

STANDARD OPERATING PROCEDURE
FOR
pH and DISSOLVED OXYGEN INSTRUMENT CALIBRATION

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The pH Meter

When pH meters are used, the instrument is calibrated for each day of use and at each sampling site. The pH meter is calibrated with a buffer of pH 7.0 and either 4.0 for naturally acidic waters or pH for alkaline waters.

The pH buffers contain high concentrations of phosphate. Care must be taken during calibration to avoid leaving traces of buffer on equipment or at the workplace that could contaminate water samples. Buffer solutions prepared from reagent powder or concentrate will be labeled with the date of preparation and replaced after a month.

The pH Meter Calibration

YSI Instruments

Two-Point Calibration

pH 7 - place enough pH 7 buffer into a clean, dry or pre-rinsed calibration cup to immerse the pH probe, reference junction, and thermistor. Allow at least a minute for the temperature to equilibrate before reading.

From the **Calibrate Menu**, select 4-ISE 1 pH to access the pH calibration choices; then press 2-2 Point (or 3-3 Point). Press **Enter** and input the value of the buffer at the prompt. Press **Enter** and the current values of all enables sensors will appear on the screen. Observe the pH mV reading. This value should range from -40 to +40.

Observe the pH reading and when it shows no significant changes for approximately 30 seconds, Press **Enter**. The display will indicate that the calibration is accepted.

After the pH 7 calibration is complete, press **Enter** again to continue. Rinse the Sonde or probe in the water before proceeding.

Dissolved Oxygen Sensor

pH 4 or 10 - next, place enough pH 4 (or 10) buffer into a clean, dry or pre-rinsed calibration cup to immerse the pH probe, reference junction, and thermistor. Allow at least one minute for the temperature to equilibrate before reading. Observe the pH mV reading. This value should range from 140 to 220 in pH 4 and -140 to -220 in pH 10 buffer.

Observe the pH reading and when it shows no significant change for approximately 30 seconds, press **Enter**. After the second calibration is completed, press **Enter** again. If performing a 2-Point Calibration the screen will return to the Calibrate Menu.

Record calibration information (see *Calibration Record Form* in Appendix). Rinse the Sonde or Probe with water and dry. Rinse and dry the calibration cup for future use.

Three-Point Calibration - If a 3-Point Calibration is being performed, the prompt will request the value if the third buffer. Follow the same calibration procedures described above.

Oxygen meters use a polarographic electrode to measure the dissolved oxygen

concentration in water. The instrument senses the partial pressure of oxygen at the surface of the membrane, rather than the actual concentration of oxygen (weight/volume). The relationship between partial pressure and concentration is dependent upon atmospheric pressure and temperature when a reading is made in the air (i.e., during the air calibration procedure), whereas, the equilibrium solubility of oxygen in water is influenced by temperature, salinity, and pressure (of the gaseous phase).

Corrections for these factors must be made either by the instrument, by the user during calibration or after readings are taken. The Winkler titration directly measures oxygen equivalents and reports dissolved oxygen concentrations (weight/volume) in a form that requires no corrections.

DO Calibration Procedure for Instantaneous Sampling

Hydrolab Instruments

Precalibration - clean the sonde and stirrer under tap water to remove debris. Swab the DO membrane and pH probe with a cotton ball soaked in Alconox or methanol. This will remove surface film that may cause the calibration to drift. Check the condition of the membrane. The membrane must be in contact and free of wrinkles, bubbles, surface films and not discolored below the membrane.

Calibration - ① remove the cup with water to just below the O-ring securing the DO membrane. Carefully remove any water droplets from the membrane (kimwipe or soft towel).

② Fill the calibration cub with the inverted plastic storage cup lid and allow to stabilize for about (5) minutes.

③ Select calibrate, (%) Saturation and then **Enter** correct barometric pressure (mm-Hg) and press **Enter**. To convert the barometric pressure from inches to mm; inches of Hg x 25.4 = mm Hg.

BAROMETRIC PRESSURE

Each instrument has specific requirements for correcting for barometric pressure. Correct the oxygen content value obtained from the calibration log book for the effect of the barometric pressure at the current location and time of calibration.

Equation ① If the true, uncorrected barometric pressure (i.e., barometric reading) for your site is known, use the following equation

① Oxygen Content Value Used in Calibration =

$$\frac{(\text{True, Uncorrected Pressure})}{760 \text{ mm or } 29.92 \text{ in. Hg}}$$

Equation ② If the current barometric pressure for your site is known, corrected to sea level (NOAA weathercasts, correct the barometric pressure for altitude) in order to obtain true, uncorrected barometric pressure, use the following equation

② True Uncorrected Pressure =

$$\frac{[760 - (\text{Altitude} \times 0.026)]}{760} \times [\text{Barometric Pressure corrected to sea level}]$$

Using the true, uncorrected barometric pressure, and the previous equation, above, calculate an oxygen content value for calibration.

Equation ③ If a barometric pressure measurement cannot be obtained, calculate the oxygen content value considering the effect of altitude alone on barometric pressure with the following equation

③ Oxygen Content Value Used =

$$\frac{[760 - (\text{Altitude} \times 0.026)]}{760} \times \left[\begin{array}{l} \text{Oxygen content value obtained from the} \\ \text{Multiprobe calibration book} \end{array} \right]$$

Instrument Calibration and Deployment Record

DEPLOYMENT RECORD

File Name:	Site:
Date Deployed:	Date Recovered:
Sonde ID:	DO Probe S/N:

Notes:

CALIBRATION INFORMATION

Date of Calibration:	Technician:
DO Membrane Changed?	Y N <u>Note:</u> Should wait 6 to 8 hours before final calibration
Turbidity Wiper Changed?	Y N Wiper Parks $\approx 180^\circ$ from Optics Y N
Record Battery Voltage:	

Record the following diagnostic numbers <u>after</u> calibration:	RECORD CALIBRATION VALUES
Conductivity Cell Constant	Range 4.5 to 5.5 Actual Sonde
DO Charge	Range 25 to 75 Conductivity
DO Gain	Range 0.7 to 1.7 DO
pH MV Buffer 7	Range 0 ± 40 MV pH
pH MV Buffer 10	Range -180 ± 40 MV pH
pH MV Buffer 4	Range $+180 \pm 40$ MV Turbidity
<u>Note:</u> Span between pH 7 and 10, milli-volt numbers should be ≈ 170 to 180 MV	Turbidity
NOTES:	Depth
	ORP

DEPLOYMENT

In Situ Date	Time
Field Readings:	
DO mg/L	Temperature $^\circ\text{C}$ Salinity
Air Temperature ($^\circ\text{C}$ or $^\circ\text{F}$)	Wind Speed MPH Wind Direction
Tide (Nearest tide and stage (ebb, slack, flood):	
Secchi Depth	Total Depth Sonde Depth
Wave Height	C=calm, CM=smooth wavelets, M=moderate (some whitecaps), R=rough (numerous whitecaps), VR=very rough
Cloud Cover	S=sunny, PC=partly cloudy, LR=light rain, HR=heavy rain, TS=thunder storms

DEPLOYMENT NOTES:

In situ Date:	Time
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Instrument Calibration and Deployment Record

Field Readings:

DO mg/L		Temperature °C		Salinity	
Air Temperature (°C or °F)		Wind Speed MPH		Wind Direction	
Tide (Nearest tide and stage (ebb, slack, flood):					
Secchi Depth		Total Depth		Sonde Depth	
Wave Height	C=calm, CM=smooth wavelets, M=moderate (some whitecaps), R=rough (numerous whitecaps), VR=very rough				
Cloud Cover	S=sunny, PC=partly cloudy, LR=light rain, HR=heavy rain, TS=thunder storms				
Probe/Sensor Fouling	1=none, 2=light, 3=moderate, 4=heavy				

RECOVERY NOTES:

POST CALIBRATION AND CHECKOUT

Battery Voltage at Recovery:

Data Uploaded Successfully:	Y	N	
	As Recovered	After Cleaning	
DO % in Calibration Cup			

Warning: DO reading for the post calibration must be recorded in either unattended mode or in discrete mode with a 120 second sampling interval. Discrete samples taken at the 4 second rate will display a DO value that is lower than actual with the standard DO warm-up interval.

PH 4		
pH 7		
pH 10		
Conductivity		
Turbidity 0 NTU		
Turbidity 100 NTU		
DO Charge (Range 25-75)		
Turbidity Wiper Parks 180° from optics	Y or N	

NOTES: