

SBE 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

56902

Customer Information:

Company Atlantic Marine Center

Date 12/22/2009

Contact Eric Thompson

PO Number Credit card

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

SENSOR SERIAL NUMBER: 0194
CALIBRATION DATE: 03-Dec-09

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = -1.961570e-005
a1 = 2.826649e-004
a2 = -2.893762e-006
a3 = 1.712699e-007

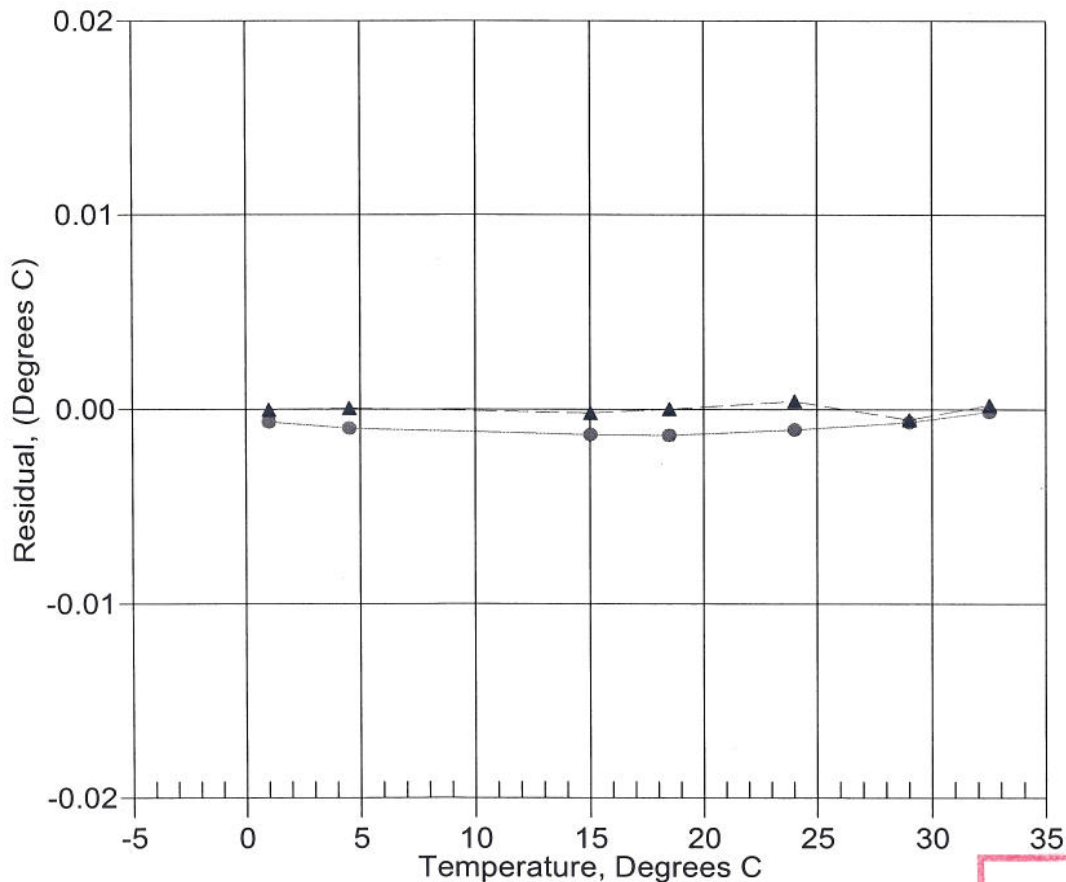
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	631872.2	1.0000	-0.0000
4.4999	541077.1	4.5000	0.0001
15.0000	346306.6	14.9998	-0.0002
18.4999	300261.3	18.4999	0.0000
23.9999	241355.3	24.0003	0.0004
28.9999	199087.2	28.9994	-0.0005
32.5000	174542.0	32.5002	0.0002

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)

● 24-Jan-09 -0.87
▲ 03-Dec-09 -0.00



**POST CRUISE
CALIBRATION**



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Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	56902	Date of Report:	12/3/2009
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: 12/3/2009

Drift since last cal: +0.00101 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: 03-Dec-09

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

COEFFICIENTS:

$g = -1.015102e+000$
 $h = 1.398393e-001$
 $i = -3.131007e-004$
 $j = 4.088811e-005$

$CP_{cor} = -9.5700e-008$
 $CT_{cor} = 3.2500e-006$
 $WBOTC = -1.1460e-005$

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	2699.89	0.00000	0.00000
1.0000	34.9774	2.98842	5360.35	2.98843	0.00001
4.4999	34.9549	3.29650	5562.37	3.29651	0.00001
15.0000	34.9094	4.28182	6163.50	4.28179	-0.00003
18.4999	34.8994	4.62819	6361.09	4.62815	-0.00004
23.9999	34.8875	5.18803	6667.87	5.18810	0.00007
28.9999	34.8790	5.71142	6942.03	5.71144	0.00002
32.5000	34.8725	6.08468	7130.94	6.08465	-0.00003

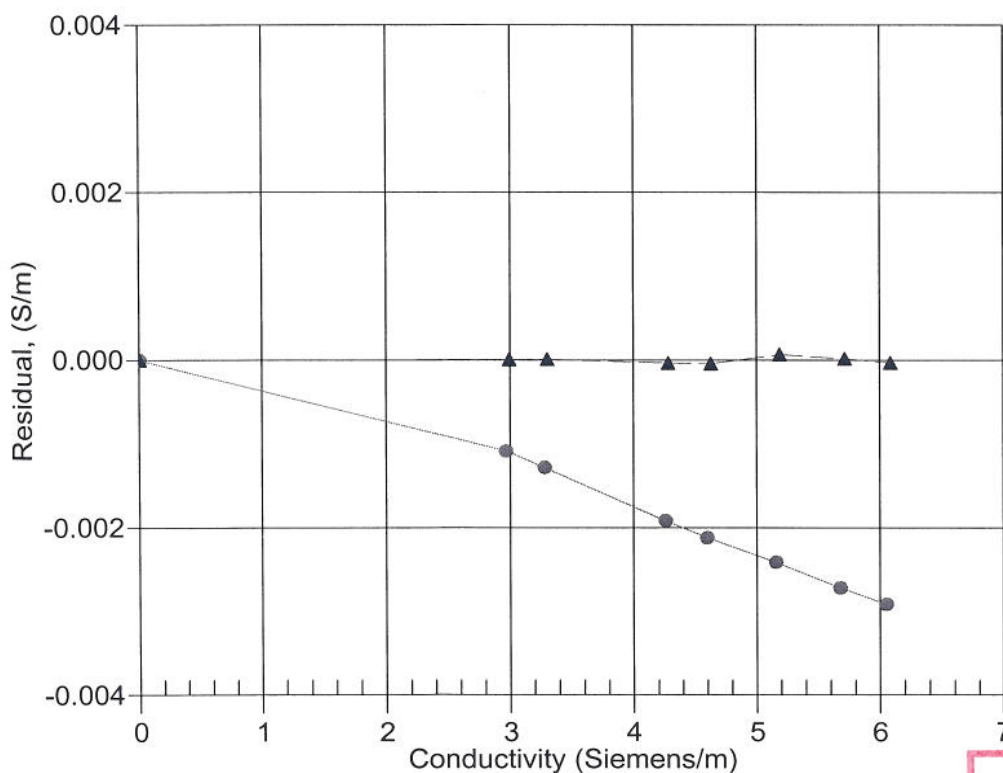
$$f = \text{INST FREQ} * \sqrt{1.0 + \text{WBOTC} * t} / 1000.0$$

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

$$t = \text{temperature}[^{\circ}\text{C}]; p = \text{pressure}[\text{decibars}]; \delta = CT_{cor}; \epsilon = CP_{cor};$$

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

Date, Slope Correction



● 24-Jan-09 1.0004597
▲ 03-Dec-09 1.0000000

**POST CRUISE
CALIBRATION**



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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	56902	Date of Report:	12/3/2009
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: 12/3/2009

Drift since last cal: +0.00130 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 Atlantic Marine Center

Job Number 56902

Date 12/9/2009

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.

*The unit is not designed for high pressure applications.

