Sea-Bird Electronics, Inc.

13431 NE 20th Street, Bellevue, WA 98005-2010 USA

Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0142
CALIBRATION DATE: 17-Sep-11

GliderAPL TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

```
g =  4.32650918e-003
h =  6.24111949e-004
i =  2.39423391e-005
j =  2.63794168e-006
f0 = 1000.0
```

IPTS-68 COEFFICIENTS

```
a =  3.64763450e-003
b =  5.80225415e-004
c =  1.50199082e-005
d =  2.63943099e-006
f0 = 3097.742
```

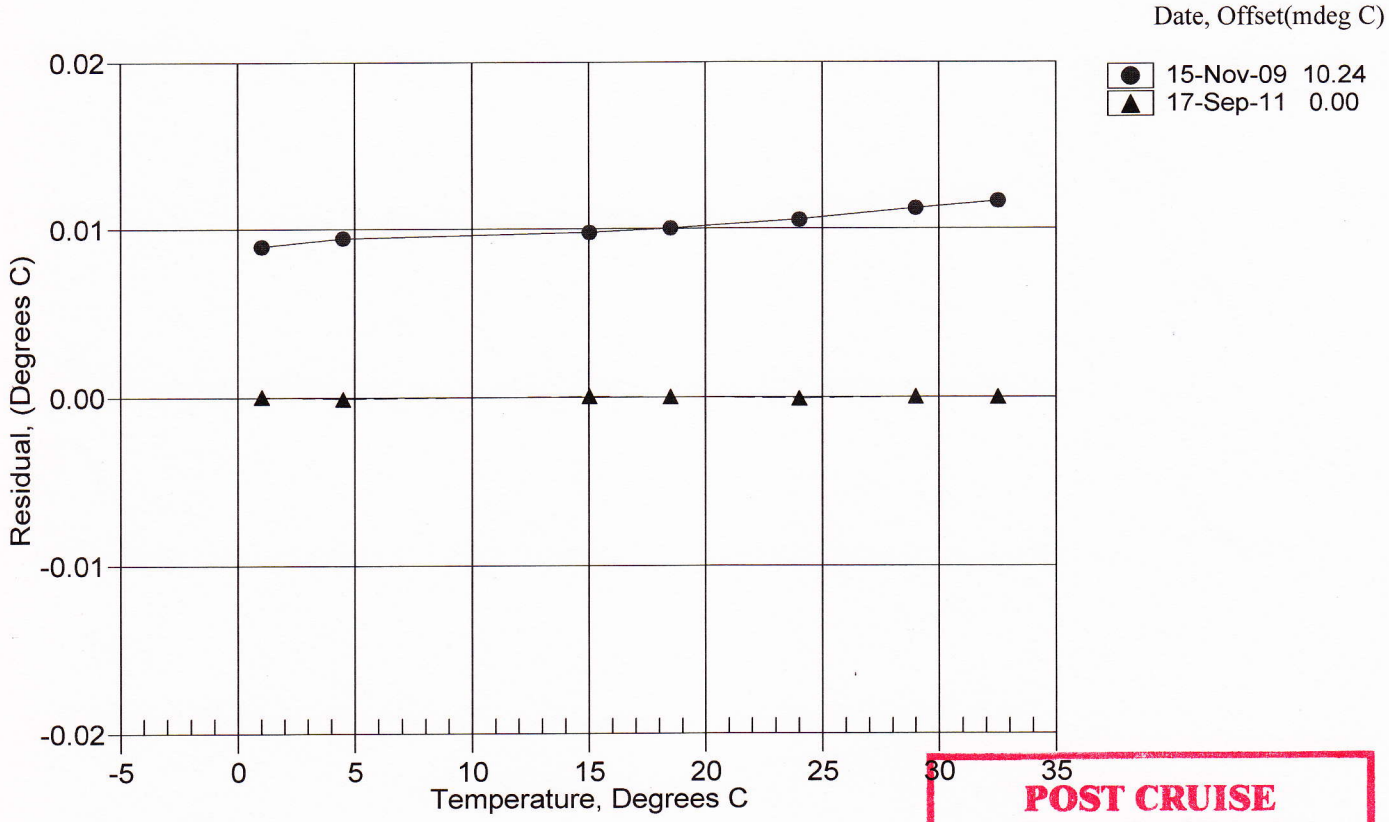
BATH TEMP (ITS-90)	INSTRUMENT FREO (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	3097.742	1.0000	0.00003
4.4999	3353.807	4.4998	-0.00006
15.0000	4214.379	15.0001	0.00006
18.5000	4533.422	18.5000	0.00002
24.0000	5068.812	23.9999	-0.00008
29.0000	5592.740	29.0000	0.00002
32.5000	5981.140	32.5000	0.00001

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature IPTS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



POST CRUISE CALIBRATION

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SENSOR SERIAL NUMBER: 0142
CALIBRATION DATE: 17-Sep-11

GliderAPL CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -1.02411238e+001
h =  1.14258441e+000
i = -2.04880367e-003
j =  2.41078752e-004
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a = -8.38319110e-036
b =  1.14161866e+000
c = -1.03476939e+001
d =  2.02255090e-003
m =  25.5
CPcor = -9.5700e-008 (nominal)
```

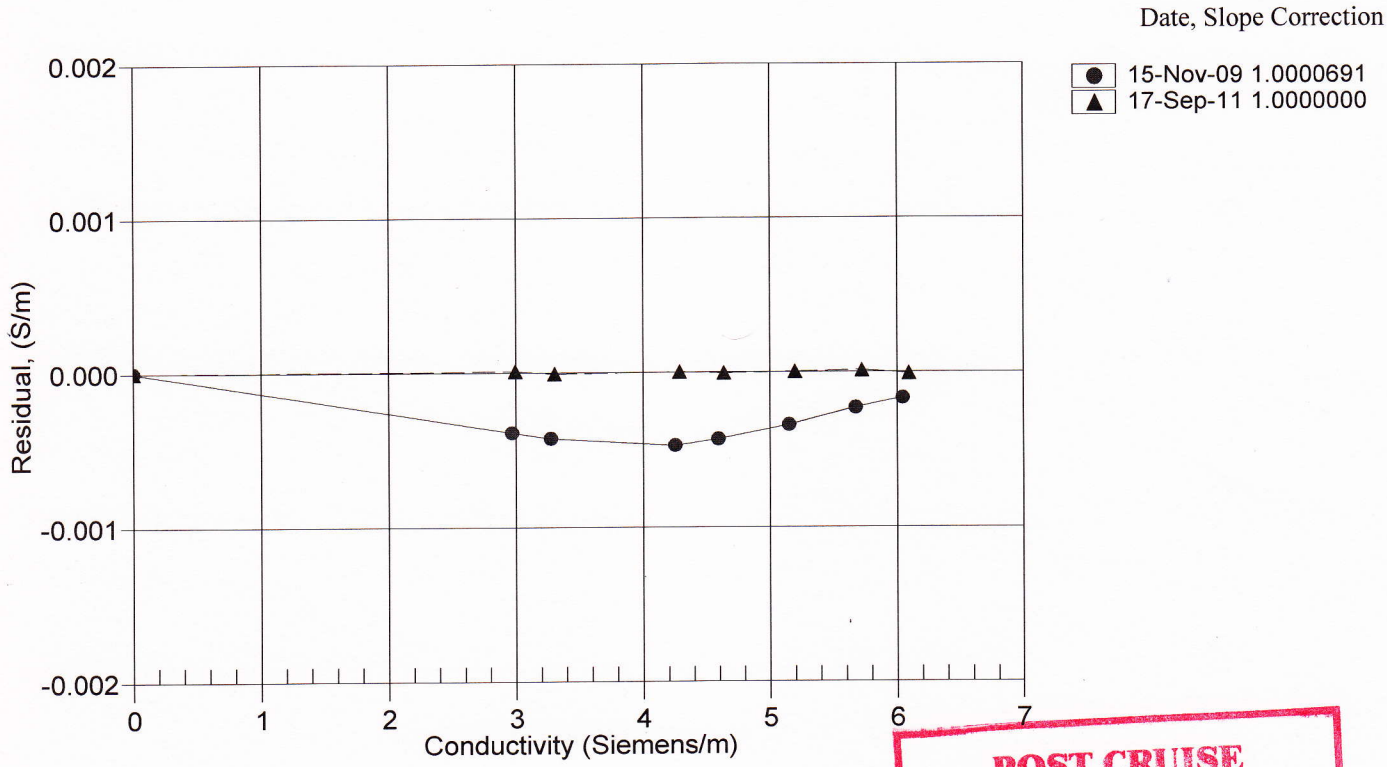
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREO (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2.99907	0.00000	0.00000
1.0000	35.0216	2.99183	5.93811	2.99184	0.00001
4.4999	35.0013	3.30044	6.16154	3.30043	-0.00001
15.0000	34.9577	4.28712	6.82630	4.28712	0.00000
18.5000	34.9484	4.63400	7.04485	4.63399	-0.00001
24.0000	34.9377	5.19468	7.38415	5.19468	0.00000
29.0000	34.9311	5.71900	7.68758	5.71901	0.00001
32.5000	34.9263	6.09300	7.89669	6.09299	-0.00001

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



POST CRUISE CALIBRATION

SBE SEA-BIRD ELECTRONICS, INC.
13431 NE 20th St. Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Service Report

RMA Number 65605

Customer Information:

Company	SEAGLIDER FABRICATION CENTER	**Date**	9/20/2011
Contact	Karl Kunkle		
PO Number	TBD		

Serial Number	0142 Glider T/C Assembly
Model Number	Glider

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Performed complete system check and full diagnostic evaluation.

Special Notes:

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Temperature Calibration Report

Customer:	SEAGLIDER FABRICATION CENTER		
Job Number:	65605	**Date of Report:**	9/19/2011
Model Number	Glider	**Serial Number:**	0142 Glider T/C Assembly

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 9/17/2011 Drift since last cal: -0.00557 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

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Conductivity Calibration Report

Customer:	SEAGLIDER FABRICATION CENTER		
Job Number:	65605	**Date of Report:**	9/19/2011
Model Number	Glider	**Serial Number:**	0142 Glider T/C Assembly

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 9/17/2011 **Drift since last cal:** +0.00010 **PSU/month***

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☐ Performed ☑ Not Performed

Date: **Drift since Last cal:** **PSU/month***

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.