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**Application Note 30**

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**Fresh Water Conductivity Measurements  
 Using the SBE-19 SEACAT Profiler**

The SBE 19 (not 19*plus*) SEACAT Profiler makes conductivity measurements in two different full-scale ranges; normal and low range. Measurements in fresh water are improved by selecting the low range during instrument set-up.

	<b>Full Scale Range [S/m]</b>	<b>Resolution [S/m]</b>	<b>Resolution [<math>\mu</math>mhos/cm]</b>
<b>normal</b>	0.0 to 6.5 [S/m]	0.0001	1.0
<b>low</b>	0.0 to 0.6 [S/m]	0.000015	0.15

*Note:* S/m = Siemens/meter. 1 S/m = 10 millimhos/cm. Resolutions are at 2 Hz sampling rate.

Conversion of conductivity measurements to ion concentration (salinity) is defined by the 1978 Practical Salinity Scale (PSS-78) (UNESCO, 1983; 1981a; 1981b). However, salinity is defined only for the ion ratios of standard seawater. In fresh water, the computation of ion concentration is not as well defined. Fresh water ion ratios are different and thus, a unique equation for salinity computations would have to be developed for the body of water under study. In most fresh water applications, it is adequate to characterize ion concentrations by a conductivity measurement that has been corrected to a reference temperature (specific conductance). The following formula (Standard Methods..., 1989) uses a reference temperature of 25°C, and is most prevalent in the United States.

$$\text{specific conductance } [\mu\text{mhos/cm}] = (C * 10,000) / (1 + A * (T-25))$$

where

C = conductivity [S/m], T = temperature [°C], A = thermal coefficient of conductivity for natural salt ion solutions = 0.019 to 0.020 (Sea-Bird's software uses this formula with A = 0.020).

An example of SEACAT low-range conductivity measurements at Lake Pend Oreille, Idaho, is included (Figure 1). The relatively uniform conductivity signal over the 350 meter profile (trace B) highlights the resolution and noise level of the SEACAT measurement. Each tick on the conductivity (trace B) and specific conductance (trace C) axes is 1.0  $\mu$ mho/cm. Digital resolution is 0.15  $\mu$ mho/cm. The noise level is less than 2 least counts. PSS-78 salinity (trace A) and temperature (trace T) are also included in the plot (generated by Sea-Bird's Seasoft software and printed on a Hewlett-Packard LaserJet II).

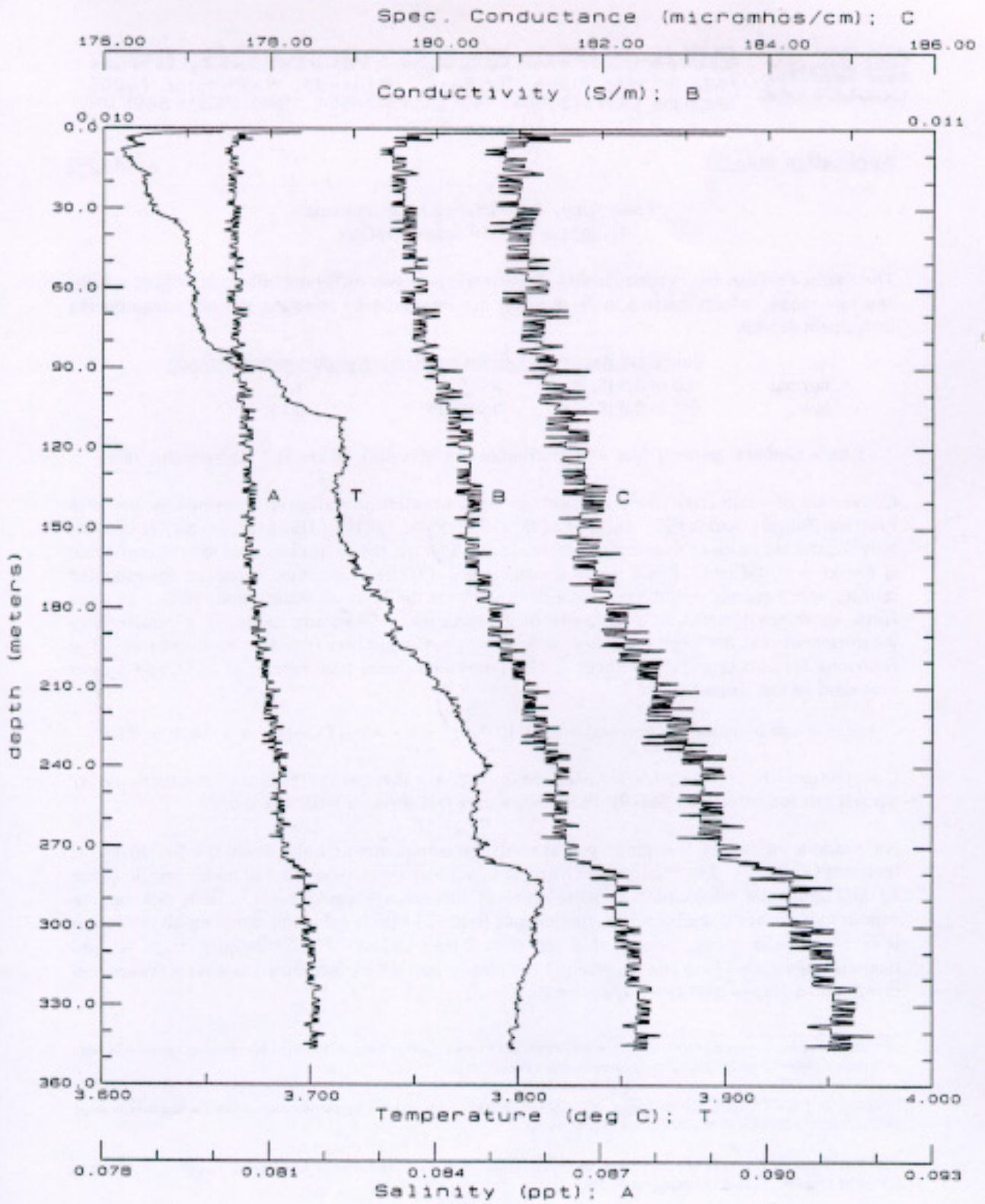
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UNESCO Technical Papers in Marine Science, #36 (1981a) "The Practical Salinity Scale 1978 and the International Equation of State of Seawater 1980", UNESCO Division of Marine Sciences (Paris), 25pp.

UNESCO Technical Papers in Marine Science, #37 (1981b) "Background papers and supporting data on the practical salinity scale, 1978", UNESCO Division of Marine Science (Paris), 144pp.

UNESCO Technical Papers in Marine Science, #44 (1983) "Algorithms for computation of fundamental properties of seawater", UNESCO Division of Marine Science (Paris), 53pp.

Standard Methods for the Examination of Water and Wastewater (1989), chapter 2, p 2-57 to 2-65, L.S. Clesceri, A.E. Greenberg, R.R. Trussell, M.H. Franson, Eds., American Public Health Association, Washington, D.C., 17th edition.



dtrc01.dat: LOW RANGE CONDUCTIVITY MEASUREMENTS

FIGURE 1