

SEA-BIRD ELECTRONICS, INC.

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

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

SENSOR SERIAL NUMBER: 0136
CALIBRATION DATE: 25-Jul-11

GliderAPL TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.32567851e-003
h = 6.19421572e-004
i = 2.12533541e-005
j = 2.03071819e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.64763717e-003
b = 5.79191966e-004
c = 1.43703327e-005
d = 2.03206960e-006
f0 = 3107.976

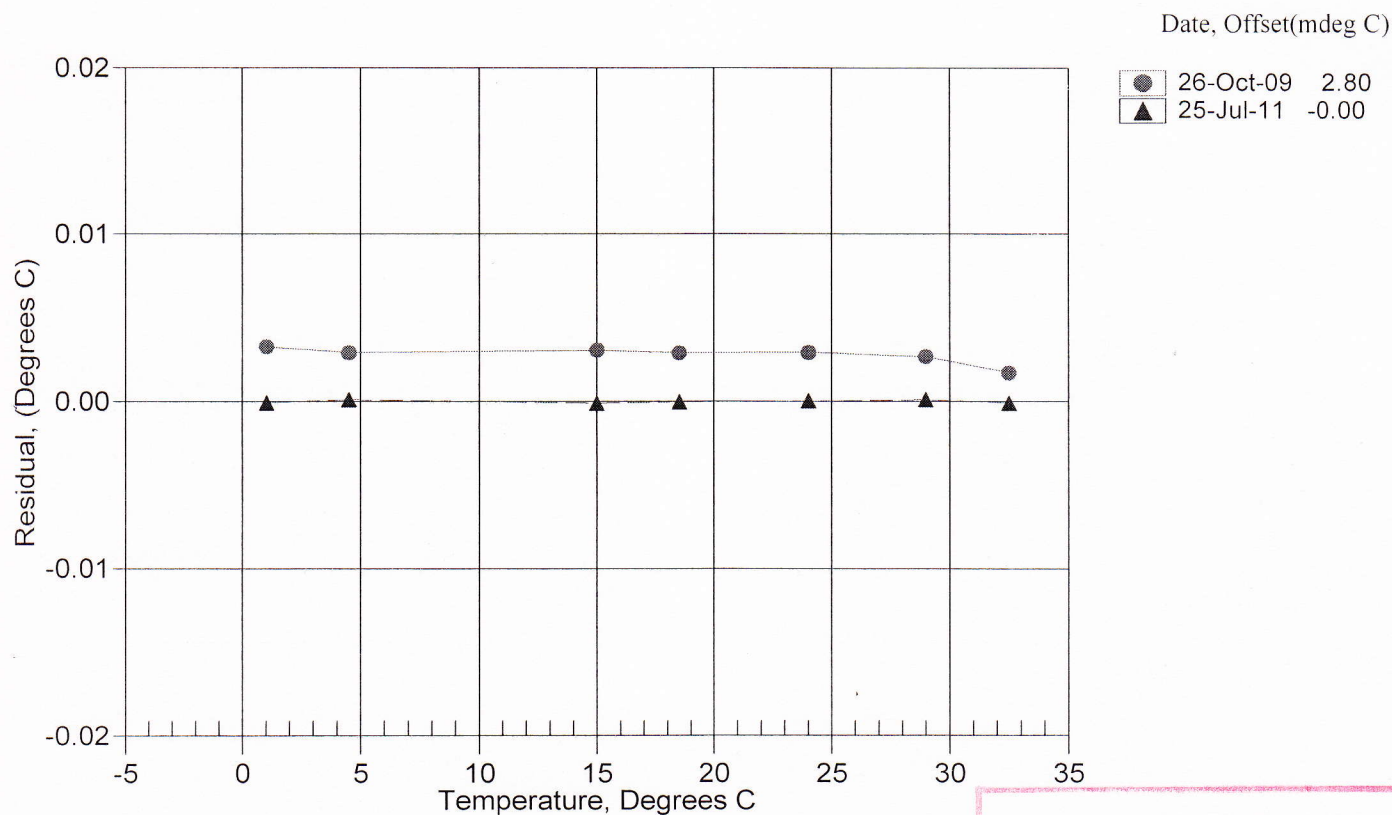
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	3107.976	0.9998	-0.00007
4.4999	3365.373	4.5000	0.00012
14.9999	4230.332	14.9998	-0.00009
18.5000	4551.077	18.5000	-0.00002
24.0000	5089.399	24.0000	0.00002
29.0000	5616.318	29.0001	0.00012
32.5000	6007.016	32.4999	-0.00008

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: 25-Jul-11

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

GHIJ COEFFICIENTS

g = -9.79924818e+000
h = 1.08455633e+000
i = -1.72175687e-003
j = 2.12520521e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 8.93215475e-006
b = 1.07950940e+000
c = -9.78328347e+000
d = -8.65018396e-005
m = 5.0
CPcor = -9.5700e-008 (nominal)

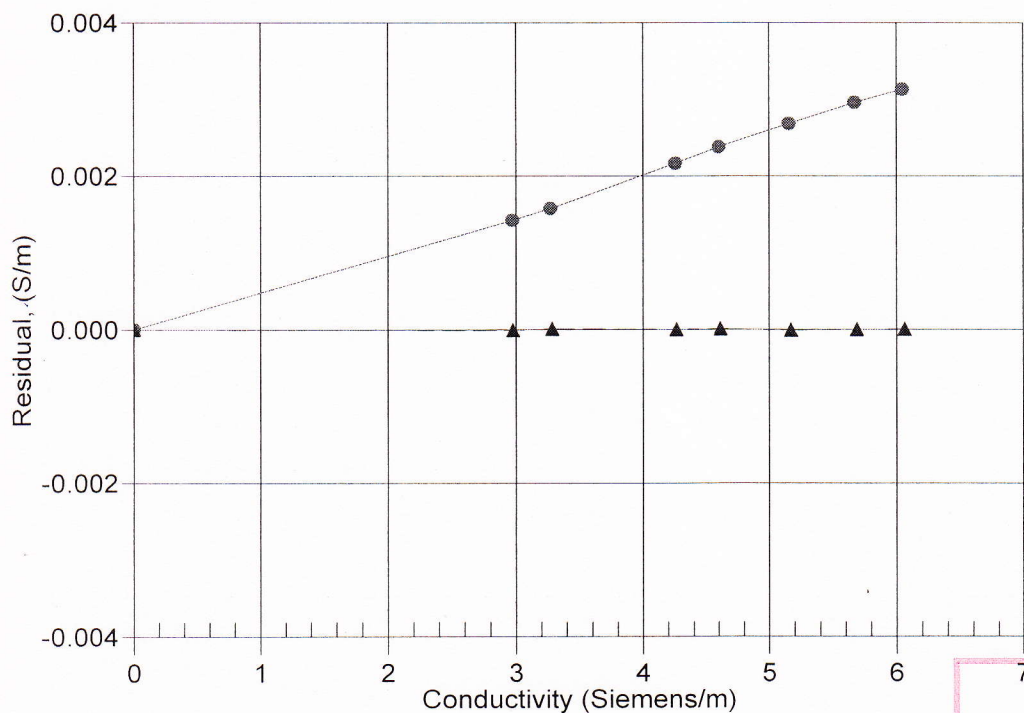
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	3.01039	0.00000	0.00000
0.9999	34.8106	2.97552	6.04645	2.97551	-0.00001
4.4999	34.7911	3.28257	6.27620	3.28258	0.00001
14.9999	34.7484	4.26415	6.95914	4.26415	-0.00000
18.5000	34.7393	4.60926	7.18356	4.60926	0.00001
24.0000	34.7293	5.16711	7.53188	5.16711	-0.00001
29.0000	34.7240	5.68890	7.84336	5.68890	-0.00000
32.5000	34.7212	6.06128	8.05809	6.06128	0.00000

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

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

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

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



Date, Slope Correction

● 26-Oct-09 0.9994881
▲ 25-Jul-11 1.0000000

POST CRUISE
CALIBRATION

SBE SEA-BIRD ELECTRONICS, INC.

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Temperature Calibration Report

Customer:	Lockheed Martin		
Job Number:	65316	Date of Report:	7/25/2011
Model Number:	Glider	Serial Number:	0136 Glider

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: 7/25/2011

Drift since last cal: -0.00160 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:	Lockheed Martin		
Job Number:	65316	Date of Report:	7/25/2011
Model Number:	Glider	Serial Number:	0136 Glider

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: 7/25/2011

Drift since last cal: -0.00070 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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Service

Report

RMA Number

65316

Customer Information:

Company Lockheed Martin

Date 7/26/2011

Contact Domenic Jannarelli

PO Number TBD

Serial Number 0136 Glider

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: