

SEA-BIRD ELECTRONICS, INC.

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

PACKING LIST

PACKING LIST NO.	53262R
DATE:	February 16, 2009
Order No.:	EM-3160

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

Ship To:
WILL CALL Attn: Kaye Kinoshita Tel: 206 553 2844 Email: kaye.kinoshita@noaa.gov

QTY	DESCRIPTION
1 ea	Box 1 of 1 SBE 45 Thermosalinograph, SN 4545414-0194, Confirmed, Recertified and Calibrated
1 ea	Shipping Documents Envelope

RECEIVED

FEB 19 2009

BY: _____

SHIP DATE: February 16, 2009	ExWorks	Factory (Bellevue, WA, USA)
SHIP VIA: WILL CALL		



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

53262

Customer Information:

Company Pacific Marine Center / NOAA Date 2/4/2009

Contact Kaye Kinoshita

PO Number EM-3160

Serial Number 4545414-0194
Model Number SBE 45

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 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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Conductivity Calibration Report

Customer:	Pacific Marine Center / NOAA		
Job Number:	53262	Date of Report:	1/26/2009
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:

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

SENSOR SERIAL NUMBER: 0194
CALIBRATION DATE: 24-Jan-09

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

COEFFICIENTS:

g = -1.010311e+000
h = 1.388980e-001
i = -8.603361e-005
j = 2.683235e-005

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

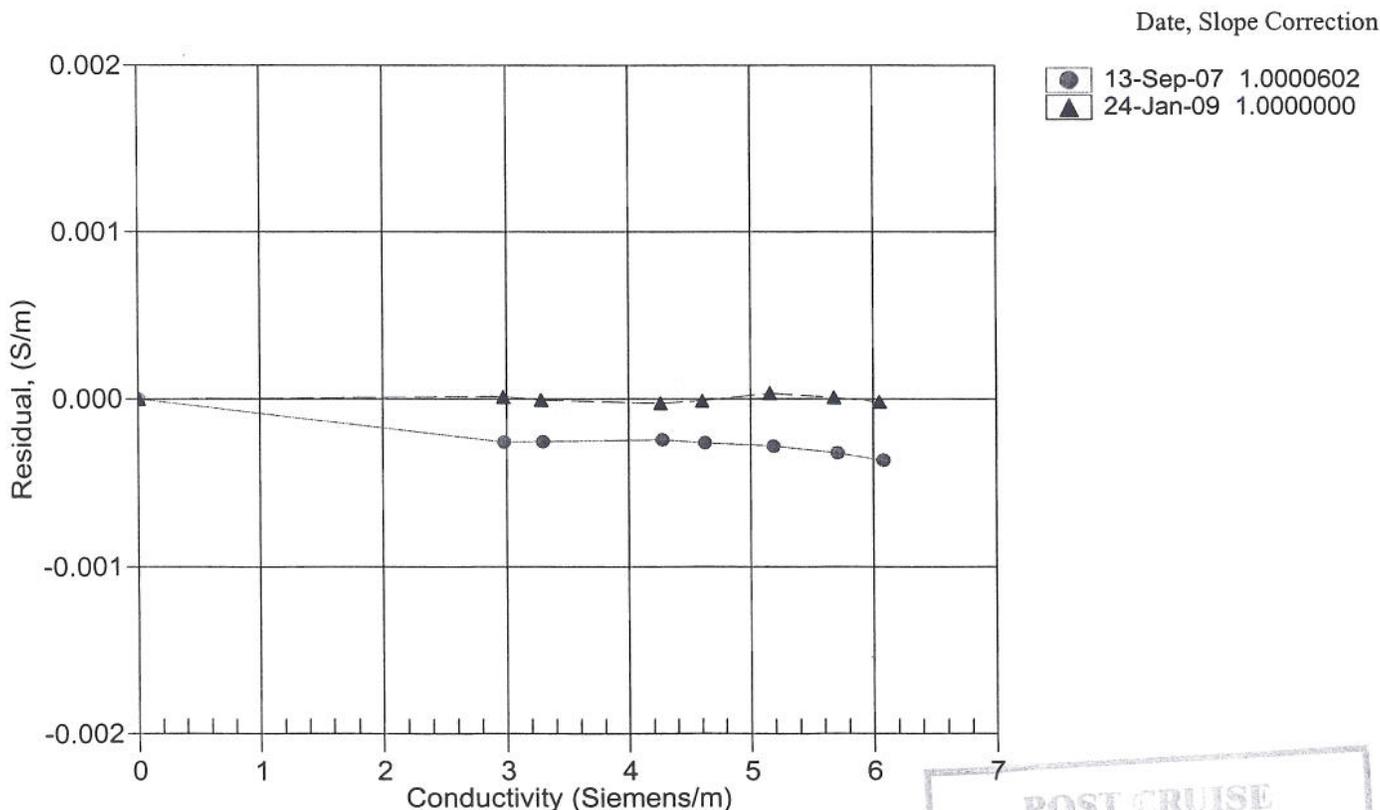
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2697.69	0.00000	0.00000
0.9999	34.7256	2.96894	5346.59	2.96896	0.00001
4.5000	34.7058	3.27532	5547.90	3.27532	-0.00001
15.0000	34.6634	4.25484	6146.75	4.25481	-0.00003
18.4999	34.6538	4.59912	6343.59	4.59911	-0.00001
24.0000	34.6428	5.15566	6649.21	5.15570	0.00003
29.0000	34.6363	5.67615	6922.52	5.67616	0.00001
32.5001	34.6321	6.04750	7110.93	6.04749	-0.00002

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

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

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

Residual = instrument conductivity - bath conductivity



POST CRUISE
CALIBRATION



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Temperature Calibration Report

Customer:	Pacific Marine Center / NOAA		
Job Number:	53262	Date of Report:	1/26/2009
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:

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: 0194
CALIBRATION DATE: 24-Jan-09

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

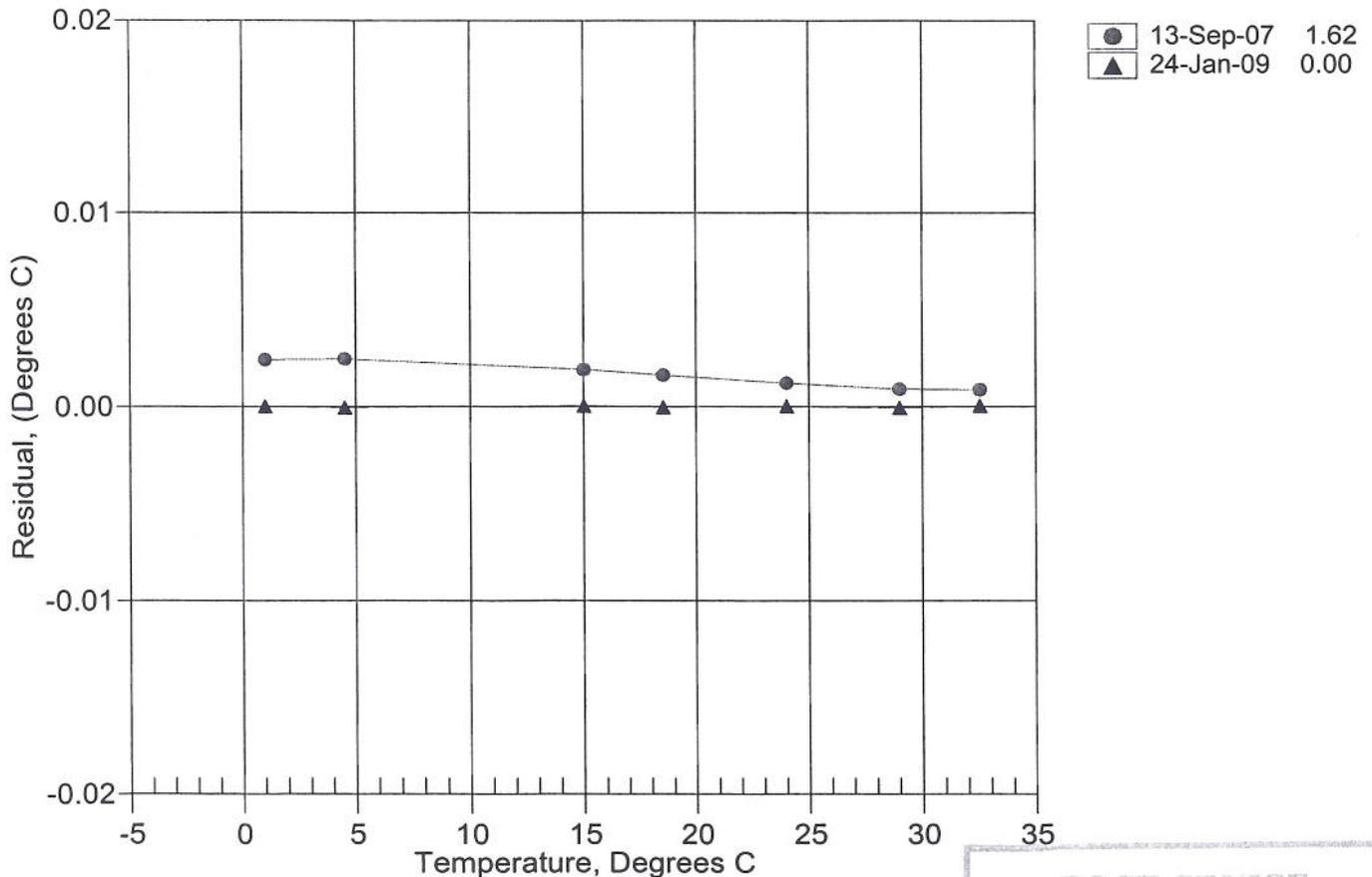
a0 = -6.714572e-006
a1 = 2.799581e-004
a2 = -2.707388e-006
a3 = 1.670713e-007

BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	631892.5	0.9999	0.0000
4.5000	541099.5	4.5000	-0.0000
15.0000	346322.8	15.0000	0.0000
18.4999	300277.7	18.4999	-0.0000
24.0000	241368.2	24.0000	0.0000
29.0000	199087.5	28.9999	-0.0001
32.5001	174543.6	32.5001	0.0000

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)



POST CRUISE
CALIBRATION

SBE
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SEABIRD ELECTRONICS, INC.
Bellevue, Washington, USA

Model No.

45

Part No.

4545414

Serial No.

4545414--0194

Made in U.S.A.

THERMOSALINOGRAPH

NOAA Ship Okeanos Explorer
NOAA / EEB
1801 Fairview Ave E
Seattle, WA 98102

Heat shrink