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: 83751

Customer Information:

Company	Kongsberg Underwater Technology	Date	4/30/2015
Contact	Richard Hile		
PO Number	TBD		

Serial Number	0141 APL Glider
Model Number	APL 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:

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: 0141
CALIBRATION DATE: 28-Apr-15

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

COEFFICIENTS:

```
g =  -9.90023450e+000
h =   1.14089659e+000
i =  -1.77708531e-003
j =   2.21017683e-004

CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

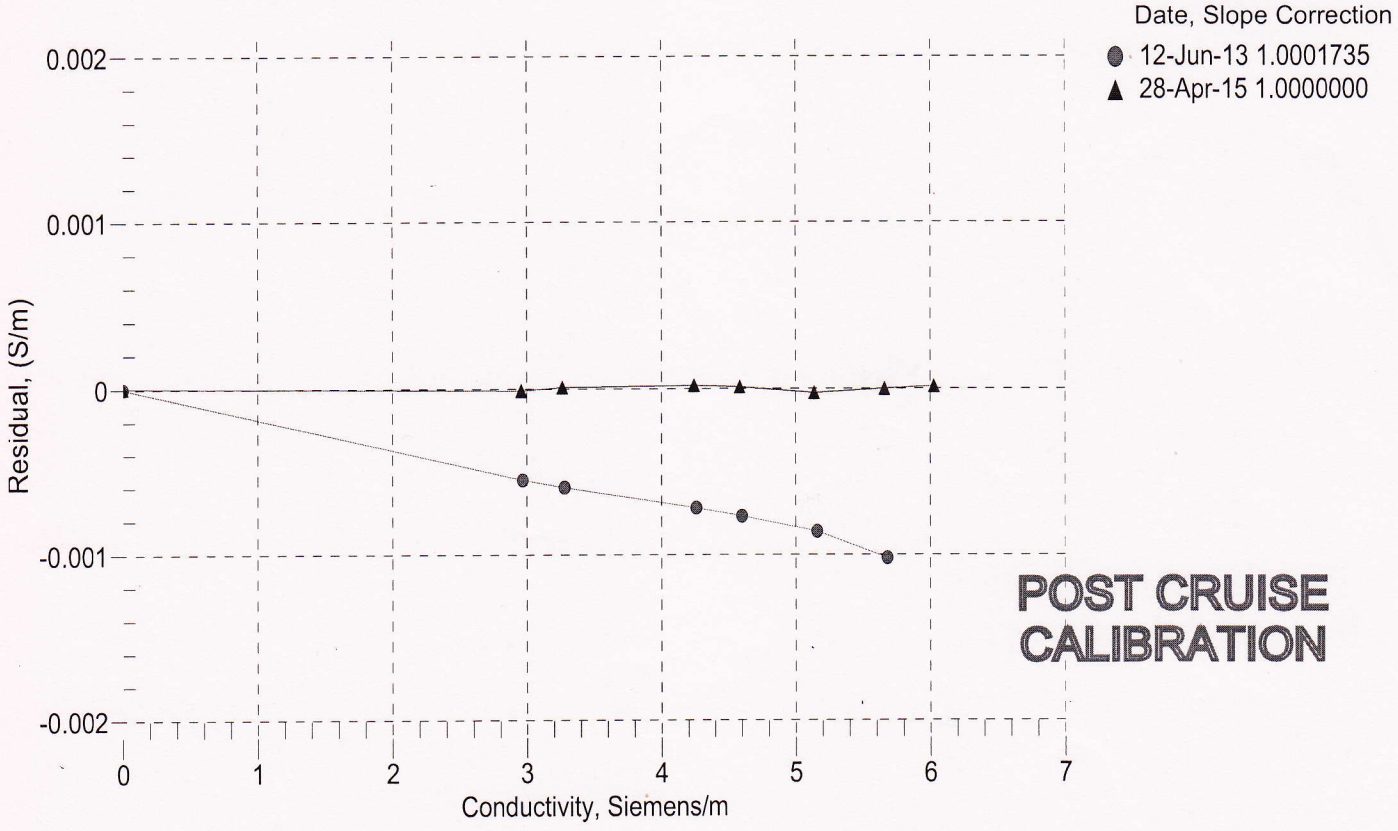
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2.95007	0.00000	0.00000
0.9999	34.6178	2.96060	5.89173	2.96059	-0.00001
4.4999	34.5976	3.26611	6.11481	3.26611	0.00001
15.0000	34.5531	4.24273	6.77815	4.24275	0.00002
18.4999	34.5420	4.58588	6.99605	4.58589	0.00001
23.9999	34.5298	5.14069	7.33438	5.14066	-0.00003
29.0000	34.5226	5.65960	7.63699	5.65960	-0.00000
32.5000	34.5174	6.02973	7.84553	6.02974	0.00001

f = INST FREQ / 1000.0

Conductivity = $(g + h * f^2 + i * f^3 + j * f^4) / (1 + \delta * t + \varepsilon * p)$ Siemens / meter

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

Residual = instrument conductivity - bath conductivity



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

Conductivity Calibration Report

Customer:	Kongsberg Underwater Technology		
Job Number:	83751	**Date of Report:**	4/28/2015
Model Number	APL Glider	**Serial Number:**	0141 APL 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. 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: 4/28/2015 Drift since last cal: +0.00020 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.

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: 0141
CALIBRATION DATE: 28-Apr-15

Glider APL TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

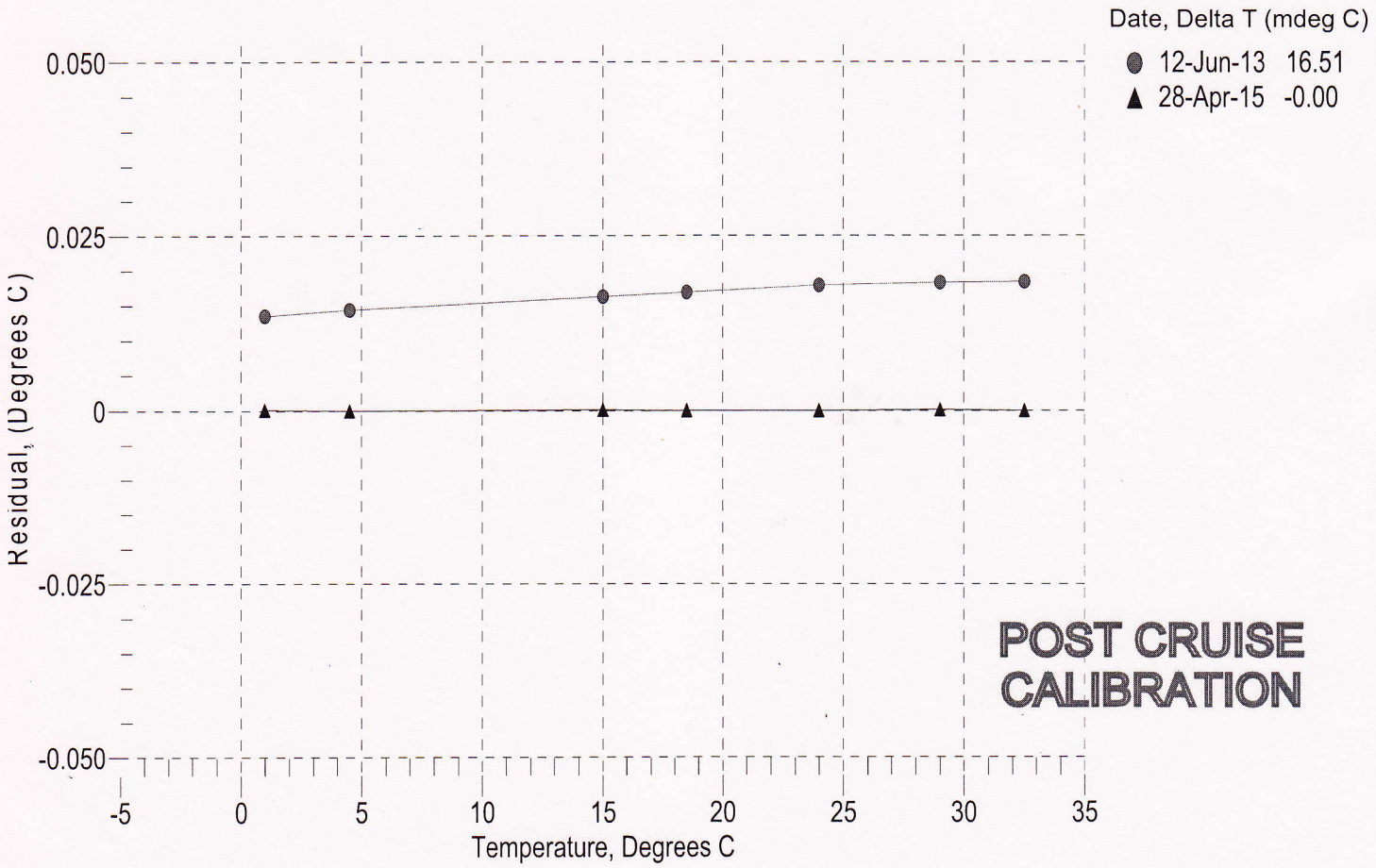
ITS-90 COEFFICIENTS:

g = 4.35629511e-003
h = 6.31180686e-004
i = 2.41867437e-005
j = 2.58844018e-006
f0 = 1000.0

BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	3217.250	0.9999	0.00001
4.4999	3480.758	4.4999	-0.00002
15.0000	4365.012	15.0001	0.00007
18.4999	4692.377	18.4998	-0.00006
23.9999	5241.316	23.9998	-0.00005
29.0000	5778.010	29.0001	0.00009
32.5000	6175.564	32.5000	-0.00004

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)

Residual = instrument temperature - bath temperature



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

Temperature Calibration Report

Customer:	Kongsberg Underwater Technology		
Job Number:	83751	**Date of Report:**	4/28/2015
Model Number	APL Glider	**Serial Number:**	0141 APL 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. 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: 4/28/2015 Drift since last cal: -0.00880 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments: