



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

66769

Customer Information:

Company U.S Dept. of Commerce NOAA, NMFS

Date 12/13/2011

Contact Ken Nadeau

PO Number TBD

Serial Number 4540402-0149

Model Number SBE 45

Services Requested:

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

Problems Found:

1. The anti-foulant devices appeared "dirty".

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Performed internal inspection and O-ring replacement.
4. Performed hydrostatic pressure test.
5. Installed NEW AF24173 Anti-foulant cylinder(s).
6. 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: 0149
CALIBRATION DATE: 19-Nov-11

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = -6.261590e-005
a1 = 2.883932e-004
a2 = -3.267151e-006
a3 = 1.820883e-007

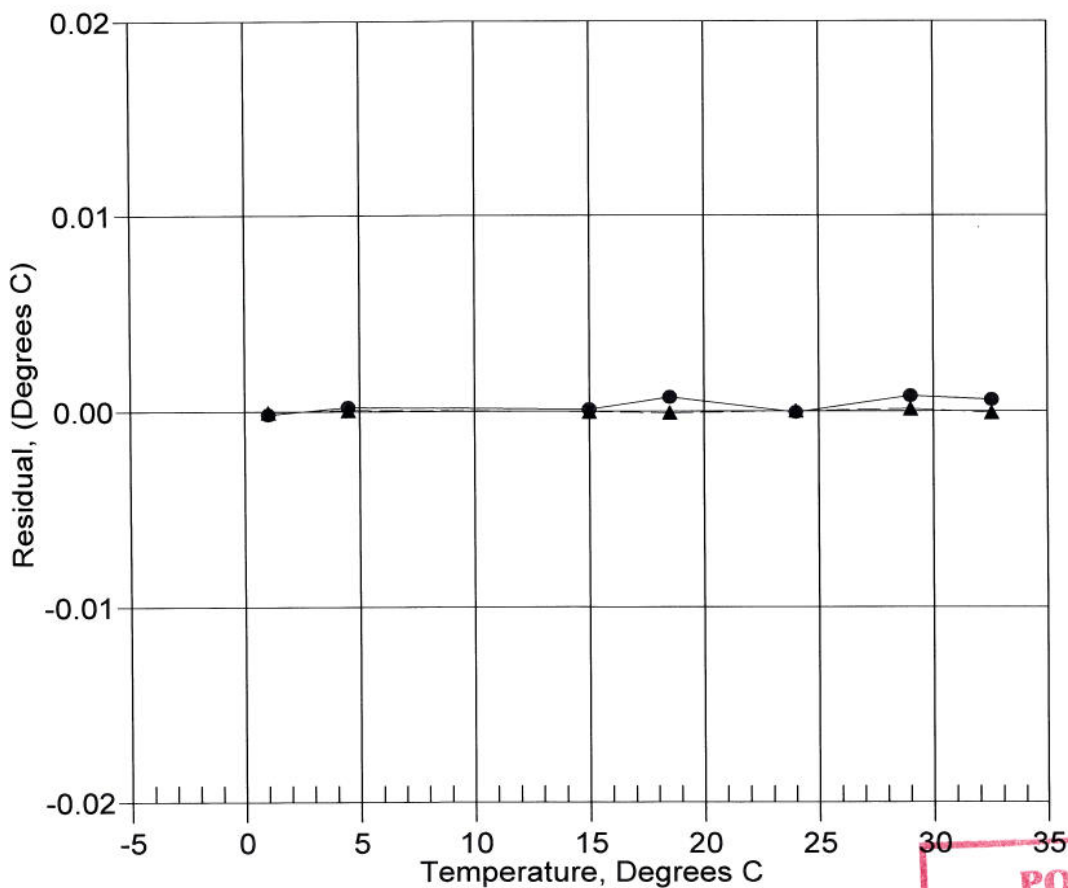
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	647561.0	1.0000	-0.0000
4.5000	555009.0	4.5001	0.0001
15.0000	356139.3	15.0000	-0.0000
18.5000	309041.7	18.4999	-0.0001
24.0000	248727.3	24.0000	0.0000
29.0000	205386.0	29.0001	0.0001
32.5000	180207.0	32.4999	-0.0001

Temperature ITS-90 = $1 / \{a_0 + a_1[\ln(n)] + a_2[\ln^2(n)] + a_3[\ln^3(n)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature

Date, Delta T (mdeg C)

● 27-May-09 0.31
▲ 19-Nov-11 -0.00



**POST CRUISE
CALIBRATION**



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Temperature Calibration Report

Customer:	U.S Dept. of Commerce NOAA, NMFS		
Job Number:	66769	Date of Report:	11/19/2011
Model Number	SBE 45	Serial Number:	4540402-0149

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: 11/19/2011

Drift since last cal: -0.00012 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR'

☐ Performed ☒ Not Performed

Date:

Drift since Last cal: Degrees Celsius/year

Comments:

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SENSOR SERIAL NUMBER: 0149
CALIBRATION DATE: 19-Nov-11

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

COEFFICIENTS:

g = -1.037087e+000
h = 1.261289e-001
i = -1.899625e-004
j = 2.955601e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006
WBOTC = 7.0615e-007

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	2870.89	0.00000	0.00000
1.0000	34.9334	2.98502	5649.94	2.98502	0.00000
4.5000	34.9127	3.29292	5861.48	3.29292	-0.00000
15.0000	34.8689	4.27738	6490.94	4.27738	-0.00001
18.5000	34.8594	4.62347	6697.88	4.62346	-0.00001
24.0000	34.8489	5.18294	7019.21	5.18295	0.00001
29.0000	34.8424	5.70611	7306.55	5.70613	0.00002
32.5000	34.8382	6.07938	7504.61	6.07936	-0.00001

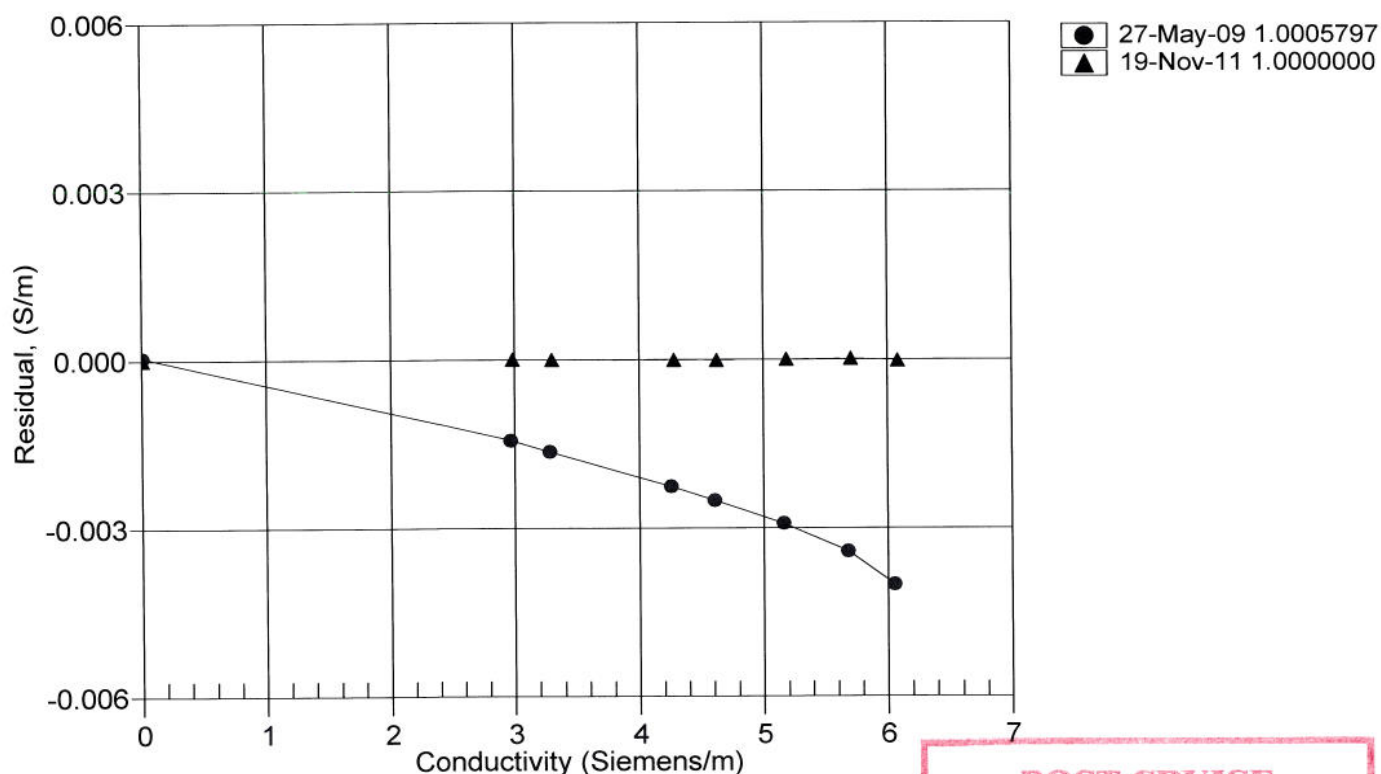
$$f = \text{INST FREQ} * \sqrt{1.0 + \text{WBOTC} * t} / 1000.0$$

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

$$t = \text{temperature}[^{\circ}\text{C}]; p = \text{pressure}[\text{decibars}]; \delta = \text{CTcor}; \epsilon = \text{CPcor};$$

$$\text{Residual} = \text{instrument conductivity} - \text{bath conductivity}$$

Date, Slope Correction



**POST CRUISE
CALIBRATION**



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Conductivity Calibration Report

Customer:	U.S Dept. of Commerce NOAA, NMFS		
Job Number:	66769	Date of Report:	11/19/2011
Model Number	SBE 45	Serial Number:	4540402-0149

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: 11/19/2011

Drift since last cal: +0.00060 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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Pressure Test Certificate

Customer U.S Dept. of Commerce NOAA, NMFS

Job Number 66769

Date 11/21/2011

Technician JK

Serial Number 4540402-0149

Low Pressure (PSI) 30 PSI

Time (Minutes) 30 Minutes

High Pressure (PSI) PSI

Time (Minutes) Minutes

Pass ☒

Fail ☐

Comments

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

