Biospherical Instruments Inc

CALIBRATION CERTIFICATE

UNDERWATER PAR SENSOR WITH LOG AMPLIFIER

Calibration Date: 08/10/06 **Job No.:** L9403
Model Number: QSP-2300
Serial Number: 4750
Operator: TPC
Standard Lamp: 99190(11/14/05)
Operating Voltage Range: 6 to 15 VDC (+)

Note: The QSP-200 uses a log amplifier to measure the detector signal current with V = log I (Amps) / IRef
To calculate irradiance, use this formula:

Irradiance = Calibration factor * (10^Light Signal Voltage - 10^Dark Voltage)

With the appropriate (solar corrected) Irradiance Calibration Factor:

Dry Calibration Factor:	**1.73E+13**	**quanta/cm²·sec/"amps"**	**2.86E-05**	**µEinsteins/cm²·sec/"amps"**
Wet Calibration Factor:	**2.90E+13**	**quanta/cm²·sec/"amps"**	**4.82E-05**	**µEinsteins/cm²·sec/"amps"**

Sensor Test Data and Results[4)]

Sensor Supply Current (Dark):	83.6	mA			
Supply Voltage:	6	Volts			
Lamp Integrated PAR Irradiance:	9.90E+15	quanta/cm^2·sec	0.01644	µEinsteins/cm²sec	
SC3 Immersion Coefficient:	0.594	Scalar Correction:	1	PAR Solar Correction:	1.0000

Nominal Filter OD	Calibrated Trans.	Sensor Voltage	Measured Trans.		Measured Signal (Amps)	Estimated Signal (Amps)	Calc. Output (Volts)	Error (Volts)	Error (%)	Test Irrad. (quanta/ cm^2·sec)
No Filter	100.00%	2.760	100.00%		5.75E-08	5.75E-08	2.761	0.001	0.0	9.90E+15
0.3	36.10%	2.320	36.09%		2.08E-08	2.08E-08	2.321	0.001	0.0	3.57E+15
0.5	27.60%	2.207	27.79%		1.60E-08	1.59E-08	2.205	-0.002	-0.7	2.75E+15
1	9.27%	1.755	9.64%		5.55E-09	5.33E-09	1.740	-0.015	-3.8	9.54E+14
2	1.11%	0.926	1.20%		6.88E-10	6.39E-10	0.901	-0.025	-7.2	1.18E+14
3	0.05%	0.311	0.08%		4.78E-11	3.07E-11	0.274	-0.037	-35.7	8.22E+12

Dark Before: 0.196 Volts
Light - No Filter Hidr.: 2.760 Volts
Dark After - NFH: 0.196 Volts
Average Dark 0.1959 Volts

I_{Ref} = 1.00E-10 Amps
I_{Dark} = 1.57E-10 Amps
10^{VDark} = 1.570001 Amps

Notes:
1. Annual calibration is recommended.
2. There is increasing error associated with readings below zero.
3. The collector should be cleaned frequently with alcohol.
4) This section is for internal use and for more advanced analysis.