APPLICATION NOTE NO. 18-4   **Revised August 1992**

SBE 18 pH SENSOR CALIBRATION EQUATION ERROR

The equation used in SEASOFT through 4.007 calculates pH as:

$$pHold = (pHref + (Vout - B) / M) / (°K * 1.98416e\text{-}4)$$

where $°K$ = temperature in degrees Kelvin

This equation ignores the glass electrode potentials and temperature compensation that are used to create a 0 volt output (independent of temperature) from the pH sensor at pH 7.

The new equation (used in SEASOFT V 4.008 and later) has the form:

$$pH = 7 + (Vout - offset) / (slope * °K * 1.98416e\text{-}4)$$

where slope and offset are computed (PHFIT V 2.0) from a least squares fit of Vout and pH in a series of buffer solutions using the measured temperature of the buffer solutions.

The relationship between the two equations (ignoring the difference between M and slope) is:

$$pH = pHold + (7 - pHvref / (°K * 1.98416e\text{-}4)) + ((B - offset) / (slope * °K * 1.98416e\text{-}4))$$

where B and pHvref are the calibration coefficients used to compute pHold

and slope is the calibration coefficient computed by PHFIT V 2.0