



SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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

Service
Report

RMA Number	54776
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Customer Information:

Company	Pacific Marine Center / NOAA	Date	6/3/2009
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Contact	Richard Conway
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PO Number	EM-3185 (VISA)
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Serial Number	4540402-0149
Model Number	SBE 45

Services Requested:

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

Problems Found:

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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. Performed complete system check and full diagnostic evaluation.

Special Notes:

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SENSOR SERIAL NUMBER: 0149
 CALIBRATION DATE: 27-May-09

SBE 45 TEMPERATURE CALIBRATION DATA
 ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = -1.148798e-005
 a1 = 2.763153e-004
 a2 = -2.316265e-006
 a3 = 1.571403e-007

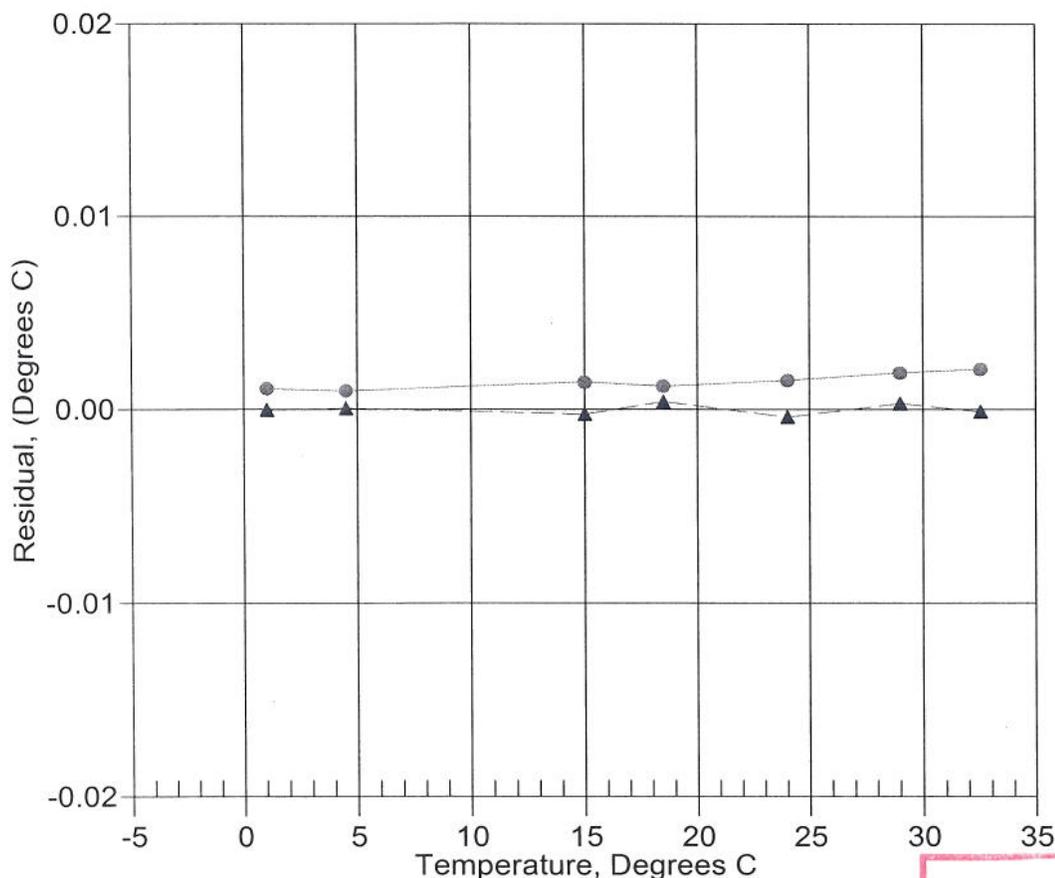
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	647564.4	1.0000	-0.0000
4.5000	555005.7	4.5001	0.0001
15.0000	356137.6	14.9998	-0.0002
18.5000	309031.8	18.5004	0.0004
24.0000	248728.1	23.9996	-0.0004
29.0000	205380.9	29.0003	0.0003
32.5001	180201.9	32.5000	-0.0001

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

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

Date, Delta T (mdeg C)

● 25-Oct-07 1.44
 ▲ 27-May-09 -0.00



**POST CRUISE
 CALIBRATION**



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Temperature Calibration Report

Customer:	Pacific Marine Center / NOAA		
Job Number:	54776	Date of Report:	5/27/2009
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 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:

Drift since last cal: 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: 27-May-09

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

COEFFICIENTS:

g = -1.038803e+000
 h = 1.265668e-001
 i = -2.951540e-004
 j = 3.759162e-005

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

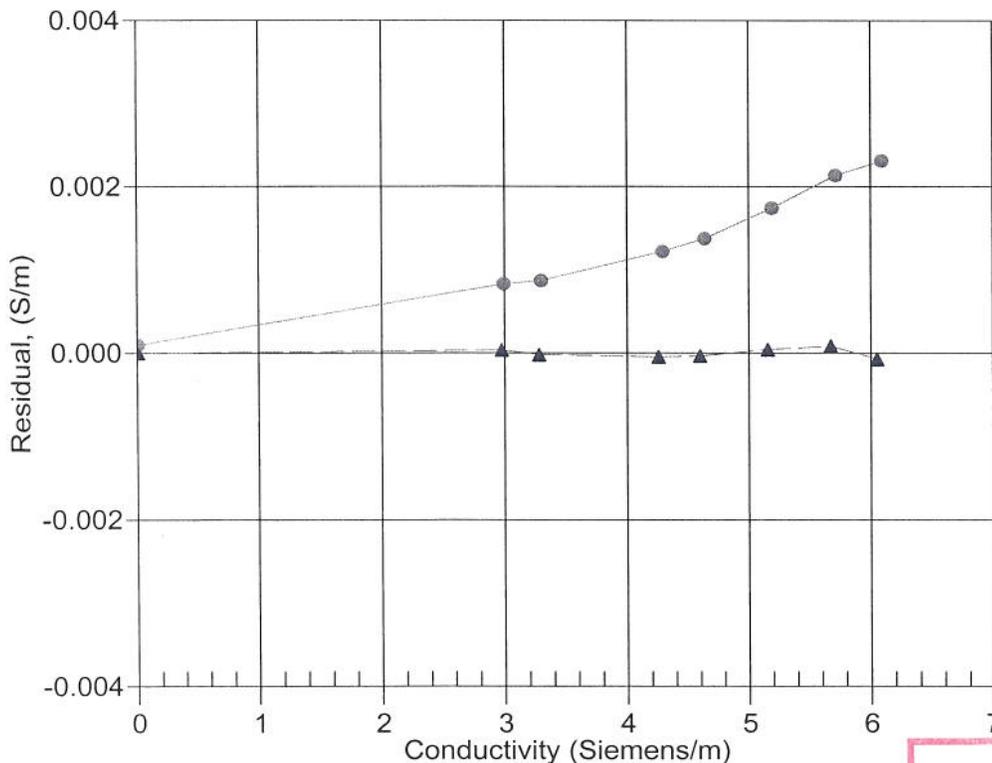
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2870.96	0.00000	0.00000
1.0000	34.7262	2.96900	5637.70	2.96903	0.00004
4.5000	34.7069	3.27542	5848.56	3.27540	-0.00002
15.0000	34.6647	4.25498	6475.94	4.25493	-0.00005
18.5000	34.6552	4.59930	6682.17	4.59927	-0.00003
24.0000	34.6440	5.15582	7002.34	5.15586	0.00004
29.0000	34.6367	5.67620	7288.59	5.67629	0.00008
32.5001	34.6312	6.04736	7485.74	6.04729	-0.00007

f = INST FREQ * sqrt(1.0 + WBOTC * t) / 1000.0
 Conductivity = (g + hf² + if³ + jf⁴) / (1 + δt + εp) Siemens/meter
 t = temperature[°C]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity

Date, Slope Correction

● 25-Oct-07 0.9996657
 ▲ 27-May-09 1.0000000



POST CRUISE
CALIBRATION



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Conductivity Calibration Report

Customer:	Pacific Marine Center / NOAA		
Job Number:	54776	Date of Report:	5/27/2009
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 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:

Drift since last cal: 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 Pacific Marine Center / NOAA

Job Number 54776

Date 6/1/2009

Technician DG

Serial Number 4540402-0149

Low Pressure (PSI) 30 PSI

Time (Minutes) 30 Minutes

High Pressure (PSI) *N/A PSI

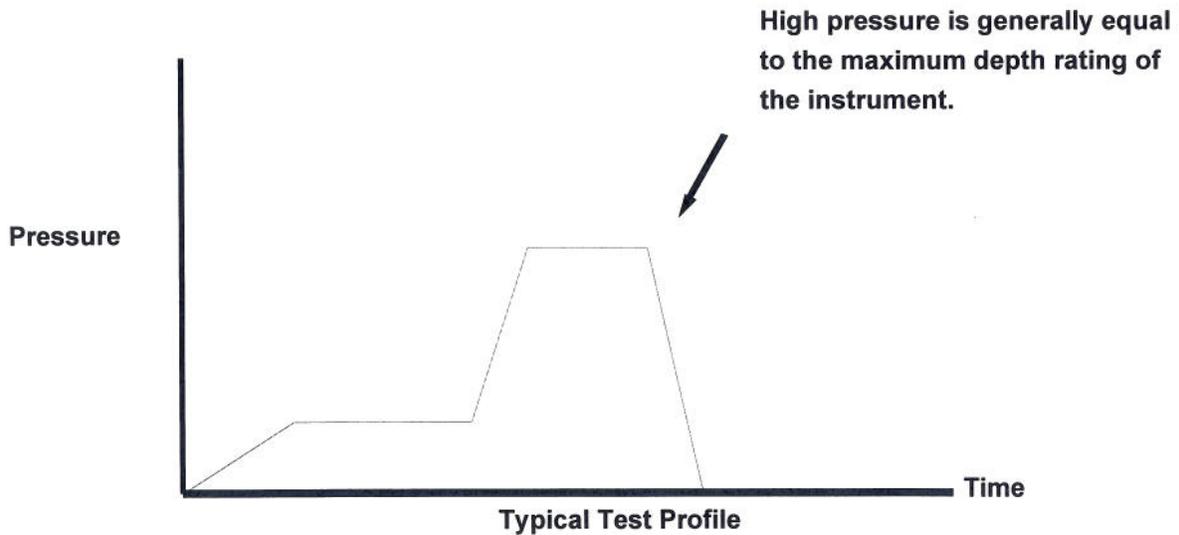
Time (Minutes) *N/A Minutes

Pass

Fail

Comments

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



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1808 136th Place NE
Bellevue, WA 98005, USA
Tel: 425 643 9866; Fax: 425 643 9954

PACKING LIST

PACKING LIST NO.	54776R
DATE:	June 4, 2009
Order No.:	EM-3185

Bill To:
NOAA - Pacific Marine Center Pacific Marine Center 1801 Fairview Avenue East Seattle, WA 98102 USA Attn: Kaye Kinoshita / Richard Conway

Ship To:
WILL CALL Attn: Richard Conway Tel: 206 553 2844 Email: richard.conway@noaa.gov

QTY	DESCRIPTION
1 ea	Box 1 of 1: SBE 45 Thermosalinograph, SN 4540402-0149, Confirmed and Recertified
1 ea	Shipping Documents Envelope

RECEIVED

JUN 04 2009

BY: _____

SHIP DATE: June 4, 2009	ExWorks Factory (Bellevue, WA, USA)
SHIP VIA: WILL CALL	