY/MM/DD, YYYY-MM-DD, MM-DD-YYYY, DD-MM-YYYY
Press **Modify** and set the date using the keypad.
Press **Format** to change the date format.
Press **Accept** to save or press **ESC** key to return to the menu.
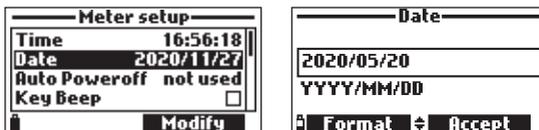
Auto Poweroff

Option: not used, 5, 10, 15, 20, 30, 60 minutes

The function is used to save battery life. After the set time is elapsed, the meter will:

1. Automatically switch off, if no key is pressed in normal measurement mode. Press **On/Off** key to switch on again.
2. Enter in power save mode, if continuous logging mode is selected with a minimum logging interval of 30 seconds. The "Power save mode" message and the **Wake up** functional key will be displayed on the LCD when it goes into this mode. Logging is not stopped. Pressing **Wake up** will exit the Power save mode.
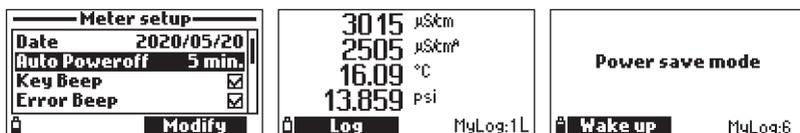
Key Beep

Option: Enabled or Disabled

When enabled, an acoustic signal is heard every time a key is pressed.
Press the functional key to select the desired option.

Error Beep

Option: Enabled or Disabled

Short beep: pressed key is incorrect. Long beep: pressed key is not active or an error is detected.
Press the functional key to select the desired option.

Decimal Separator

Option: Comma (,) or Period (.)

Select decimal separator used for display and log files.
Press the functional key to select the desired option.

LCD Contrast

Option: **0 to 15**

Press **Modify** and use the arrow keys to increase or decrease the display contrast.

Press **Accept** to save or press **ESC** key to return to the menu.
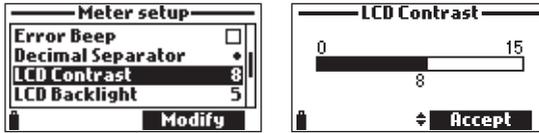
LCD Backlight

Option: **0 to 10**

Press **Modify** and use the arrow keys to change LCD backlight intensity.

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

Meter Password

The meter password protects against unauthorized configuration changes and log data from deletion. When enabled, certain settings and functions require the password before modifying or viewing. Once the password is entered, it will not be required until the meter is turned on again.

To enable password protection:

1. Select "Meter Password" and press **Modify**.
2. Enter a password (6 digits or less) in the text box and press **Accept**.

  Note: While typing, the characters are masked with a star (*) symbol.

3. Reenter the password. Press **Accept** to save or press **ESC** key to return to the menu.
4. The meter returns to the Meter Setup menu and the check mark indicates that the password protection has been enabled.

To disable password protection or to change the password:

1. Select "Meter Password" and press **Modify**.
2. Enter the current password and then press **Disable**. "No password" appears in the text box. To change the password, enter the new password.
3. Press **Accept** to save or press **ESC** key to return to the menu.

Meter ID

Option: Up to 14 characters

Press **Modify** to enter meter's ID setup screen.

Use the keypad to set or change the meter's ID. Press **Accept** to save or **ESC** to return to the menu.

```
┌──────Meter setup──────┐   ┌──────Meter ID──────┐
│LCD Backlight        5 │   │                    │
│Meter Password       □ │   │Atm                 │
│Meter ID               │   │                    │
│Language       English │   │ g h i G H I 4      │
│█          Modify      │   │█      ←      Accept │
└───────────────────────┘   └────────────────────┘
```
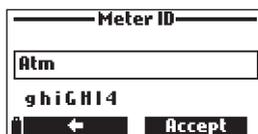
Language

Option: Español, English, Deutsch, Italiano, Portugues

Press **Modify** and use the arrow keys to change the language.

Press **Select** to save or press **ESC** key return to the menu.

```
┌──────Meter setup──────┐   ┌──────Language──────┐
│Meter Password       □ │   │Español             │
│Meter ID               │   │English             │
│Language       English │   │Deutsch             │
│Restore factory settings│  │Italiano            │
│█          Modify      │   │█          Select    │
└───────────────────────┘   └────────────────────┘
```

Restore Factory Settings

This function restores measurement settings to their original factory values. This includes measurement units, coefficients, other measurement configurations and all logged data. The factory calibration for the sensor channels is not affected.

1. Select "Restore factory settings" and press **Select**.
2. Press **Yes** to confirm or press **No** to return to the menu.

```
┌──────Meter setup──────┐   ┌-Restore factory settings-┐
│Meter Password       □ │   │   Do you want to perfom  │
│Meter ID               │   │   the current operation? │
│Language       English │   │                          │
│Restore factory settings│  │                          │
│█          Select      │   │█     Yes        No       │
└───────────────────────┘   └──────────────────────────┘
```
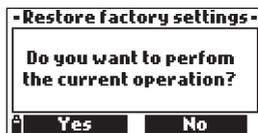
9.2. PROBE SETUP

Probe ID

Option: Up to 14 characters

Press **Modify** to enter probe ID setup screen. Use the keypad to set or change the probe ID.

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

```
┌──────Probe setup──────┐   ┌──────Probe ID──────┐
│Probe ID               │   │                    │
│                       │   │P6█                 │
│                       │   │                    │
│                       │   │                    │
│█          Modify      │   │█      ←      Accept │
└───────────────────────┘   └────────────────────┘
```
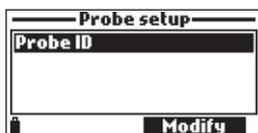
10. STATUS

In the measurement screen press **Menu**. Use the arrow keys to highlight "Status" and press **Select**. Use the arrow keys to highlight the desired option and press **Select**.

```
┌──────────Menu──────────┐
│Parameter setup         │
│Calibration             │
│System setup            │
│Status                  │
│█           Select      │
└────────────────────────┘
```

10.1. METER STATUS

Meter Status displays information related to the batteries, charging status, logging, internal temperature, password, Meter ID, serial number and firmware version.

```
┌─────────Status─────────┐
│Meter status            │
│Probe status            │
│GLP                     │
│                        │
│█           Select      │
└────────────────────────┘
```

Use the arrow keys to navigate through the meter status information.
Press **ESC** key to return to the "Status" menu.

```
┌─────Meter status─────┐   ┌─────Meter status─────┐   ┌─────Meter status─────┐
│Battery level    57%  │   │Free log space   99 % │   │Password     Not set  │
│Battery voltage  4.94V│   │Log interval  00:00:01│   │Meter ID       - - - -│
│Battery life  61 hours│   │Internal temp.  29.8°C│   │Meter SN    123456xx  │
│                      │   │                      │   │Firmware       v1.00  │
│█       ▾             │   │█       ⬍             │   │█       ▴             │
└──────────────────────┘   └──────────────────────┘   └──────────────────────┘
```
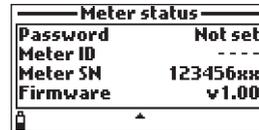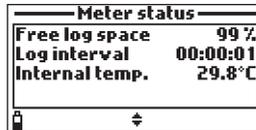
10.2. PROBE STATUS

Probe Status displays information related to the probe type, connected sensors, probe ID, serial number and firmware version.
Use the arrow keys to navigate through the probe status information.
Press **ESC** key to return to the "Status" menu.

```
┌─────────Status─────────┐   ┌─────Probe status─────┐   ┌─────Probe status─────┐
│Meter status            │   │Probe type  HI 7698195│   │Probe ID          12  │
│Probe status            │   │CONN1       pH & ORP  │   │Probe SN   K3014006   │
│GLP                     │   │CONN2            EC   │   │Firmware       v1.00  │
│                        │   │                      │   │                      │
│█           Select      │   │█ Measure ▾ Param.    │   │█       ▴             │
└────────────────────────┘   └──────────────────────┘   └──────────────────────┘
```
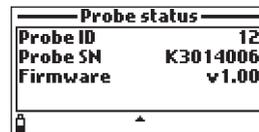
Note: Probe status screen will automatically be displayed when probe sensor status has changed.

10.3. GLP

GLP (Good Laboratory Practice) is a set of functions that allows the user to store or recall data regarding the probe calibration. GLP data stores the last five calibrations.
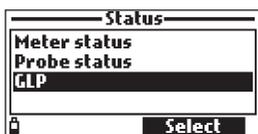
Note: *If no user calibration data is available for the selected parameter, "Factory Calibration" message is displayed.*

To navigate the GLP screens:
• Use the arrow keys to scroll through the stored data for the last 5 calibrations.
• Press **ESC** key to return to the menu.

pH

pH GLP screen displays: offset, acidic slope, basic slope, buffers used, time and date of the calibration.

Notes: *A "C" label near the buffer value indicates a custom point, while an "H" indicates a Hanna Instruments standard buffer value. If a quick calibration was performed, buffer values are replaced with "Quick calibration" indication.*

ORP

ORP GLP screen displays: calibration point, time and date.
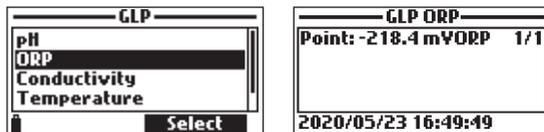
Conductivity

Conductivity GLP screen displays: calibration point, cell constant value, calibration type (conductivity, absolute conductivity or salinity), time and date.
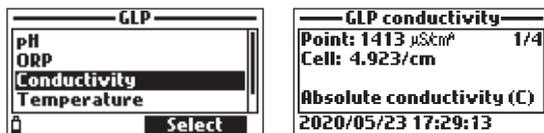
Notes: *If a quick calibration was performed, calibration point is replaced with "Quick Calibration".*

Temperature

Temperature GLP screen displays: calibrated point, time and date.

```
————— GLP —————        ——— GLP Temperature ———
ORP                     Point: 25.00 °C      1/1
Conductivity
Temperature
Atm. pressure
█                Select  2020/05/19 17:26:21
```
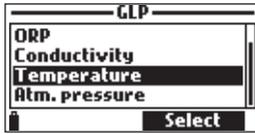
Atmospheric Pressure

Atmospheric pressure GLP screen displays: custom calibration point, time and date.

```
————— GLP —————        ——— GLP atm. pressure ———
ORP                     Point: 928.100 mbar   1/1
Conductivity
Temperature
Atm. pressure
█                Select  2020/05/20 09:13:11
```
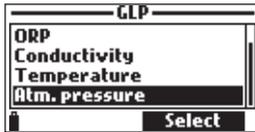
11. MEASUREMENT

During measurement mode HI981954 will simultaneously measure data for all enabled parameters.
Use the numbers 1 through 7 on the keypad to select the number of parameters that are shown on the screen at one time. The display will automatically resize the digits to fit the screen.
Use the arrow keys to scroll through the enabled parameters if they do not fit on one screen.
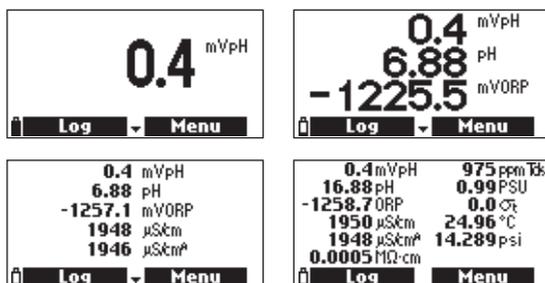
A blinking measurement value indicates that the measurement is out of range.
A blinking measurement unit indicates that the user calibration has not been done and is needed for accurate readings.

12. LOGGING

The HI981954 and the HI7698195 multi-sensor probe offer two types of logging: meter only parameters, and meter and probe parameters.

METER PARAMETERS ONLY
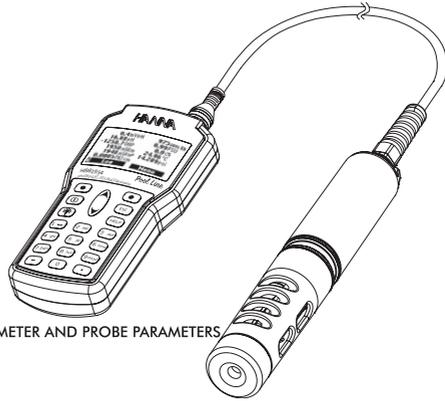
METER AND PROBE PARAMETERS

From measurement mode, press **Log** to access Log menu.

The data logged on the meter are organized by lots. Up to 45,000 complete records can be stored in up to 100 lots. Each lot can store log-on-demand records and/or continuous records with different parameter configurations.

12.1. ONE SAMPLE ON METER

1. Select "One sample on meter" to add one set of enabled measurement parameters to the meter's memory.

2. If there are existing lots on the meter, select the lot to log the sample in (use the suggested one by pressing **OK** or press **Options** to select from the list).
   If no lots have been saved or to create a new lot, press **New**. Use the keypad to enter desired lot name and press **Accept** to confirm.

3. Press **OK** to log the sample in the selected lot.

4. The Remarks window will open, press **Yes** to add a remark to the data point or **No** to skip.
   The meter will return to the measurement screen automatically.

12.2. START METER LOG

1. Select "Start meter log" to log the currently enabled parameters at the set logging interval on the meter.
2. To set the logging interval, press **Options**. The log interval time can set from 1 second to 3 hours. Press **Modify** and use the alphanumeric keys to enter the desired log interval. Press **Accept** to confirm.
3. Press **Select** to to edit the lot, remark or tag.
4. To stop the meter log, enter the log menu and select "Stop meter log".

```
┌──────── Log ────────┐   ┌───── Meter log ─────┐   ┌──────── Log ────────┐
│One sample on meter  │   │Log interval 00:05:00│   │*Stop meter log      │
│Start meter log      │   │                     │   │Log notes            │
│Log recall           │   │                     │   │                     │
│Log notes            │   │                     │   │                     │
│ Options    Select   │   │            Modify   │   │            Select   │
└─────────────────────┘   └─────────────────────┘   └─────────────────────┘
```

12.3. LOG RECALL

Select "Log recall" to view or delete logs that are stored on the meter. The number of available lots is displayed.

Lots

Select this option to view or delete individual lots.

1. Use the arrow keys to select the desired lot and 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.
2. Press **View** to review the log data. Use the arrow keys to change the sample number in the selected lot. The sample number is shown on the bottom right corner of the display.

```
┌─── Meter log recall ──┐   ┌─────── Lots ───────┐   ┌────── Horn pond ──────┐
│Lots          4 lots   │   │Horn pond           │   │Samples:          51   │
│Delete all lots        │   │Bear Hole           │   │Memory usage:    <1%   │
│                       │   │Red river           │   │First: 2020/05/17 15:51:20│
│                       │   │                    │   │Last:  2020/05/18 11:15:03│
│            Select     │   │ Delete      View   │   │              View     │
└───────────────────────┘   └────────────────────┘   └───────────────────────┘
```

Notes: The values displayed for 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.

3. Press **Info** to see record information for the current sample (time & date, remark or serial number, if available).

4. 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.
5. Press **ESC** to return to the menu.
6. Press **Plot** and the meter will create a list with all available parameters that can be plotted.
7. Use the arrow keys to select the desired parameter to be plotted. Press **Select** to view the graph.

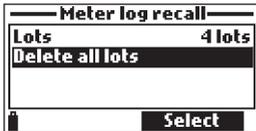| 155 µS/cm 24.96 °C	─────── Tap ───────
155 µS/cm* 14.314 psi	Sample: 3/2380
0.0065 MΩ·cm	2020/11/24 13:04:17
77 ppm Tds	Remarks
0.07 PSU	
0.0 σₜ	
Info ┆ ⬍ Tap:3	Data ┆ ⬍ Jump
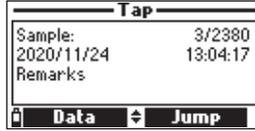
8. Use the arrow keys to move the cursor in the graph and highlight a sample. The sample data is displayed below the graph.
9. Press **ESC** to return to the parameter list.
10. Press **ESC** again to return to the menu.

─────── Tap ───────	-1.1mV
Jump to sample	
0003	
0001...2380 records	13:04:17 1
┆ ← Accept	2020/11/24 ⬍
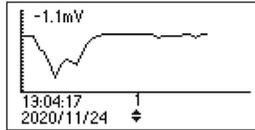
Note: The number of lot samples that can be plotted is limited by the display resolution. To view a complete graph download data to PC.

Delete All Lots

When this option is selected the instrument 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** key.

───Meter log recall───	───Delete all lots───
Lots 4 lots	
Delete all lots	Do you want to perfom
	the current operation?
┆ Select	┆ Yes No

12.4. LOG NOTES

Remarks

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

To add a new remark:

1. Select "Log notes" from Log menu, then "Remarks". Display shows a list of stored remarks.
2. Press **New**. Use the keypad to enter text. Entry is saved with **Accept**.
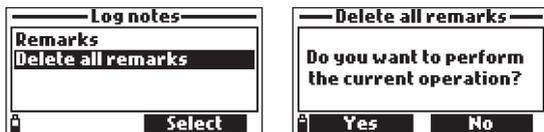
To delete a remark:

1. Select the remark from the list
2. Press **Delete** and confirm with **Yes**. Press **No** or **ESC** to return to the previous screen.

   Note: If deleted remark is used in an existing lot, information will still be available in lot data.

```
┌──────Log notes──────┐    ┌──────Remarks──────┐
│Remarks              │    │1am                │
│Delete all remarks   │    │                   │
│                     │    │                   │
│            Select   │    │ Delete      New   │
└─────────────────────┘    └───────────────────┘
```

Delete All Remarks

1. Select "Log notes" from the Log menu, then "Delete all remarks".
2. Confirm with **Yes**. Press **No** or **ESC** to return to the previous screen.

```
┌──────Log notes──────┐    ┌──Delete all remarks──┐
│Remarks              │    │ Do you want to perform│
│Delete all remarks   │    │ the current operation?│
│                     │    │                      │
│            Select   │    │  Yes         No      │
└─────────────────────┘    └──────────────────────┘
```

13. PC CONNECTION

The logged data from a probe or meter can be transferred to a PC using the HI9298194 application. The software is compatible with Windows® 10 & below.

HI9298194 software offers a variety of features (meter info, parameters, view & plot, export or delete log data and on-line help).

Saved logged data can be imported into most spreadsheet programs to be further analyzed or graphed.

Software Installation

Download & install the HI9298194 application from http://software.hannainst.com.

Meter to PC Connection

1. With the meter off, disconnect the probe.
2. Connect the USB cable to the meter and to a USB port on the PC.
3. Turn the meter on and the message "PC connected" will be displayed.

PC connected...

4. Run the HI9298194 application software.
5. Press **Setting** button on the top of the screen and select the desired measurement units.
6. 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 a new window will be displayed with meter data: status information (software version and date, SN, ID, battery level and free memory info), as well as a summary of logged data lots.
7. The lots logged on the meter can be saved to the PC by pressing the "Download lot" button after the desired lot is selected.
8. Once the lot has been downloaded, all the logged samples can be viewed.
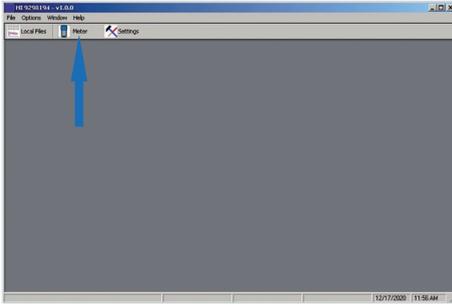
Meter to PC data

a. Select parameter units
b. Select Meter from toolbar
c. Select Lot
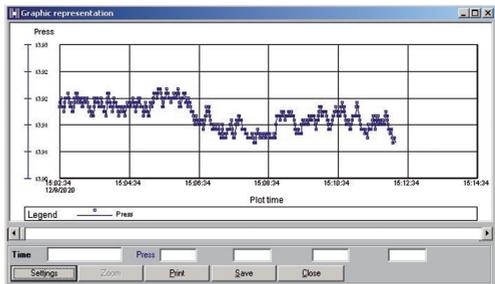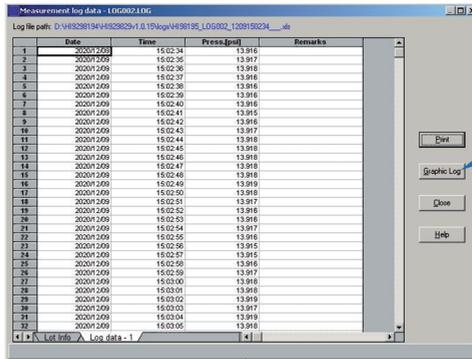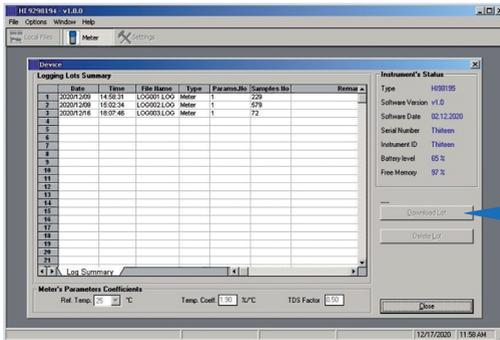
14. PROBE DEPLOYMENT

The Hanna Instruments HI7698195 have been designed for a variety of water quality measurements both in situ or in active deployments in urban or natural waters.

The HI981954 system may be used for discrete spot sampling with log on demand function or, continuous monitoring and logging. These data can be downloaded to a PC and plotted with logging software to obtain the graphical log needed for interpretation of the essential physical property of the aqueous body of water.

In all of these deployment situations data quality is dependent upon the site location, service intervals, amount of coatings, sedimentation and vegetation, and the actual installation. The probe may be installed in a horizontal bank (fixed installation) or a vertical suspension. The maximum depth rating of 20 m (65') for the probe should be adhered to.

Note: Actual sensor specifications may be less.

- The location must be accessible for the duration of the measurement (consider seasonal flooding, freezing and other acts of nature) when selecting a site. Many conditions may affect the quality of measurements.

- Select an installation site that is representative of the water body being monitored.

- Avoid areas without adequate water circulation. To protect equipment it is best to avoid exposure to wind, foam, turbulence, air temperature gradients/sun, extended periods of high flow, extended periods of high sediment and floating debris. The standard operating procedures (SOP) for the data gathering must be upheld. This typically includes pre and post deployment checks of the sensors to validate data gathered between calibrations, upholding service intervals, and following any other site-specific procedures. Grab samples for laboratory analysis or spot sampling with another probe are addition ways to validate the measurements taken by unattended continuous logs.

- The probe is suitable for installation in confined locations such as air vaults, river intakes, vertical wells, tanks etc. The streamline diameter of the probe permits insertion into 2" pipelines. Unlike probes that require a cable support for active deployments the probe can be manually lowered and raised by the cable due to it's superior strength member.

- It is suitable for installation in open moving waters; rivers, streams, ditches (farmland drainage), conveyance canals etc. In these cases protecting the probe from debris is important. If the probe is suspended from a pier or bridge position it behind a support and anchor the cable/probe to a pipe.

- It is suitable for deployment in open waters; monitoring lakes, ponds, wetland basin, infiltration basins, bays. Schedule regular service to remove aquatic weed growth that may be interfering with representative water samples.

Measurements in a flow cell

The probe is suitable for measurements in a flow cell. Pumping water to a flow-through monitoring station has obvious pros and cons.

- Typically a shelter is required to secure a pump, and flow chamber.
- A power requirement, shelter, pump maintenance and higher installation cost need to be considered.
- Freeze protection, security, and convenience of calibration.
- Possibility of adding multiple measurement points and anti-fouling preconditioning systems.
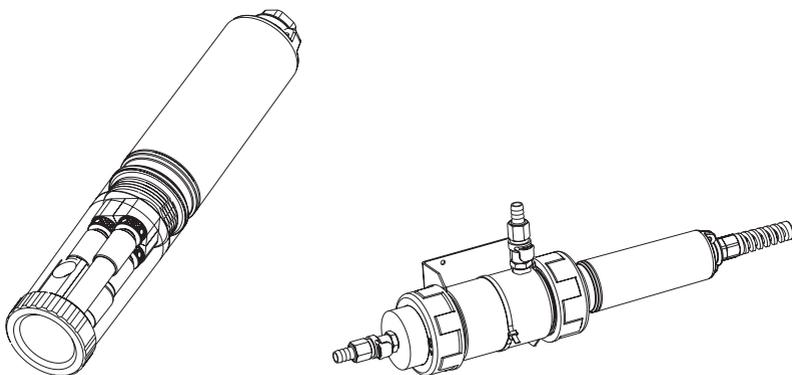
General Guidelines for fixed installation:

- Select a water-sampling site that will allow collection of representative water samples.
- Position the probe so the sensor surfaces face toward the flow. This will minimize air bubble or fluid cavitation. Limit flow rate to moderate.
- Mount the probe at a 0 to 45° angle. This will prevent the sensors (pH, pH/ORP) from becoming electrically discontinuous due to internal electrolytes flowing away from their internal cells.
- Ensure sampling sites have easy access.
- Regularly visit water sampling sites to: check for damage to sensors, the installation mountings, and the meter battery power.
- Remove aquatic weed growth that may be interfering with water sample collection.
- Position suspended probes behind a support. Anchor the cable/probe to a pipe to protect against debris.
- Have access to spare sensors and calibration standards or buffers.
- Strictly follow the established standard operating procedures (SOPs).
- Avoid trapped air and maintain constant flow rate if installed in a flow cell.

15. TROUBLESHOOTING / ERROR MESSAGES

HI981954 displays error messages to aid in troubleshooting. Warnings are displayed for non-critical issues. Errors are displayed for critical issues. See CALIBRATION section for messages during calibration.

"Log space full" is displayed 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" is displayed when powering up the meter with a probe connected. It is triggered if 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!" is displayed when powering up the meter if the language file is not loaded.
Restart the meter. If the problem persists, contact your local Hanna Instruments Office.

''Dead meter battery!'' is displayed if the meter batteries are too low to power the meter. The meter will automatically turn off.
Connect the charger if using rechargeable battery or replace the alkaline batteries to continue.

''User data corrupted!'' is displayed when powering up and the user data stored on meter is corrupted.
Restart the meter. If the problem persists, contact your local Hanna Instruments Office.

"Incompatible Probe" is displayed when the connected probe is not compatible with the meter.
Replace the probe.

"Incompatible sensor detected!" is displayed when the connected sensor is not compatible with probe or meter.
Replace the sensor before continuing.

''Warning x'': Any other warning that appears at power-on is 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 with no guarantee.
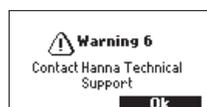
''Errors x'': Any critical errors that appear are identified using a numeric code, and the meter is automatically switched off. Contact your local Hanna Instruments Office.

ACCESSORIES

16. ACCESSORIES

Probes Packed in Carton Box, without Sensors or Protective Shield

Code	Description
HI7698195/4	HI7698195 probe with 4 m (13.1') cable
HI7698195/10	HI7698195 probe with 10 m (33.0') cable
HI7698195/20	HI7698195 probe with 20 m (65.6') cable
HI7698195/40	HI7698195 probe with 40 m (131.2') cable

Note: Probes with different cable length are available upon request. Order protective shields separately.

Sensors

Code	Description
HI7698194-0	pH sensor
HI7698194-1	pH/ORP sensor
HI7698194-3	EC sensor

Cables, Connectors, Accessories

Code	Description
HI710034	Shockproof silicon rubber boot
HI7698290	Short calibration beaker
HI7698295	Short protective shield
HI7698297	Long, quick release flow cell
HI76981952	Probe maintenance kit with small brush, small hex key, o-rings for probe (5 pcs.), 6 g sachet with silicone grease to lubricate the o-rings and syringe
HI9298194	PC application software, downloadable from http://software.hannainst.com
HI920015	Micro USB cable, PC to meter

Quick Calibration Solutions

Code	Description
HI9828-20	Quick calibration solution, 230 mL
HI9828-25	Quick calibration solution, 500 mL
HI9828-27	Quick calibration solution, 1 gal.

pH Buffers

Code	Description
HI5004	pH 4.01 buffer solution, 500 mL
HI5005	pH 5.00 buffer solution, 500 mL
HI5006	pH 6.00 buffer solution, 500 mL
HI5068	pH 6.86 buffer solution, 500 mL
HI5007	pH 7.01 buffer solution, 500 mL
HI5074	pH 7.41 buffer solution, 500 mL
HI5008	pH 8.00 buffer solution, 500 mL
HI5009	pH 9.00 buffer solution, 500 mL
HI5091	pH 9.18 buffer solution, 500 mL
HI5010	pH 10.01 buffer solution, 500 mL
HI700044P	Pool Line 4.01 pH buffer solution, 20 mL sachet (25 pcs.)
HI700074P	Pool Line 7.01 pH buffer solution, 20 mL sachet (25 pcs.)

ORP Solutions

Code	Description
HI7021L	240 mV ORP test solution, 500 mL
HI70224L	Pool Line 470 mV ORP test solution, 500 mL
HI7091L	Reducing pretreatment solution, 500 mL + 14 g (set)
HI7092L	Oxidizing pretreatment solution, 500 mL
HI700224P	Pool Line 470 mV ORP test solution, 20 mL sachet (25 pcs.)

pH/ORP Maintenance Solutions

Code	Description
HI70614L	Pool Line electrode cleaning solution, 500 mL
HI70670L	Cleaning solution for salt deposits, 500 mL
HI70671L	Cleaning and disinfection solution for algae, fungi and bacteria, 500 mL
HI70774L	Pool Line oil and fats cleaning solution, 500 mL
HI703004L	Pool Line storage solution for pH and ORP electrodes, 500 mL
HI7006014P	Pool Line pH and ORP Electrode cleaning solution, 20 mL sachet (25 pcs.)

Conductivity Standard Solutions

Code	Description
HI7030L	12880 μS/cm calibration solution, 500 mL
HI7031L	1413 μS/cm calibration solution, 500 mL
HI7033L	84 μS/cm calibration solution, 500 mL
HI7034L	80000 μS/cm calibration solution, 500 mL
HI7035L	111800 μS/cm calibration solution, 500 mL
HI7039L	5000 μS/cm calibration solution, 500 mL
HI700304P	Pool Line 12880 μS/cm calibration solution, 20 mL sachet (25 pcs.)

CERTIFICATION

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

$$C\epsilon \qquad \text{RoHS}_{\text{compliant}}$$

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 your and the instrument's safety do not use or store the instrument in hazardous environments.

WARRANTY

HI981954 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.

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