SURFACE WATER QUALITY MONITORING PROGRAM

HYDROLAB

MULTIPROBE CALIBRATION LOGBOOK

Sonde Model: _____

Sonde Serial No.: _____

Inventory Number: _____

Dates of Use (mm/yy) from: _____to:_____

TCEQ

Revised 6/4/2013

For more information, contact:

Texas Commission on Environmental Quality
Monitoring and Assessment Section
Surface Water Quality Monitoring Program
MC 234
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Austin, TX 78711-3087

TCEQ is phasing out the small calibration logbooks because the increasing complexity of calibration information is making the smaller format obsolete. The calibration log book is now provided in 8”x11” format. The Hydrolab calibration log sheet and calibration logbook are available online at <http://www.tceq.texas.gov/waterquality/monitoring/swqm_forms-n-quality.html>.

Calibration

Please refer to Chapter 8 of the Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, TCEQ Publication RG-415 for detailed information on calibration and maintenance of Hydrolab multiprobe instruments. The manual is available online at <http://www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.html>.

Specific Conductance

- Calibrate specific conductance first. Avoid any contamination of the standard.
- Series 3 and Quanta Sondes require a **one-point** conductivity calibration (no zero needed). Series 4, Series 4a, & Series 5 Sondes require a two-point conductivity calibration. Calibrate the 'zero' point first by leaving the conductivity sensor in air**.**
- Choose a standard solution with a conductance similar to the water being sampled and calibrate with this solution. The calibration standard should be higher than the expected specific conductance of the water being monitored.

Note: This procedure calibrates specific conductance, salinity and total dissolved solids.

pH Sensor

- The pH system is calibrated first with a pH 7.0 buffer and either pH 4.0 for naturally acidic waters or pH 10.0 for alkaline waters.
- pH buffer values for calibration should be corrected for temperature by referring to the pH Calibration Standards table in this logbook or Table 8-5 in the Surface Water Quality Monitoring Procedures, Volume 1.
- pH buffers contain high concentrations of phosphate. Care must be taken during calibration to avoid leaving traces of buffer on equipment or at the work place that could contaminate water samples. Buffer solutions prepared in the field offices from reagent powder or concentrate are labeled with date of preparation and replaced after one month.

Dissolved Oxygen

Air calibration is the preferred method for dissolved oxygen. In this method three factors are important: water temperature, water-saturation, and barometric pressure. Water temperature is measured directly by the sensor. The air in the calibration cup then becomes saturated by exposure to water. Finally, barometric pressure is directly measured (barometer), obtained from a local weather bureau, or estimated based on altitude only.

DO concentrations in water are measured using either a polarographic electrode or optical sensors.

Clark Polarographic DO Cell

Precalibration

- Clean the sonde and the stirrer using running water to remove debris.
- Check the condition of the DO membrane—ensure it is intact and free of wrinkles, bubbles, and surface films. Inspect the appearance of the DO sensor and the

electrolyte. If probes appear questionable, perform sensor maintenance according to accepted procedures.

- ► Confirm that the circulator or stirrer is operational.

Luminescent DO Cell—Series 5 Sondes Only

Precalibration

- ► Clean the sonde using running water to remove debris.
- ► Inspect the luminescent DO (LDO) sensor cap.
- ► If the cap or the sensor appears questionable, perform sensor maintenance.

It is important to maintain temperature stability during calibration. Keep the sonde out of direct sunlight and away from any other source of heat or other energy that may change the temperature in the cup during calibration. If the temperature in the cup changes more than 0.5°C during calibration, recalibration is recommended.

Uncorrecting Barometric Readings Corrected to Sea Level

Most barometric readings obtained from local and Internet sources are corrected to sea level (the effect of altitude is removed) and reported in inches of mercury.

To uncorrect the barometric pressure that was set to sea level:

Barometric Pressure (BP) = Corrected Barometric Pressure (CBP) -2.5 (A/100)

Where: BP = estimated absolute barometric pressure

CBP = local barometric pressure corrected to sea level (from weather bureau other source; convert reading supplied in inches to mm; inches x 25.4 = mm

2.5 = a constant. Atmospheric pressure decreases 2.5 mm Hg for each increase in altitude of 30.5 meters (100 feet)

A = local altitude in feet above mean sea level

For example: A barometric pressure reading of 29.50 inches Hg , corrected to sea level at an altitude of 650 feet above sea level is recalculated (uncorrected) by:

29.5 inches x 25.4 = 749 mm Hg
BP = 749 mm - 2.5 (650/100)
BP = 732.8 mm Hg

The above equation should be posted in the laboratory or site where the instruments are routinely calibrated. Once an initial calculation is made, the back half of the equation, i.e., 2.5 (A/100), will then be constant and can be subtracted from the corrected barometric pressure for calibrations at the specific laboratory.

If an instrument needs to be calibrated at a remote location where the barometric pressure is not available from the usual sources, the barometric pressure can be estimated from the following equation:

Barometric Pressure (BP) = 760 - 2.5 (A/100)

For example: If the altitude at the site of calibration is 1,200 feet above sea level, the estimated barometric pressure is:

BP = 760 - 2.5 (1200/100)
BP = 730 mm Hg

Post-Calibration Check Error Limits

- Post calibration must be performed after each use of the instrument and before any instrument maintenance is performed.
- Calibration and post calibration should never be more than 24-hours apart when used for instantaneous monitoring. Sondes used in a long-term deployment should be calibrated as soon as possible following retrieval. See Chapter 3 for details on 24-hour deployments.
- If post-calibration values fall outside the error limits for DO, pH, and specific conductance, data collected does not meet quality assurance (QA) and should not be reported. If post-calibration measurements do not consistently fall within the error limits after in-house trouble shooting, the instrument should be returned to the manufacturer for maintenance.

  If post-calibration values fall outside the error limits for DO, pH, and specific conductance, data collected does not meet quality assurance (QA) and should not be reported.

  If post-calibration measurements do not consistently fall within the error limits after in-house trouble shooting, the instrument should be returned to the manufacturer for maintenance.

Post-Calibration Check Error Limits

Parameter	Value
Specific conductance	± 5%
pH	± 0.5 standard units
Dissolved oxygen	± 6% saturation
Temperature	± 0.2 °C

Temperature Sensor Check

- Check the accuracy of the temperature sensor during routine instrument maintenance. See Chapter 8 for temperature check details. Temperature sensors are factory calibrated and cannot be adjusted by the user. Calibration and maintenance (other than general cleaning) of the sensor is not required.

pH Calibration Standards

Temperature (EC)	pH 4 Standard	pH 7 Standard	pH 9 Standard	pH 10 Standard
10	4.00	7.06	9.33	10.15
11	4.00	7.06	9.32	10.14
12	4.00	7.05	9.31	10.13
13	4.00	7.05	9.30	10.12
14	4.00	7.04	9.29	10.11
15	4.00	7.04	9.28	10.10
16	4.00	7.04	9.27	10.09
17	4.00	7.03	9.26	10.08
18	4.00	7.03	9.25	10.07
19	4.00	7.02	9.24	10.06
20	4.00	7.02	9.23	10.05
21	4.00	7.01	9.22	10.05
22	4.00	7.01	9.21	10.04
23	4.00	7.00	9.20	10.03
24	4.00	7.00	9.19	10.01
25	4.00	7.00	9.18	10.00
26	4.00	7.00	9.17	9.99
27	4.00	7.00	9.16	9.98
28	4.01	6.99	9.16	9.98
29	4.01	6.99	9.15	9.97
30	4.01	6.99	9.14	9.96
31	4.01	6.99	9.13	9.95
32	4.01	6.99	9.13	9.94
33	4.02	6.98	9.12	9.93
34	4.02	6.98	9.12	9.92
35	4.02	6.98	9.11	9.91
36	4.02	6.98	9.10	9.90
37	4.02	6.98	9.09	9.89
38	4.02	6.98	9.08	9.88

Date: Time: Employee name:

Battery Voltage: Sonde Type and Serial No.:

Calibration

Function	Temp. of Standard	Value of Standard	Initial Reading	Calibrated to	Comments
Specific conductance—Air (For Series 4,4a, & 5)		0			
Specific conductance					
pH calibrated (~7)					
pH slope (~ 4/10)					
Dissolved oxygen (% sat)		100%			
Dissolved oxygen (mg/L) optional					

Barometric-Pressure Options	**Barometric-Pressure Formulas**
Altitude (A)=_____feet above msl	Barometric pressure _____ inches _____ mm
Barometer	Barometric pressure (inches) _____ × 25.4 = BP _____mm
From local source correction (CBP)	BP _____ mm = CBP _____mm – 2.5 (altitude ____/100)
Estimated from altitude only	BP _____ mm= 760 mm – 2.5 (altitude _____/100)

Post-Calibration Check

Date: Time: Employee Name:

Battery Voltage: Sonde Type and Serial No.

Function	Temp. of Standard	Value of Standard	Initial Reading	Pass Post-Cal?	Comments
Specific conductance				☐Yes ☐No	
pH calibrated (~7)				☐Yes ☐No	
pH slope (~ 4/10)				☐Yes ☐No	
Dissolved oxygen (% sat)		100%		☐Yes ☐No	
Location of Deployment, Run, or Special Study:		Date/Time Deployed:		Date/Time Retrieved:	
Use (circle one):	24-hr	Continuous		Grab	

MAINTENANCE

(Refer to Chapter 8 for maintenance requirements)

Sensor	Date	Initials	Maintenance Completed
pH			
DO			
Specific Cond.			

Perform temperature check along with regular maintenance. The laboratory thermometer must be checked against NIST traceable thermometer annually.

Annual NIST traceable check	Date:	NIST Temp:	Lab Thermometer Temp:	Correction Factor:
Maintenance temperature check	Date:	Sonde Temp:	Lab Thermometer Temp:	

Factory maintenance/repair notes: