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APPLICATION NOTE NO. 47 **Revised June 2005**

Using Biospherical Instruments Surface PAR Light Sensor with SBE 33 or SBE 36 Deck Unit

If the SBE 33 or 36 Deck Unit is configured with the optional A/D converter, it can acquire the output of a Biospherical Instruments Surface PAR sensor and integrate this into the CTD data stream. This application note applies to the following Surface PAR sensors (the corresponding underwater PAR sensor, mounted on the CTD or cage, is also shown):

Surface PAR Sensor	Corresponding Underwater PAR Sensor	
	If underwater PAR sensor connected directly to CTD A/D voltage channel	**If underwater PAR sensor:** • **Connected directly to CTD PAR connector, or** • **Interfacing to PN 90310 Log Amp Module, which is connected to CTD A/D voltage channel**
QSR-240 or QSR-2200	QSP-200L or QSP-2300L	QSP-200PD or QSP 2200 (PD)
QCR-240 or QCR-2200	QCP-200L or QCP-2300L	QCP 2200 (PD)

Notes:
- QSR-240, QCR-240, QSP-200L, QSP-200PD, and QCP-200L are no longer in production by Biospherical.
- See Application Note 11 QSP-L for details on the QSP-200L, QCP-200L, QSP-2300L, and QCP-2300L underwater PAR sensors.
- See Application Note 11 QSP-PD for details on the QSP-200PD, QSP-2200 (PD) and QCP-2200 (PD) underwater PAR sensors.

SEASOFT-DOS Versions 4.214 and later, and all versions of SEASOFT-Win32, fully support the acquisition and display of the data from these surface reference PAR sensors and the corresponding underwater PAR sensor.

1. DECK UNIT CONFIGURATION

A. Locate the NMEA Interface PCB with optional A/D converter under the bottom cover panel of the Deck Unit (refer to the Deck Unit manual). Verify that dip switch S1 position 8 is in the OFF position. This will add the surface PAR voltage to the end of the CTD data stream, increasing the number of Hex data bytes by 3.

B. Plug the cable connected to the surface PAR sensor into the 4-pin MS connector labeled *PAR Input* on the back of the Deck Unit. A spare 4-pin MS-style connector (MS3106A14S-2P) was supplied if a cable was not provided. The surface PAR bulkhead connector on the back of the Deck Unit is an MS3102A14S-2S.

Deck Unit	Function	Biospherical Surface PAR Sensor with Switchcraft Connector
Pin A	Signal (ground)	Pin 3
Pin B	Power (+12 volts)	Pin 4
Pin C	Power (ground) -- Deck Units with NMEA PCB Assembly 40785b/40786b or greater use Pin C. All previous versions do not use Pin C.	Pin 1
Pin D	Signal	Pin 2
-	-	Pin 5

Note: Biospherical sold the Surface PAR sensor with other connector types in the past. See the appropriate drawing for pinout details if your sensor does not have a Switchcraft connector.

2. SOFTWARE CONFIGURATION

Note: SBE 16*plus* and 19*plus* are not supported in SEASOFT-DOS. You must use SEASOFT-Win32's SBE Data Processing or SEASAVE to set up these CTDs.

Set up the configuration (.con) file for the appropriate CTD (SBE 16/16*plus*/19/19*plus*/25). Enable the recording of the surface PAR sensor by selecting *Surface PAR voltage added*. This alters the display by adding two additional external voltages. The highest numbered voltage is labeled **SPAR/surface irradiance**. Enter the surface light **conversion factor** and the **ratio multiplier** in the .con file.

Note: The CTD configuration (.con) file is edited using the Configure menu (in SEASAVE or SBE Data Processing in our SEASOFT-Win32 suite of programs) or SEACON (in SEASOFT-DOS).

SEASOFT calculates surface light as:

surface light (µEinsteins/m^2•sec) = volts * conversion factor

To compute the **conversion factor**, calculate the output of the surface PAR sensor in µEinsteins/m^2•sec/volt using the data from the Surface PAR calibration sheet that was provided by Biospherical (located in the CTD manual).

Conversion factor = Output in Air / Probe Net Response

For example, if Probe Net Response = 85.6 mV (0.0856 volts) and Output in Air = 0.01384 µEinsteins/cm^2•sec:
Conversion factor = (0.01384 µEinsteins/cm^2•sec) * (10000 cm^2·/m^2) / 0.0856 volts = 1851 µEinsteins/m^2•sec/volt

SEASOFT calculates corrected PAR as:

corrected PAR = 100 * ratio multiplier * underwater light / surface light
(underwater light is the calculated light output from the underwater sensor)

To compare the *shape* of data sets taken at disparate light levels, the **ratio multiplier** can be used to *scale* the data. For example, a ratio multiplier of 10 would make a 100 µEinsteins/m^2•sec light level plot as 1000 µEinsteins/m^2•sec. **The ratio multiplier should be set to 1 for normal operations.**

Notes:

- **Do not enter the Conversion factor from the Biospherical calibration sheet as the Conversion factor in SEASOFT.**
- To output Surface PAR in units other than µEinsteins/m^2•sec, multiply the calculated Conversion factor to obtain the desired units. See Application Note 11General to convert units.
- See Application Note 11 QSP-L or 11 QSP-PD, as applicable, for instructions on entering the underwater PAR sensor coefficients.