

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: 0134
CALIBRATION DATE: 25-Jul-11

GliderAPL TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.33513290e-003
h = 6.20971963e-004
i = 2.18044340e-005
j = 2.13343939e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.64763798e-003
b = 5.79475798e-004
c = 1.44808468e-005
d = 2.13481164e-006
f0 = 3152.559

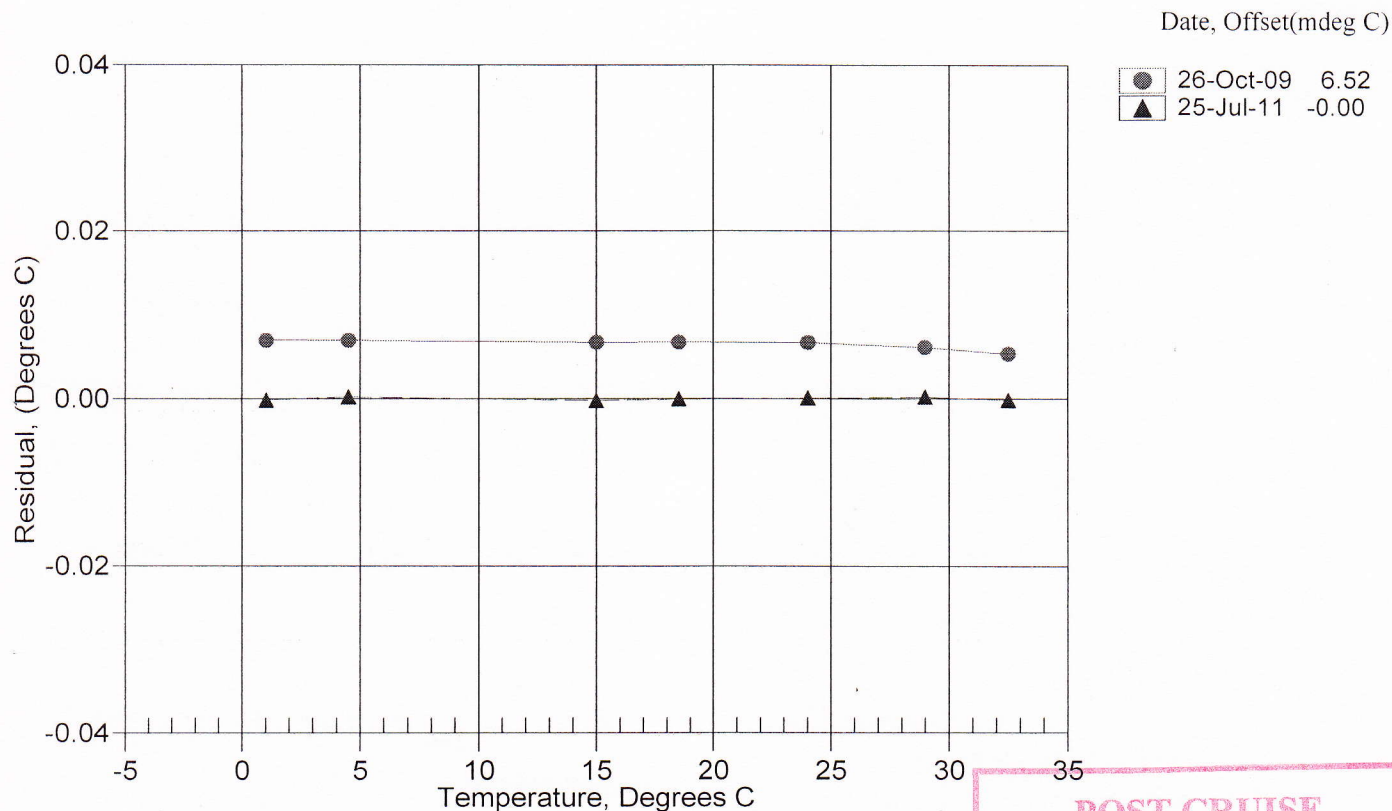
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	3152.559	0.9998	-0.00013
4.4999	3413.532	4.5001	0.00023
14.9999	4290.411	14.9997	-0.00019
18.5000	4615.573	18.5000	-0.00003
24.0000	5161.275	24.0001	0.00007
29.0000	5695.379	29.0002	0.00018
32.5000	6091.365	32.4999	-0.00014

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

GHIJ COEFFICIENTS

g = -1.00598771e+001
h = 1.15553133e+000
i = -2.26020018e-003
j = 2.55234451e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 4.79331198e-006
b = 1.14882830e+000
c = -1.00395513e+001
d = -8.77665220e-005
m = 5.3
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	2.95627	0.00000	0.00000
0.9999	34.8106	2.97552	5.88131	2.97552	0.00000
4.4999	34.7911	3.28257	6.10344	3.28257	0.00000
14.9999	34.7484	4.26415	6.76407	4.26414	-0.00001
18.5000	34.7393	4.60926	6.98124	4.60926	0.00000
24.0000	34.7293	5.16711	7.31839	5.16712	0.00000
29.0000	34.7240	5.68890	7.61992	5.68891	0.00001
32.5000	34.7212	6.06128	7.82781	6.06127	-0.00001

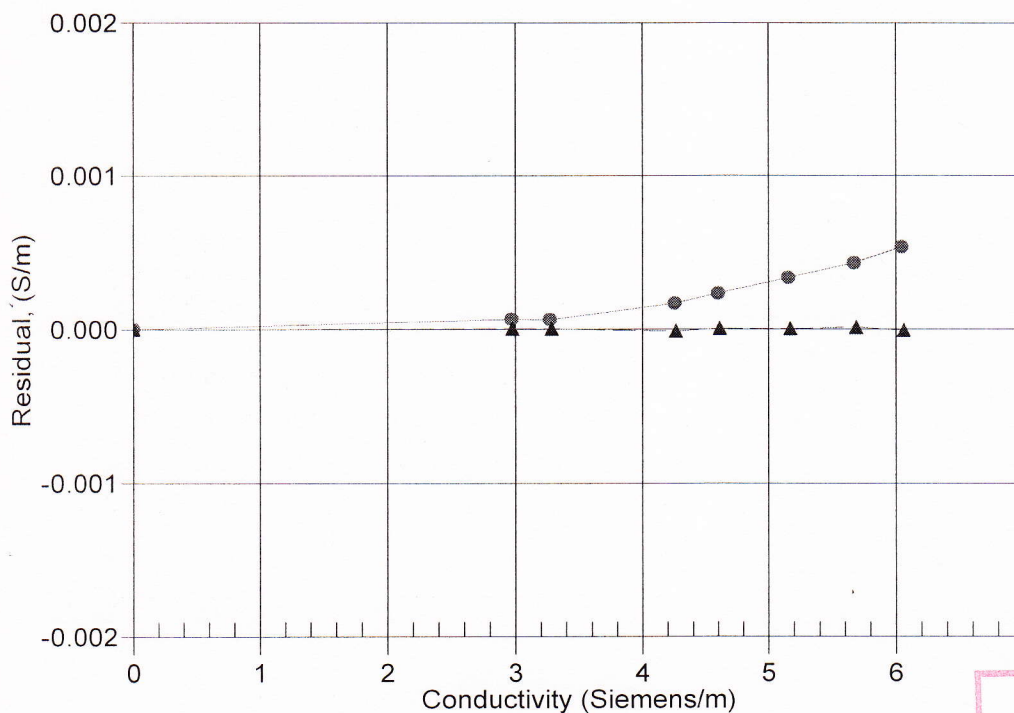
Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

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 0.9999377
▲ 25-Jul-11 1.0000000

POST CRUISE
CALIBRATION



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Temperature Calibration Report

Customer:	Lockheed Martin		
Job Number:	65316	Date of Report:	7/25/2011
Model Number:	Glider	Serial Number:	0134 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: -0.00374 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:	0134 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: -0.00010 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.



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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

0134 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: