

STANDARD OPERATING PROCEDURE  
**HANNA Instruments HI93703-11 Portable Logging Turbidity Meter with RS232**

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**KEY WORDS**

Particulates, scattered light

**APPROVALS**

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## **1.0 INTRODUCTION**

### **1.1 Purpose**

Turbidity is a measure of water's clarity based on scattered light due to suspended particulates. The turbidity meter functions by shining infrared light through the water and measuring the amount of light that veers from its straight path. A higher intensity of scattered light results in a higher value of turbidity. Particulates that contribute to turbidity may include organic and inorganic matter such as clay, silt, soluble colored compounds, algae, and other microscopic organisms (U.S. Geological Survey, 2005).

The portable turbidity meter allows for measurements to be taken in the field at the time of sampling. Though groundwater samples typically have very low turbidity, testing for it gives insight into the integrity of the well.

Turbidity measurements are in FTU (Formazine Turbidity Unit); see the instruction manual for conversions to other common turbidity units.

### **1.2 Scope**

This Standard Operating Procedure provides the instructions for calibration and use of the HI93703-11 Portable Logging Turbidity Meter with RS232 while sampling wells for pesticides ([FSWA001](#)).

## **2.0 MATERIALS**

### **2.1 Calibration**

- 2.1.1 HI93703-11 Portable Logging Turbidity Meter
- 2.1.2 Glass cuvette with cap
- 2.1.3 Deionized water (DI water)
- 2.1.4 AMCO-AEPA-1 @0 FTU calibration solution, 30 mL (expires at 6 months)
- 2.1.5 AMCO-AEPA-1 @10 FTU calibration solution, 30 mL (expires at 6 months)
- 2.1.6 Shared Turbidity Meter Logs (Appendix 1 and 2)

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#### **2.2 General Use**

- 2.2.1 HI93703-11 Portable Logging Turbidity Meter
- 2.2.2 Glass cuvette with cap
- 2.2.3 Batteries, 4 x AA
- 2.2.4 Carrying case
- 2.2.5 DI water
- 2.2.6 Phillips screwdriver
- 2.2.7 H193703-50 cleaning solution
- 2.2.8 Kimwipes or lab wipes
- 2.2.9 Turbidity Meter Logs (Appendix 1 and 2)

### **3.0 PROCEDURES**

#### **3.1 General Use**

- 3.1.1 Turn the meter on and off by pressing [ON/OFF] key (Figure 1); the meter will shut off automatically after 5-minutes of non-use.
- 3.1.2 Every time the meter is turned on, the battery life will automatically display as a percentage. If it is below 10%, "LO BAT" will appear in the lower right-hand corner, meaning the batteries should be replaced.
- 3.1.3 Install 4-AA batteries; unscrew the back cover of the meter with a screwdriver. Record battery replacement in the shared Turbidity Meter Log.
- 3.1.4 Ensure the cuvette and cap are clean before use; clean the cuvette with H193703-50 cleaning solution and rinse with deionized water (DI water); fill it completely with DI water for storage and in between field sites.
- 3.1.5 Calibration should be conducted monthly (See 3.5).

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Figure 1: Turbidity meter in open case. Inset picture shows cuvette and its cap.

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#### **3.2 Taking a measurement**

- 3.2.1 Turn the meter on.
- 3.2.2 The meter is ready for use when the display reads “- - - -” (four dashes).
- 3.2.3 If the cuvette has been stored full of DI water, discard the water.
- 3.2.4 Pour 10 mL of well water into the cuvette and secure the cap.
- 3.2.5 The water must be free of air bubbles; gently tap the glass to release any bubbles.
  - 3.2.5.1 If bubbles remain on the glass, dislodge them by inverting the cuvette several times and ensure they are gone by tapping the glass again if necessary.
- 3.2.6 Clean the cuvette with a Kimwipe to remove any dirt or fingerprints; handle the cuvette from the cap to ensure the glass remains clean.
- 3.2.7 Gently turn over the cuvette multiple times to disperse the particulates and check again for any air bubbles before inserting into the meter.
- 3.2.8 Remove the cap from the measurement cell.
- 3.2.9 Insert the cuvette into the meter, rotating until the notch on underside of cap fits into the groove on the meter.
- 3.2.10 Press the [READ] key and wait 20 seconds for the turbidity value to appear.
- 3.2.11 If the value exceeds 40 FTU, dilution methods for highly accurate readings are available on page 12 of the instruction manual.
- 3.2.12 Press [STO] button to save the measurement.
  - 3.2.12.1 If the display shows “FULL,” the oldest recorded measurement will automatically be deleted to accommodate the newest measurement.
- 3.2.13 Discard the water and triple-rinse the cuvette and cap with DI water in between samples. Fill the cuvette completely with DI water for storage while out in the field.

#### **3.3 Viewing stored measurements**

- 3.3.1 Press [ALT] & [VIEW] buttons together.
- 3.3.2 Press UP/DOWN arrow to view different sample measurements.
- 3.3.3 Press the right arrow to view the date and time.

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3.3.4 Press [ALT] & [VIEW] buttons together to exit.

#### **3.4 Erasing stored measurements**

3.4.1 To erase all stored measurements, press [ALT] & [CLR] buttons together. The display will show "CLR." Press the buttons again to erase all measurements or any one key to cancel the operation.

#### **3.5 Calibration**

3.5.1 Check the last date of calibration by pressing [CAL/GLP] button; press again to toggle between date and time. Calibration should be done monthly and recorded in the shared Turbidity Meter Log.

3.5.2 Double-rinse the inside of a clean cuvette with 5 mL 0.00 FTU standard solution: fill, cap, shake, and dispose of solution.

3.5.3 Fill 10mL 0.00 FTU standard solution into the cuvette and secure the cap.

3.5.4 Tap the glass to dislodge any air bubbles.

3.5.4.1 If bubbles remain on the glass, dislodge them by inverting the cuvette several times and check to be sure they are gone by tapping the glass again if necessary.

3.5.5 Clean the outside of the cuvette: handle by the top cap and wipe the glass thoroughly with a Kimwipe; be sure to wipe off any fingerprints.

3.5.6 Turn the meter on and wait for the display to show "- - - -."

3.5.7 Press the [ALT] & [CAL] buttons together. The meter is in calibration mode after "CAL" blinks on the display 3 times.

3.5.8 Once the display shows "0.00," insert the cuvette into the meter, rotating until the notch on the underside of cap fits into the groove on meter.

3.5.9 Press [CAL]; "SIP" will blink on the display.

3.5.10 Wait 30 seconds. If "ERR1" is displayed, check that the standard solution is correct.

3.5.11 When the display reads "10.00," the meter is ready for calibration with the 10.00 FTU standard. Remove the cuvette from the meter and discard the 0.00 FTU standard solution. Triple-rinse the cuvette and cap with DI water.

3.5.12 Repeat steps 3.5.3-3.5.10 with the 10.00 FTU standard.

3.5.13 When the display reads "500," the calibration is complete. Remove the cuvette from meter and discard the 10.00 FTU standard solution. Triple-rinse the cuvette and cap with DI water.

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- 3.5.14 Note: An optional third calibration point can be done with the 500 FTU buffer solution following steps 3.5.3-3.5.11.
- 3.5.15 Press [ALT] & [CAL] buttons together to exit calibration mode.
- 3.5.16 Fill the cuvette completely with DI water for storage.
- 3.5.17 Record calibration date in the shared Turbidity Meter Log. If the calibration is unsuccessful, make a note of it.

### **3.6 Cleaning**

- 3.6.1 Glassware: wash with H193703-50 cleaning solution and rinse thoroughly with deionized water.
- 3.6.2 Fill the cuvette completely with DI water and store it in the case.
- 3.6.3 Record the cleaning date in the shared Turbidity Meter Log.

## **4.0 REFERENCES**

Hanna Instruments. 2019. Instruction Manual HI93703-11 Portable Logging Turbidity Meter with RS232. Available at:

[www.hannainst.com/hubfs/product-manuals/MAN93703-11\\_06\\_19.pdf?hsLang=en](http://www.hannainst.com/hubfs/product-manuals/MAN93703-11_06_19.pdf?hsLang=en)

U.S. Geological Survey. 2005. National field manual for the collection of water-quality data. U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. 6.7 (2005). Available at:

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## **5.0 APPENDICES**

Appendix 1: Turbidity Meter Log SN: 06440006101

Appendix 2: Turbidity Meter Log SN: 07030119101