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: 0136
CALIBRATION DATE: 16-Aug-12

GliderAPL TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.32729448e-003
h = 6.22416625e-004
i = 2.32070375e-005
j = 2.46409952e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.64763536e-003
b = 5.79422864e-004
c = 1.48485051e-005
d = 2.46554770e-006
f0 = 3108.522

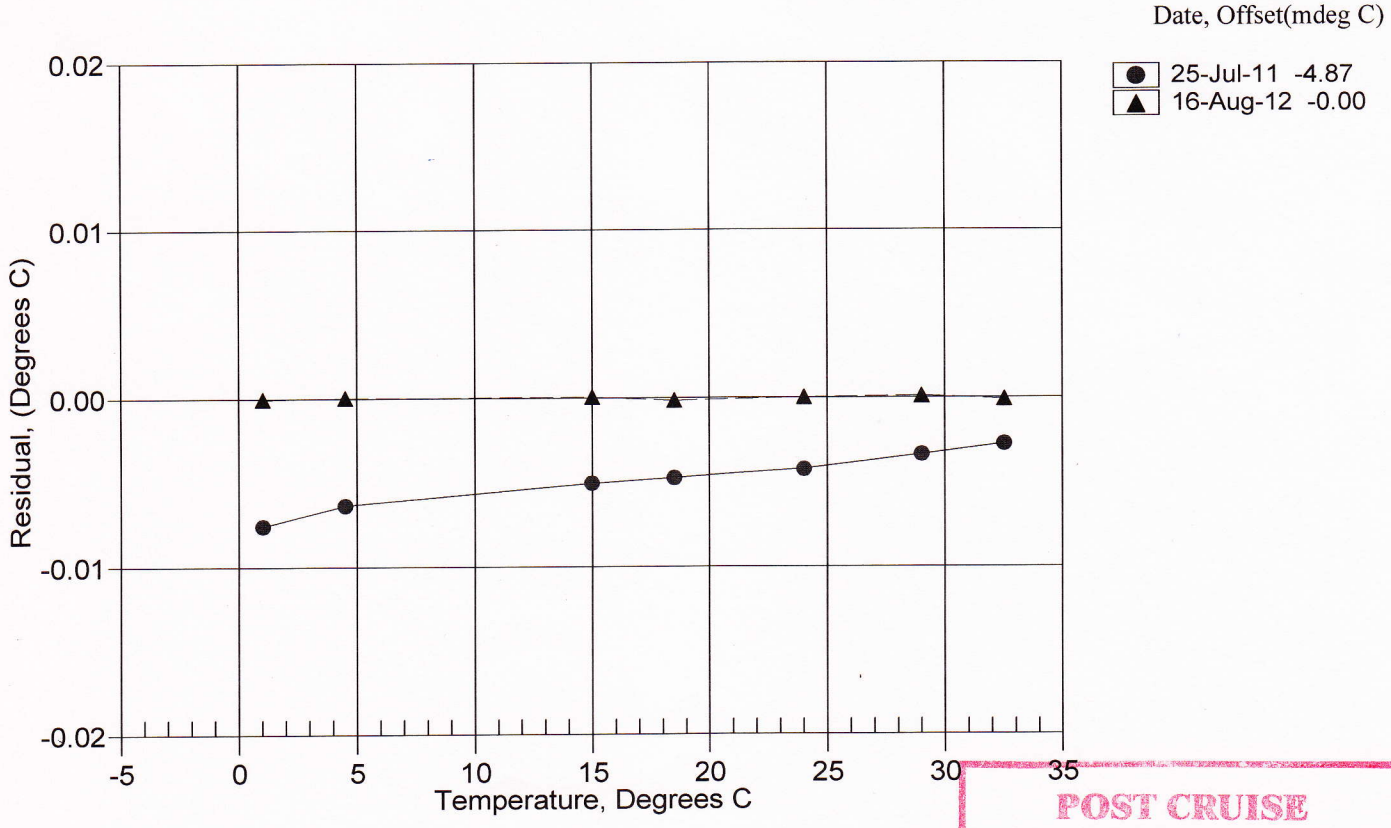
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	3108.522	1.0000	-0.00003
4.5000	3365.865	4.5000	0.00005
15.0000	4230.799	15.0001	0.00006
18.5000	4551.510	18.4999	-0.00015
24.0000	5089.832	24.0000	0.00003
29.0000	5616.700	29.0001	0.00012
32.5000	6007.321	32.4999	-0.00008

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: 0136
CALIBRATION DATE: 16-Aug-12

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

GHIJ COEFFICIENTS

```
g = -9.79860985e+000
h =  1.08451239e+000
i = -1.74154145e-003
j =  2.16070263e-004
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  9.13426288e-006
b =  1.07943160e+000
c = -9.78266585e+000
d = -8.64568576e-005
m =  5.0
CPcor = -9.5700e-008 (nominal)
```

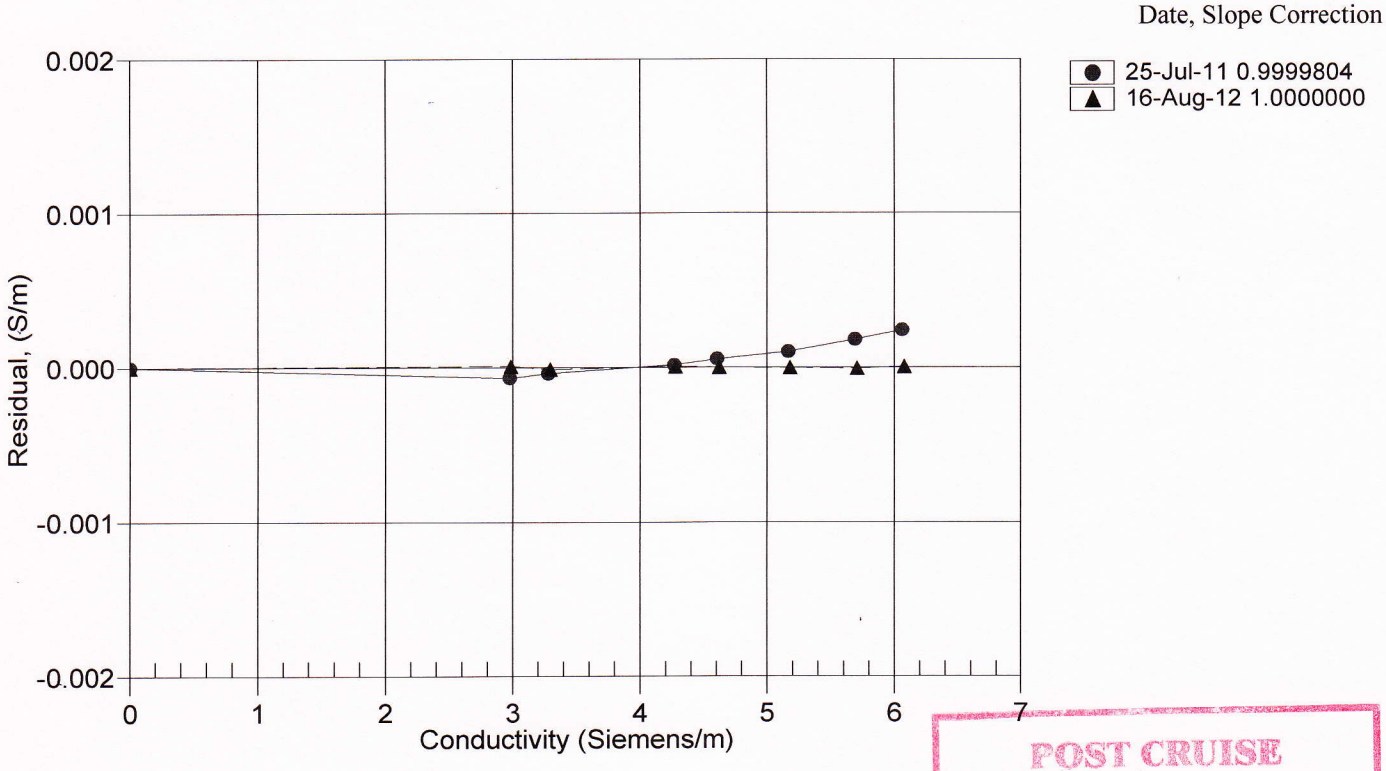
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	3.01040	0.00000	0.00000
1.0000	34.9063	2.98292	6.05216	2.98293	0.00001
4.5000	34.8856	3.29062	6.28212	3.29060	-0.00001
15.0000	34.8417	4.27440	6.96590	4.27440	0.00001
18.5000	34.8321	4.62024	7.19055	4.62024	0.00000
24.0000	34.8216	5.17933	7.53926	5.17933	-0.00000
29.0000	34.8155	5.70220	7.85102	5.70220	-0.00001
32.5000	34.8121	6.07534	8.06594	6.07534	0.00000

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

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Service Report

RMA Number 70333

Customer Information:

Company	SEAGLIDER FABRICATION CENTER	**Date**	8/27/2012
Contact	Karl Kunkle		
PO Number	TBD		

Serial Number	0136 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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Conductivity Calibration Report

Customer:	SEAGLIDER FABRICATION CENTER		
Job Number:	70333	**Date of Report:**	8/17/2012
Model Number	Glider	**Serial Number:**	0136 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. 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: 8/16/2012 Drift since last cal: 0.0000 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.

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Temperature Calibration Report

Customer:	SEAGLIDER FABRICATION CENTER		
Job Number:	70333	**Date of Report:**	8/17/2012
Model Number	Glider	**Serial Number:**	0136 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. 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: 8/16/2012 Drift since last cal: +0.00460 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments: