SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	Harris Electric		
Job Number:	48071	Date of Report:	9/13/2007
Model Number	SBE 45	Serial Number:	4545414-0194

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: 9/13/2007 Drift since last cal: +0.00272 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

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

SENSOR SERIAL NUMBER: 0194
CALIBRATION DATE: 13-Sep-07

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

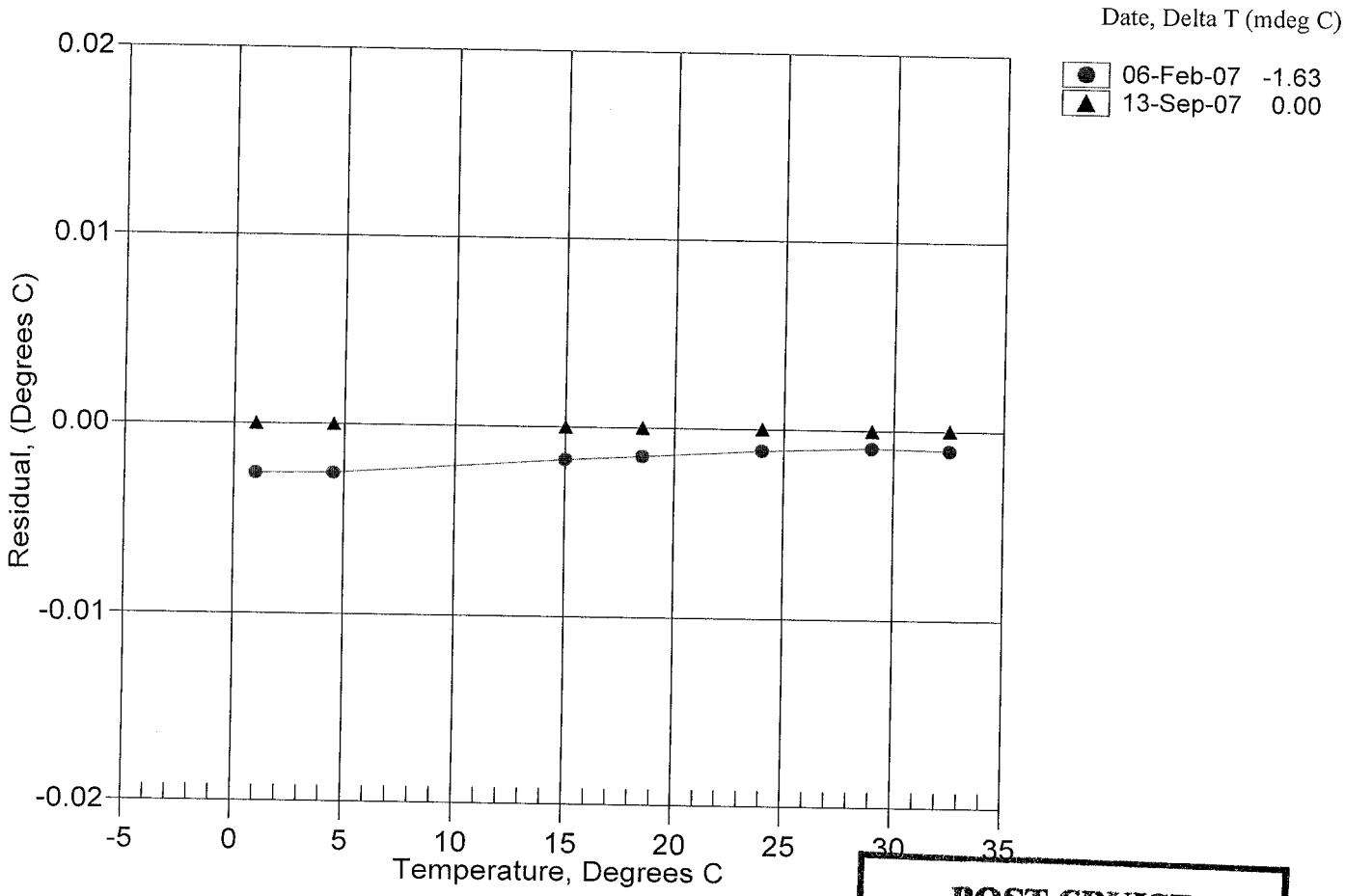
ITS-90 COEFFICIENTS

a0 = 4.140899e-005
a1 = 2.685111e-004
a2 = -1.801594e-006
a3 = 1.432374e-007

BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	631822.2	1.0000	0.0000
4.5000	541040.6	4.5000	-0.0000
14.9999	346297.5	14.9999	0.0000
18.5000	300256.6	18.5000	-0.0000
24.0000	241357.1	24.0000	0.0000
29.0000	199080.2	29.0000	-0.0000
32.5000	174538.8	32.5000	0.0000

Temperature ITS-90 = $1/\{a0 + a1[ln(n)] + a2[ln^2(n)] + a3[ln^3(n)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



POST CRUISE CALIBRATION

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Conductivity Calibration Report

Customer:	Harris Electric		
Job Number:	48071	Date of Report:	9/13/2007
Model Number	SBE 45	Serial Number:	4545414-0194

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: 9/13/2007 Drift since last cal: -0.00030 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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SENSOR SERIAL NUMBER: 0194
CALIBRATION DATE: 13-Sep-07

SBE 45 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.010792e+000
h = 1.390684e-001
i = -1.294766e-004
j = 2.990148e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006
WBOTC = -1.1460e-005

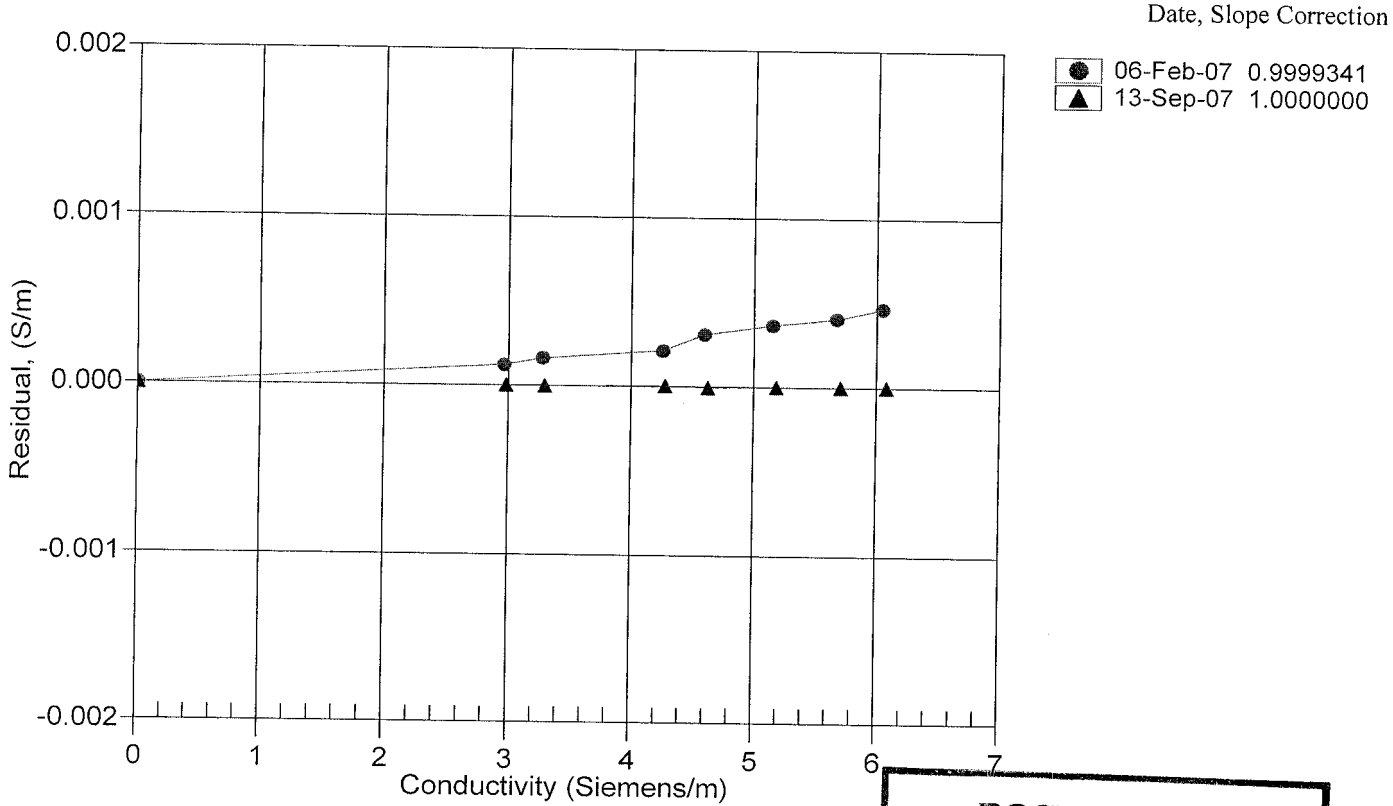
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2697.60	0.00000	0.00000
1.0000	34.9185	2.98387	5356.39	2.98387	0.00000
4.5000	34.8986	3.29172	5558.30	3.29172	-0.00000
14.9999	34.8552	4.27587	6158.82	4.27587	0.00000
18.5000	34.8461	4.62189	6356.24	4.62189	-0.00000
24.0000	34.8362	5.18126	6662.74	5.18126	0.00000
29.0000	34.8307	5.70441	6936.86	5.70441	0.00000
32.5000	34.8274	6.07771	7125.84	6.07771	-0.00000

f = INST FREQ * sqrt(1.0 + WBOTC * t) / 1000.0

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

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

Residual = instrument conductivity - bath conductivity



POST CRUISE CALIBRATION

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Pressure Test Certificate

Customer	Harris Electric
Job Number	48071
Date	9/14/2007
Technician	DG

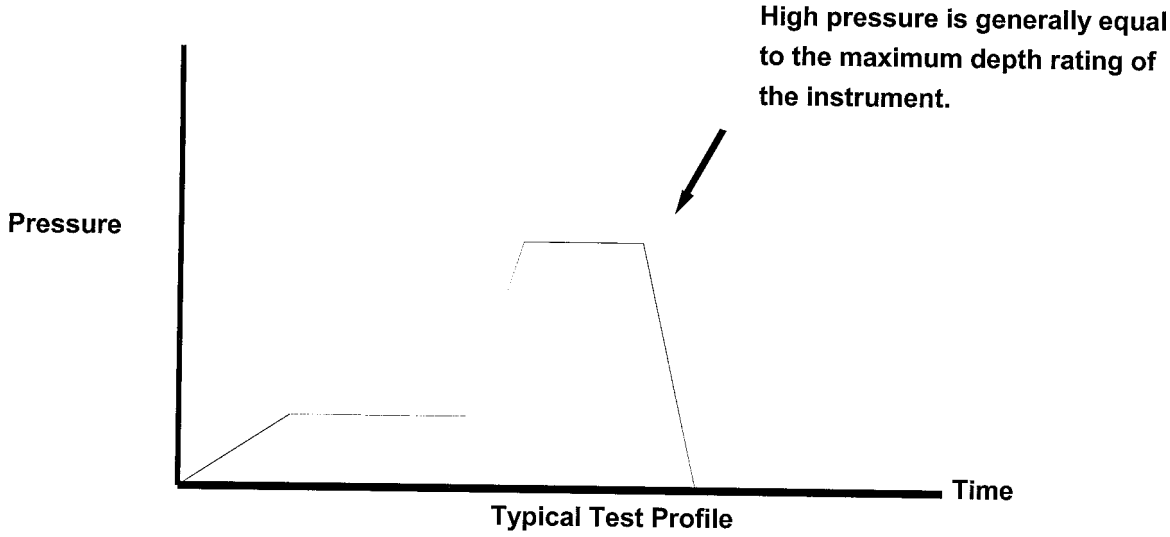
Serial Number	4545414-0194	
Low Pressure (PSI)	30	PSI
Time (Minutes)	30	Minutes
High Pressure (PSI)	*N/A	PSI
Time (Minutes)	*N/A	Minutes

Pass ☑

Fail ☐

Comments

Replaced the main piston "O"-Rings
Replaced the housing
*The unit is not designed for high pressure applications.



Typical Test Profile

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Service Report

RMA Number 48071

Customer Information:

Company	Harris Electric	**Date**	9/17/2007
Contact	Bob Gregoire		
PO Number	3-75471		

Serial Number	4545414-0194
Model Number	SBE 45

Services Requested:

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

Problems Found:

1. The main housing was found to be cracked above the lower inlet opening down to the bottom plate.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Installed NEW SBE 45 Housing.
4. Performed internal inspection and O-ring replacement.
5. Performed hydrostatic pressure test.
6. Performed complete system check and full diagnostic evaluation.

Special Notes: