

Instruction Manual

HI 93102

Multiparameter Turbidity & Ion Specific Meter



www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using these instruments.

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

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

WARRANTY

HI 93102 is guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. 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 the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

TABLE OF CONTENTS

| | |
|------------------------------------|----|
| WARRANTY | 2 |
| PRELIMINARY EXAMINATION | 3 |
| GENERAL DESCRIPTION | 4 |
| PRINCIPLE OF OPERATION | 6 |
| FUNCTIONAL DESCRIPTION | 9 |
| SPECIFICATIONS | 12 |
| OPERATIONAL GUIDE | 13 |
| CALIBRATION | 21 |
| DIAGNOSTIC MODE | 29 |
| LOGGING WITH HI 93102 | 30 |
| USER-SELECTABLE AUTO-OFF | 32 |
| BATTERY REPLACEMENT | 33 |
| DIAGNOSTIC CODES | 34 |
| ACCESSORIES | 35 |

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it to make sure that no damage has occurred during shipping. If there is any damage, notify your Dealer.

HI 93102 is supplied complete with:

- Glass cuvette with cap
- Batteries (4 x 1.5V AA)
- Instruction manual

The **HI 731327** complete maintenance kit is also available, including:

- 2 glass cuvettes
- Primary calibration standards:
 - HI 93102-0** AMCO-AEPA-1 0 NTU* calibration solution, 30 mL
 - HI 93102-20** AMCO-AEPA-1 20 NTU* calibration solution, 30 mL
- **HI 93703-50** cleaning solution, 230 mL
- Cloth for wiping cuvettes
- Rugged carrying case

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

* 1 NTU (Nephelometric Turbidity Unit) = 1 FTU (Formazine Turbidity Unit)

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GENERAL DESCRIPTION

The Hanna **HI 93102** is a portable microprocessor driven, multiparameter, turbidity and ion specific meter. It measures Free & Total Chlorine, Cyanuric Acid, pH, Iodine, Bromine, Low Range Iron and Turbidity.

In the colorimetric mode, the user can select either factory preprogrammed calibration settings or calibrate the meter using customized calibration values based on the concentration or relative absorbance of the sample. Calibration data is also stored in a non-volatile EEPROM.

In the turbidity mode, periodic recalibration of the meter with primary standards according to regulatory requirements or personal experience is suggested. Turbidity ranges are 0.00-9.99 NTU and 10.0-50.0 NTU.

HI 93102 complies with G.L.P. Standards (Good Laboratory Practice), that is:

- When switched on, the LCD displays all segments (display check).
- Battery status is monitored during every measurement cycle warning the user if the batteries become weak.

In addition, **HI 93102** will turn itself off before low voltage causes erroneous readings.

- It utilizes a real time clock and recalls calibration data such as date, time and calibration values.

To facilitate field tests, the meter provides a logging mode. In this mode, the user can store up to twenty five time-tagged measurements in RAM and scroll the memory at any time.

There are eight keys for the different operational modes. The large Liquid Crystal Display is dual-level: the upper level has four digits and can display the measured parameter in hundredths. The lower level has three characters and indicates current mode (e.g. F CL for free chlorine or TR for turbidity). Different LCD segments indicate low battery, logging mode, date, time, etc.

A pure green LED has been utilized as a light source for both turbidimetric and colorimetric measurements. A silicon photocell is used to receive transmitted light from colorimetric channel while another photocell receives scattered light from the turbidimetric (nephelometric) channel.

In order to measure colorimetric parameters, all the operator has to do is zero the blank sample and then add 1 packet of reagent (for Bromine, Chlorine, Cyanuric Acid, Iodine and Low Range Iron) or 0.2 mL of Phenol Red (for pH). After placing the cuvette back in the meter and pressing READ, the measurements are shown directly on the LCD.

The instrument operates with four AA batteries and may be operator-programmed to turn itself off automatically after 10, 20, 30, 40, 50 or 60 minutes of inactivity.

HI 93102 and all accessories such as sample vials, reagent pillows, primary standards, can be easily stored in the optional carrying case.

PRINCIPLE OF OPERATION

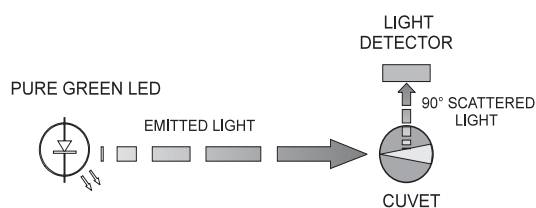
TURBIDITY MODE

HI 93102 has been designed to perform measurements according to the USEPA's 180.1 method and the Standard Method 2130B.

The instrument functions by passing a beam of light through a vial containing the sample being measured.

The light source is a Pure Green LED to ensure that any interference caused by a colored samples is minimized.

A sensor, positioned at 90° with respect to the direction of light, detects the amount of light scattered by the undissolved particles present in the sample. The microprocessor converts such readings into NTU* values.



NTU units are equal to FTU units. However, there are other known measurement units for turbidity, namely the Jackson Turbidity Unit (JTU) based on the old method of Jackson's candle, and Silica Unit (mg/L of SiO₂). The conversion table between these measurement units is shown below:

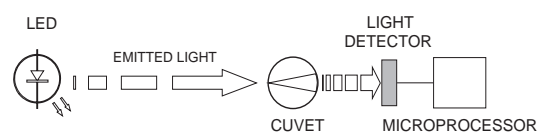
| | JTU | NTU/FTU | SiO ₂ (mg/L) |
|-------------------------|-------|---------|-------------------------|
| JTU | 1 | 19 | 2.5 |
| NTU/FTU | 0.053 | 1 | 0.13 |
| SiO ₂ (mg/L) | 0.4 | 7.5 | 1 |

* 1 NTU = 1 FTU

COLORIMETRIC MODE

The color of every object we see is determined by a process of absorption and emission of the electromagnetic radiation (light) of its molecules.

Colorimetric analysis is based on the principle that specific compounds react with others to form a color, the intensity of which is proportional to the concentration of the substance being measured.



Block diagram of an ion specific measurement

When a substance is exposed to a beam of light intensity I_0 , a portion of the radiation is absorbed by the substance's molecules and a radiation of intensity I , lower than I_0 is emitted.

The quantity of radiation absorbed is given by the Lambert-Beer Law:

$$\log I_0/I = \epsilon_\lambda c d$$

Where $\log I_0/I = \text{Absorbance (A)}$

ϵ_λ = molar extinction coefficient of the substance at wavelength λ

c = molar concentration of the substance

d = optical distance light travels through the sample

Since other factors are known, the concentration "c" can be calculated from the color intensity of the substance determined by the emitted radiation I .

An LED (Light Emitting Diode) emits radiation at a relatively narrow spectrum, supplying the system with the intensity I_0 .

A substance absorbs a color complimentary to the color it emits. For example, a substance appears yellow because it absorbs blue light. As a result, the Hanna meters use LED's with specific wavelengths to measure samples.

The optical distance (d) is measured by the internal diameter of the cuvette containing the sample.

The photoelectric cell collects the radiation I that is not absorbed by the sample and converts it into an electric current.

The microprocessor converts the value into the desired measuring unit and displays it on the LCD.

The measurement process is done in two phases: setting the meter to zero and actual measurement.

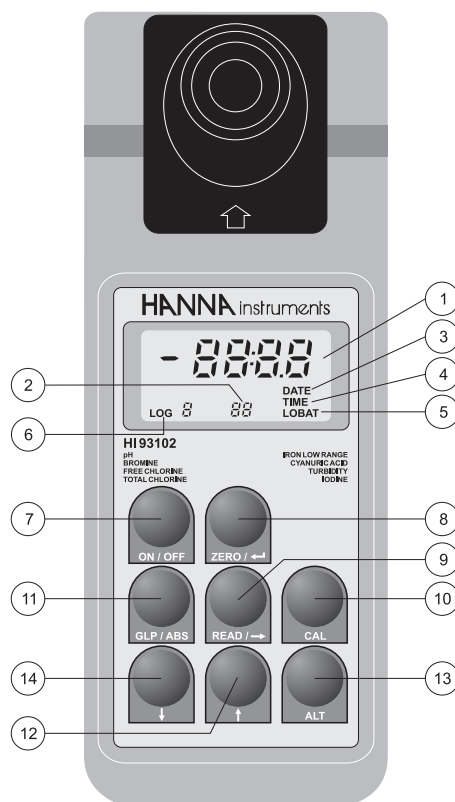
The cuvette is an optical element and hence has an important role in the measurement process. Both the measurement and the calibration cuvettes must be optically identical to provide the same measurement conditions.

It is also important that the surface of the cuvette is clean and free from scratches or dents, in order to avoid measurement interference due to unwanted reflection and absorption of light.

It is recommended that wherever possible the cuvette walls are not touched by the operator.

Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvettes to prevent any contamination.

FUNCTIONAL DESCRIPTION



1) Primary LCD:

The four-digit LCD shows all segments for several seconds when the meter is switched on. It then displays four dashes to indicate "ready to measure". It is also the area where the date, time and value of last calibration are shown. In "Read" and "Zero" mode, "SIP" is shown to indicate "Sample In Progress". The upper level also indicates the concentration or turbidity of the sample, as well as different diagnostic modes, such as "-BA-" for low battery.

- 2) **Secondary LCD:** The three-digit LCD shows the current mode of measurement that is "F CL", "tCL", "CY", "PH", "ld", "Br", "LFE", "tr", and diagnostic or calibration modes, such as "d11", "2 Fn", "5c1".
- 3) **DATE:** Indicates that the upper level of LCD is showing the current date, the date of last calibration or the date of logged measurement in memory.
- 4) **TIME:** Indicates that the upper level of LCD is showing the current time, the time of last calibration or the time of logged measurement in memory.
- 5) **LOBAT:** Blinking segment warns user of low battery voltage.
- 6) **LOG:** If intermittent, it indicates that the user is in the scroll mode viewing the logged measurements. If fixed, it indicates that the meter is in the log mode and every reading taken will be stored in memory.
- 7) **ON/OFF key:** Turns the meter on and off.
- 8) **ZERO / ← key:** In ion specific (colorimetric) mode, it zeros the sample. In calibration and diagnostic modes, it functions as ENTER (not used in turbidity mode).
- 9) **READ / → key:** Takes the measurement of concentration/turbidity of the sample which is shown on the LCD. In diagnostic or calibration mode, shifts the flashing digit to the right.
- 10) **CAL key:** If pressed during calibration, the calibration procedure will be aborted and the last calibration data will be reinstated. If pressed together with the **ALT** key for less than 3 seconds, the diagnostic mode will be entered. If pressed together with the **ALT** key again, the

- meter will quit diagnostic mode. If pressed for more than 3 seconds, an intermittent "CAL" prompt will appear on the upper LCD level and the calibration procedure is entered.
- 11) **GLP/Abs key:** In ion specific mode, it will toggle concentration/absorbance readings on the upper LCD. In turbidity mode, date, time and the two calibration values of the current mode will be shown. If pressed in time/date setup mode, the meter will quit current mode without making any changes to current time/date.
 - 12) **↑ key:** Scrolls upwards through the parameters to be measured. In calibration/diagnostic mode, increments the blinking digit by one. If pressed together with **ALT** while the meter is in logging mode, the upper LCD will show the data (date/time/value) in the memory.
 - 13) **ALT key:** Alternative functions.
 - 14) **↓ key:** Scrolls downwards through the parameters to be measured. In calibration/diagnostic mode, decreases the blinking digit by one. If pressed together with **ALT** while the meter is in logging mode, the upper LCD will show the current lot number.

SPECIFICATIONS

| | | |
|--------------------------|---|--------------------------------------|
| Range | Turbidity | 0.00 to 50.0 NTU* |
| | Bromine | 0.00 to 8.00 mg/L |
| | Free Cl₂ | 0.00 to 2.50 mg/L |
| | Total Cl₂ | 0.00 to 3.50 mg/L |
| | CYS | 0 to 80 mg/L |
| | Iodine | 0.0 to 12.5 mg/L |
| | LR Iron | 0.00 to 1.00 mg/L |
| | pH | 5.9 to 8.5 |
| Resolution | Turbidity | 0.01 and 0.1 NTU* |
| | Bromine | 0.01 mg/L |
| | Free Cl₂ | 0.01 mg/L |
| | Total Cl₂ | 0.01 mg/L |
| | CYS | 1 mg/L |
| | Iodine | 0.1 mg/L |
| | LR Iron | 0.01 mg/L |
| | pH | 0.1 |
| Accuracy | Turbidity | ±0.5 NTU* or ±5% (whichever greater) |
| | Bromine | ±0.08 mg/L; ±3% |
| | Free Cl₂ | ±0.03 mg/L; ±3% |
| | Total Cl₂ | ±0.03 mg/L; ±3% |
| | CYS | ±1 mg/L; ±15% |
| | Iodine | ±0.1 mg/L; ±5% |
| | LR Iron | ±0.02 mg/L; ±3% |
| pH | 0.1 pH | |
| Light Source | Pure Green LED | |
| Light Source Life | Life of the instrument | |
| Light Detector | Two Silicon Photocells | |
| Power Source | 4 x 1.5V AA alkaline batteries | |
| Battery Life | 60 hours or 1000 measurements | |
| Auto-off | Selectable after 10, 20, 30, 40, 50 or 60 min. of non-use | |
| Environment | 0 to 50 °C (32 to 122 °F) RH max. 95% non-condensing | |
| Dimensions | 220 x 82 x 66 mm (8.7 x 3.2 x 2.6") | |
| Weight | 510 g (1.1 lb.) | |

* 1 NTU = 1 FTU

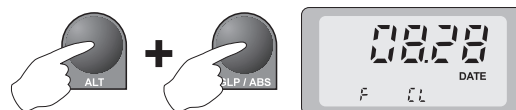
OPERATIONAL GUIDE

SET CURRENT TIME/DATE

To set or change the current time, turn on the meter. After initialization routine, the LCD will show:



Press and hold the **ALT** and **GLP** keys together. Display will show the current date in MM.DD format (e.g. August 28 is shown as 08.28).



Release the keys. The month digits will blink. Make the necessary adjustments with the **↑** and **↓** keys. To skip to the day digits, press the **→** key.



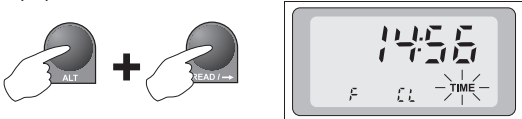
After the adjustments, press the **←** key. The unit will store the newly set month-day data in its EEPROM and will show the current time by a 24 hour clock HH:MM format, e.g. 2:28 pm is:



Similarly, make the necessary adjustments as described above and press **←**. The newly set up "month - day - hour - minute" data will be stored in memory.

CURRENT TIME/DATE RECALL

To recall current TIME/DATE press and hold the **ALT** and **READ** keys together. The current time and an intermittent "TIME" will be displayed.



Release the keys.

Press and hold the **ALT** and **READ** keys again and the meter will show the current date together with an intermittent "DATE".

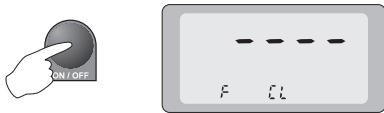


TURBIDITY MEASUREMENTS

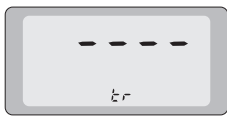
Fill the vial with the sample. The surface of the vial should be clean and scratch free.



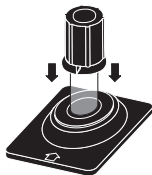
Turn the meter on. After the initialization routine, the LCD will show:



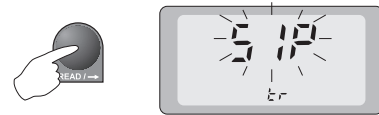
Use the **↑** and **↓** keys to set the lower level of the LCD to turbidity (tr).



Insert the sample into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove.



Press **READ**. The meter will intermittently display "SIP" on the upper level of the LCD.



After a few seconds the display will show the turbidity value, e.g. 5.34 NTU:

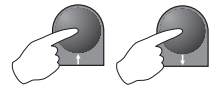


COLORIMETRIC MEASUREMENTS

Turn the meter on. After the initialization routine, the LCD will display:



Use the **↑** and **↓** keys to choose the desired parameter:



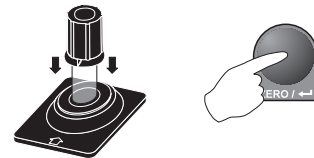
| | | | |
|------|---------------|------|----------------|
| F CL | Free Chlorine | t CL | Total Chlorine |
| CY | Cyanuric Acid | PH | pH |
| Id | Iodine | Br | Bromine |
| L FE | Iron | | |

Measuring Chlorine, Cyanuric Acid, pH, Iodine, Bromine

Fill the vial with the sample (blank). The surface of the vial should be clean and scratch free.



Insert the blank sample into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. Press **ZERO**.



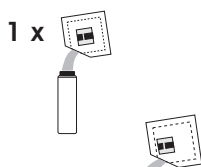
The meter will show "SIP" for a few seconds and then a zero indication:



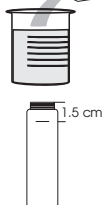
For pH, add 0.2 mL of HI 93710-01:



For Chlorine, Iodine and Bromine, add the content of their respective packet:

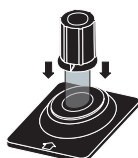


For Cyanuric Acid only, add the content of one packet of HI 93722 reagent to a beaker filled up to the 25 mL mark with unreacted sample up to the 25 mL mark. Stir gently to mix and then fill the cuvette up to 1.5 cm (3/4") below the rim with 10 mL of the reacted sample.



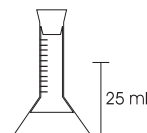
Replace the cap, shake the cuvette and allow a few seconds for color to develop. For best results, wait 2 1/2 mins. for Total Chlorine, Bromine, Iodine, and 45 secs. for Cyanuric Acid. Insert the reacted sample into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. Press **READ**.

The meter will show "SIP" for a few seconds and then the concentration:

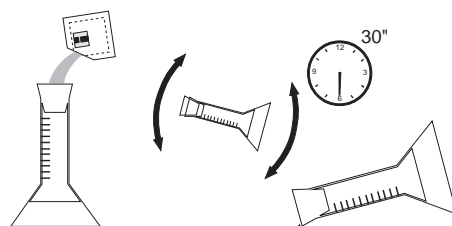


Measuring Iron

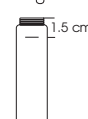
Fill one graduated mixing cylinder up to the 25 mL mark with deionized water.



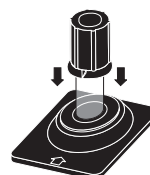
Add the content of one packet of HI 93746 TPTZ reagent, close the cylinder and agitate for 30 seconds. This is the blank.



Fill a cuvette with 10 mL of the blank up to 1.5 cm (3/4") below the rim and replace the cap.



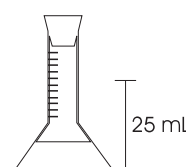
Insert the blank into the cuvette holder and make sure that the notch on the cap is positioned securely into the groove. Press **ZERO**.



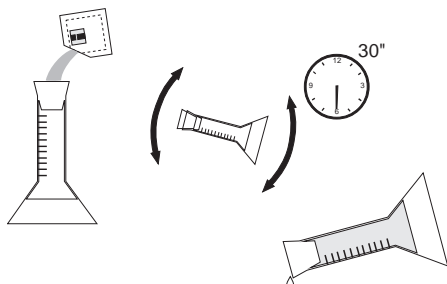
The meter will show "SIP" for a few seconds and then a zero indication:



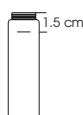
Fill one graduated mixing cylinder up to the 25 mL mark with the sample.



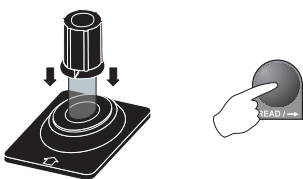
Add the content of one packet of **HI 93746** TPTZ reagent, close the cylinder and agitate for 30 seconds.



Fill a cuvette with 10 mL of the reacted sample up to 1.5 cm (3/4") below the rim and replace the cap. This is the sample.



Insert the reacted sample into the cuvette holder and make sure that the notch on the cap is positioned securely into the groove. Wait 30" and then press **READ**.



The meter will show "SIP" for about a few seconds and then the concentration:



Note: To review the relative absorbance of the sample, wait until the concentration measurement is completed, and then press **GLP/Abs**. The display will show the absorbance in milliunits together with the "Ab" indicator, e.g.:

533 Ab = 533 milliabs. units



Note: Absorbance readings may have a negative sign if the transmittance of the "ZERO" sample is less than that of the reacted sample.

Note: For better accuracy wash glassware with HCl 6N.

Measurements in user-customized mode

Note: The meter must be calibrated for this purpose. Follow the two-point customized calibration on page 26 before proceeding.

Turn the meter on and by momentarily pressing both **ALT** and **CAL**.



The LCD will show four dashes on the upper and "d 00" on the lower part of the LCD with the second "0" flashing:



Using the **↑**, **↓** and **→** keys change the lower row of the display to show "d 11":



Press the **←** key. This key is also used as a toggle between *USER* (USR) and *FACTORY* (FCT) programmed functions. Select the *USER* mode (if necessary by pressing the **←** key more than once):

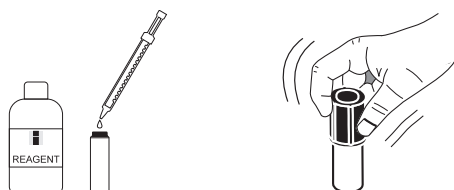


Press **ALT** and **CAL** until four dashes are displayed on the upper display and "# fn" are shown in the lower part of the LCD.

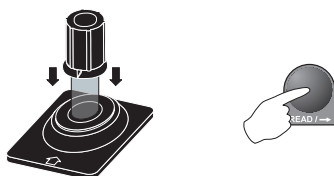


Using the **↑** and **↓** keys select the number from 0 to 7 where the appropriate calibration data have been stored.

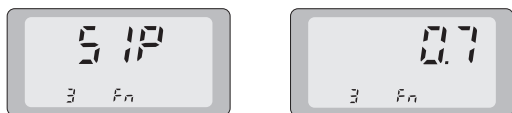
Add the appropriate reagent into the blank sample cuvette. Shake and allow a few seconds for color to develop.



Insert the reacted sample into the cuvette holder and make sure that the notch on the cap is positioned securely into the groove. Press **READ**.



The meter will first show "SIP" for a few seconds and afterwards the sample concentration:



CALIBRATION

TURBIDITY CALIBRATION

The meter should be properly calibrated with a standard prepared as described in USEPA method 180.1.

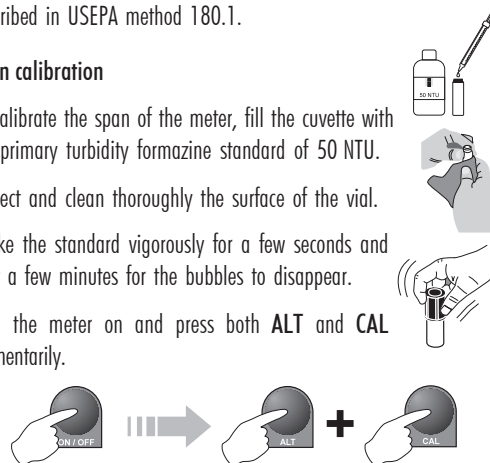
Span calibration

To calibrate the span of the meter, fill the cuvette with the primary turbidity formazine standard of 50 NTU.

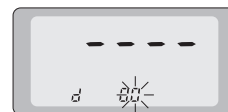
Inspect and clean thoroughly the surface of the vial.

Shake the standard vigorously for a few seconds and wait a few minutes for the bubbles to disappear.

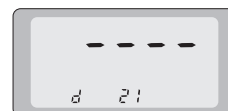
Turn the meter on and press both **ALT** and **CAL** momentarily.



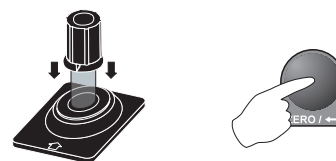
The LCD will show four dashes on the upper and "d 00" on the lower part of the LCD with the second "0" blinking.



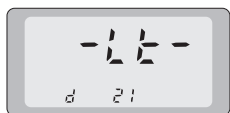
Using the **↑**, **↓** and **→** keys change the lower row of the display to show "d 21".



Insert the previously prepared 50 NTU standard into the cuvette holder and make sure that the notch on the cap is positioned securely into the groove. Press **←**.



The display will blink “-Lt-” for several seconds, indicating that the LED is being adjusted for the turbidimetric channel.



Afterwards, a sequence of numbers between -511 to 512 will appear on the upper part of the LCD indicating different levels of LED light intensity.

In approximately one minute, the adjustment will be made and the calibration data stored in the non-volatile memory.

The display will show four dashes again indicating the end of the span calibration procedure.



Press the **ALT** and **CAL** keys together again to leave the diagnostic mode.



Two-point customized calibration

To enter the turbidity calibration mode, the meter should be in “turbidity” mode.



Use the **↑** and **↓** keys to set the lower level of the LCD to “tr”.

To enter the calibration mode, press and hold the **ALT** and **CAL** keys together for at least three seconds. The upper display will start flashing “CAL” for approximately three seconds.



To confirm entry into the calibration mode, press the **CAL** key again while “CAL” is blinking.



If the **CAL** key is not pressed, the upper display will show “----”, indicating that calibration mode was not entered. In which case, hold down the **ALT** and **CAL** keys together for 3 seconds to restart the procedure.

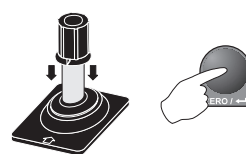


After entering the calibration mode, the display will show the first point of the previous calibration. The most significant digit will also be blinking.



Using the **↑**, **↓**, **→** keys, set the turbidity of first calibration standard (from 0.00 to 50.0 NTU).

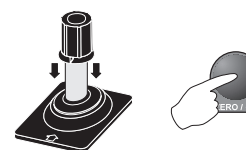
Insert the standard vial into the cuvette holder and ensure that the notch is positioned securely into the groove. Press the **←** key. The display will indicate Sample In Progress (**SIP**).



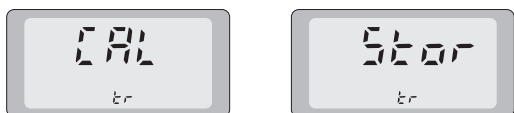
After the first calibration point is memorized, the LCD will indicate the second point of the previous calibration with the most significant digit blinking.



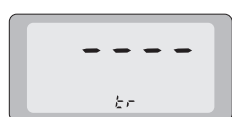
Using the **↑**, **↓**, **→** keys, set the turbidity of the second calibration standard (from 0.00 to 50.0 NTU). Insert the standard into the cuvette holder and make sure that the notch is positioned securely into the groove. Press the **←** key. The display will indicate “SIP” again.



After the second calibration point is memorized, the unit will store the calibration data together with time and date in the EEPROM while intermittently indicating "CAL" and "Stor" for several seconds.



Subsequently, the upper display will show "----", indicating that the meter is calibrated and ready to measure turbidity of an unknown sample.



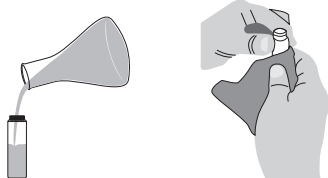
By pressing CAL during calibration, user can quit the calibration mode at any time without changing the previously stored calibration data.



COLORIMETRIC CALIBRATION

Zero calibration

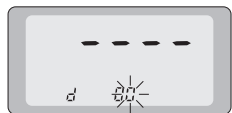
To calibrate the span of the meter, fill the cuvette with a clean deionized water sample. Inspect and thoroughly clean the surface of the vial.



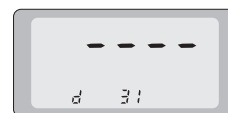
Turn the meter on and press both ALT and CAL momentarily.



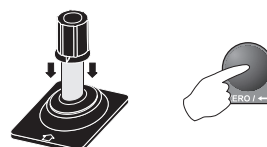
The display will show four dashes and "d 00". The second "0" will blink to allow the user to make a selection.



Using ↑, ↓, → keys set the lower part to "d 31".



Insert the previously prepared deionized water standard into the cuvette holder and make sure that the notch on the cap is positioned securely into the groove. Press the ← key.



The display will blink "-Lc-" for several seconds, indicating that adjustment of the LED for the colorimetric measurements is in progress.



After this, a sequence of numbers between -511 to 512 will appear on the upper LCD indicating the different levels of LED light intensity. In approximately one minute, the adjustment will be made and the calibration data will be stored in the non-volatile memory.

Display will show four dashes again indicating the end of the zero calibration procedure.



Press the ALT and CAL keys again to leave the diagnostic mode.



Two-point customized calibration

To enter the colorimetric calibration mode, press momentarily both the ALT and CAL keys. The LCD will show four dashes and "d00".



Using the ↑ and ↓ keys, set the lower part of the LCD to “d 11” and then press the ← key.



The ← key is used as a toggle function in this mode and allows the user to select between *USER* (USR) or *FACTORY* (FCT) programmed functions.



Select the *USER* mode and press **ALT** and **CAL** keys together to leave the diagnostic mode. The display of the meter will indicate four dashes together with a number from 0 to 7 on the lower part of the LCD.



Press and hold the **ALT** and **CAL** keys together for at least three seconds. The upper display will start flashing “CAL” for approximately three seconds.



To confirm entry into the calibration mode, press the **CAL** key again while “CAL” is still blinking.



If the **CAL** key is not pressed, the upper row of the display will show “----”, indicating that the calibration mode was not entered. In which case, hold down the **ALT** and **CAL** keys together for 3 seconds to restart the procedure.

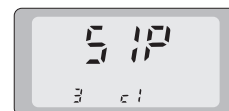
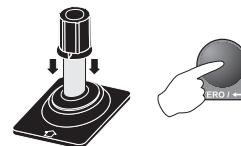


After entering the calibration mode, the display will show the first point of the previous calibration with the most significant digit blinking.



Using the ↑, ↓ and → keys, choose the concentration of the first calibration standard.

Insert the known standard into the cuvette holder and make sure that the notch is positioned securely into the groove. Press the ← key. The display will indicate sample in progress.

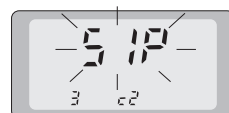
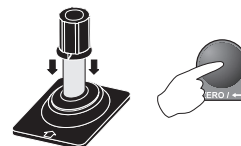


After the first calibration point is memorized, the LCD will indicate the second point of the previous calibration with the most significant digit blinking.



Using the ↑, ↓, → keys, choose the known concentration of the second calibration standard.

Insert the standard into the cuvette holder and make sure that the notch is positioned securely into the groove. Press the ← key. The display will blink “SIP” again.



After the second calibration point is memorized, the unit will store the calibration data, time and date in the EEPROM while intermittently indicating “CAL” and “Stor” for several seconds.



Subsequently, the upper display will show "----", indicating that the meter is calibrated and ready to measure the concentration of an unknown sample.



By pressing the **CAL** key during calibration, user can leave the calibration mode at any time without changing the previously stored calibration data.



DIAGNOSTIC MODE

HI 93102 facilitates operations by providing a diagnostic mode. In this mode, user can set or verify different parameters necessary to ensure optimum performance of the meter.

To enter the diagnostic mode, turn the meter on and momentarily press **ALT** and **CAL** together. The display will show four dashes together with "d 00":



Using the **↑**, **↓** and **→** keys, select the required diagnostic mode and press the **←** key.

The meter will execute one of the following user-diagnostic functions:

| | |
|----|---------------------------------------|
| 10 | Customizes automatic shutdown |
| 11 | Selects User or Factory functions |
| 12 | Turns logging mode on or off |
| 21 | Calibrates span in turbidimetric mode |
| 31 | Calibrates span in colorimetric mode |
| 40 | Clears the logged memory |

The following diagnostic modes are reserved for authorized service technicians:

| | |
|----|--|
| 00 | Shows the Blank level in colorimetric mode |
| 01 | Shows the Sample level in colorimetric mode |
| 02 | Shows the Dark level in colorimetric mode |
| 05 | Shows the Ground voltage |
| 06 | Shows 5V on-board level |
| 07 | Shows battery voltage level |
| 08 | Shows 1.23V reference voltage level |
| 09 | Shows -5V on-board level |
| 99 | Shows software version number |

To quit diagnostic mode, press the **ALT** and **CAL** keys together again.



LOGGING WITH HI 93102

HI 93102 allows user to log 25 time/day-tagged measurements. User can easily turn the logging mode on and off, review the logged memory, review the current lot number and clean the buffer (memory). HI 93102 also reminds user if its memory is full.

TURNING THE LOG MODE ON OR OFF

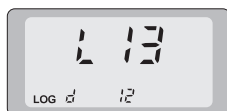
Enter the diagnostic mode by pressing ALT and CAL together.



Select mode 12 and press the ← key.



The display will show the current (vacant) lot together with "LOG" if the log mode is on. Otherwise it will show "----" if the log mode is off.



By pressing the ← key, the meter toggles between the Log on and off positions. If the log on mode is selected, every time a measurement is taken (READ pressed) the relevant values will be stored in the current (vacant) lot number.

To quit diagnostic mode, press the ALT and CAL keys together again.



The LCD will then show "diAG" and "Stor" for a few seconds. If the log on mode was selected "LOG" will appear on the bottom left hand side of the display to remind the user that every time a measurement is taken, the value is stored in the next available lot number.

REVIEWING THE LOGGED BUFFER

To review the memorized values, press together ALT and ↑.



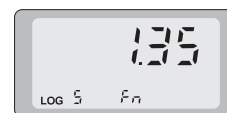
The meter will scroll all the data in the buffer showing the lot number, value, date and time.

e.g. The first recorded reading in the buffer is lot # 0, 0.35 mg/L of Iron, memorized on 23rd August at 3:34 pm;

The second logged data relates to lot # 1, 1.35 mg/L of the customized parameter, logged on 23rd August at 3:55 pm.

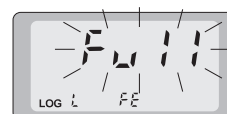
First lot

Second lot

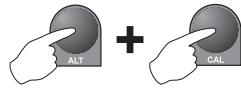


CLEARING THE MEMORY

After all the buffer (memory) is taken up, the LCD will blink "Full".



To clear the buffer, press the **ALT** and **CAL** keys.



Select mode 40. Press the **←** key. The display will show the "Cln" message, indicating that memory is being cleaned.



The lot number will be reset to 00 automatically.

REVIEWING THE CURRENT LOT NUMBER

To check the current (vacant) lot number, while in log mode, press **ALT** and **↓** together.



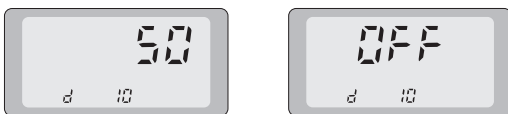
USER-SELECTABLE AUTO-OFF

With HI 93102, the users can customize the shutdown time to save power.

To change the shutdown time, enter the diagnostic mode by momentarily pressing the **ALT** and **CAL** keys together.



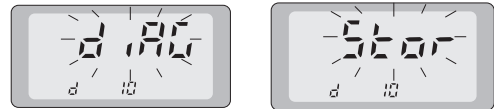
Select mode 10 and press the **←** key repeatedly to set the desired shutdown time from 10 to 60 minutes with 10 minute increments, or disable the shutdown mode by choosing the OFF selection.



After the selection is completed, exit the diagnostic mode by pressing **ALT + CAL** together.

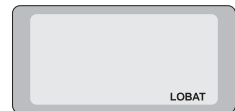


The meter will store new settings in its non-volatile memory and the display will flash "diAG" and "Stor" alternatively for several seconds.



BATTERY REPLACEMENT

A "LOBAT" indication appears on the lower right hand side of the display when the batteries are weak and require replacement. At this point the instrument is still able to perform approximately 50 additional measurements.

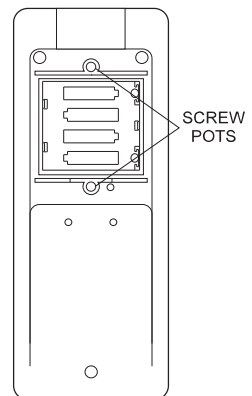


A "-BA-" indication will appear on the display when the batteries are too weak to perform accurate measurements. This message appears for a few seconds and then the meter will completely switch itself off. At this point the batteries must be replaced.



Batteries should only be replaced in a safe area using 1.5V AA alkaline type.

In order to replace the batteries, simply remove the two screws on the rear cover of the instrument and replace all four 1.5V AA batteries with new ones, while paying attention to their polarity.



DIAGNOSTIC CODES

| | |
|--------------|---|
| LOBAT | Weak batteries. Change all batteries as soon as possible. |
| -BA- | Exhausted batteries. Change all batteries immediately. |
| -LO- | Low level of light is received during the zeroing procedure. Check for scratches on the cuvette and ensure that sample is not excessively turbid. Repeat the readings. If the problem persists, recalibrate the meter using deionized water in the diagnostic mode "31" (see Calibration). |
| -CAP- | Light intensity is high during last measurement. Make sure the cuvette is capped and placed properly in the holder, and that ambient light does not reach the photodetector. Repeat the measurement. If the problem persists, contact your dealer or the nearest Hanna Office. |
| Er 1 | Hardware error. Repeat the measurement. If the error message appears again, contact your dealer or the nearest Hanna Office. |
| rnG | Out of range. Check the measuring procedure and verify the concentration of the sample to ensure that is not too high. |

Recommendations for Users

Before using these products, make sure that they are entirely suitable for your specific application and for the environment in which they are used.

Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

To avoid damages or burns, do not put the instrument in microwave oven. For yours and the instrument safety do not use or store the instrument in hazardous environments.

ACCESSORIES

| | |
|--------------------|--|
| HI 731327 | Maintenance kit: rugged carrying case including HI93102-0 and HI93102-20 calibration solutions, HI 93703-50 cuvette cleaning solution, one cloth for wiping cuvettes and two cuvettes |
| HI 93102-0 | AMCO-AEPA-1 @ 0 NTU* calibration solution, 30 mL |
| HI 93102-20 | AMCO-AEPA-1 @ 20 NTU* calibration solution, 30 mL |
| HI 93701-01 | Reagents for 100 Free Chlorine tests |
| HI 93701-03 | Reagents for 300 Free Chlorine tests |
| HI 93703-50 | Cuvette cleaning solution, 230 mL bottle |
| HI 93710-01 | Reagents for 100 pH tests |
| HI 93710-03 | Reagents for 300 pH tests |
| HI 93711-01 | Reagents for 100 Total Chlorine tests |
| HI 93711-03 | Reagents for 300 Total Chlorine tests |
| HI 93716-01 | Reagents for 100 Bromine tests |
| HI 93716-03 | Reagents for 300 Bromine tests |
| HI 93718-01 | Reagents for 100 Iodine tests |
| HI 93718-03 | Reagents for 300 Iodine tests |
| HI 93722-01 | Reagents for 100 Cyanuric Acid tests |
| HI 93722-03 | Reagents for 300 Cyanuric Acid tests |
| HI 93746-01 | Reagents for 100 Low Range Iron tests |
| HI 93746-03 | Reagents for 300 Low Range Iron tests |
| HI 731318 | Cloth for wiping cuvettes (4pcs.) |

* 1 NTU = 1 FTU.

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



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