

SEA-BIRD ELECTRONICS, INC.

13431 NE 20th Street, Bellevue, Washington, 98005-2010 USA

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

SENSOR SERIAL NUMBER: 0906
CALIBRATION DATE: 08-Oct-10

SBE9plus PRESSURE CALIBRATION DATA
10000 psia S/N 107068

DIGIQUARTZ COEFFICIENTS:

C1 = -4.580614e+004
C2 = -3.898443e-001
C3 = 1.330500e-002
D1 = 3.298900e-002
D2 = 0.000000e+000
T1 = 3.025149e+001
T2 = -4.453719e-004
T3 = 3.330120e-006
T4 = 6.106350e-009
T5 = 0.000000e+000

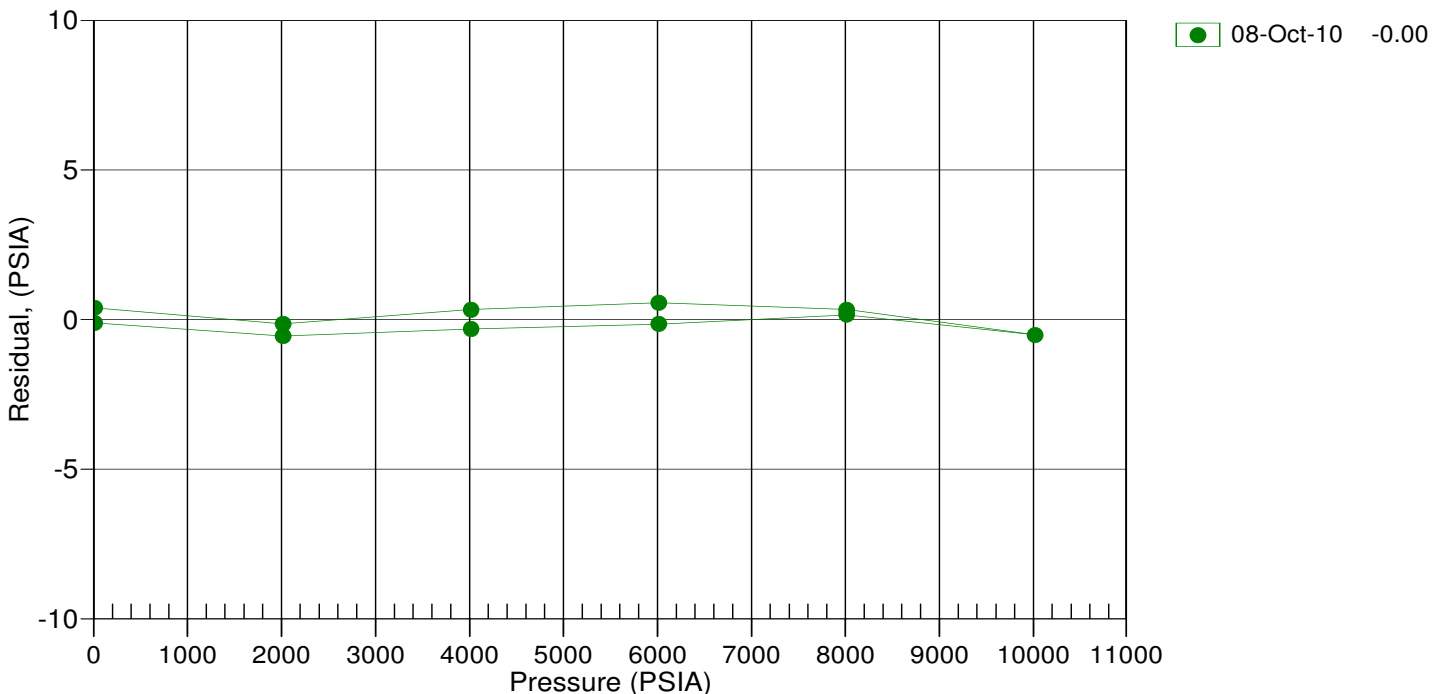
AD590M, AD590B, SLOPE AND OFFSET:

AD590M = 1.26215e-002
AD590B = -8.82208e+000
Slope = 0.99996
Offset = -1.8044 (dbars)

PRESSURE (PSIA)	INST OUTPUT(Hz)	INST TEMP(C)	INST OUTPUT (PSIA)	CORRECTED INST OUTPUT (PSIA)	RESIDUAL (PSIA)
14.649	33071.01	21.1	17.157	14.539	-0.110
2014.985	33783.95	21.2	2017.130	2014.438	-0.547
4015.016	34480.29	21.2	4017.467	4014.699	-0.317
6014.921	35160.86	21.2	6017.612	6014.769	-0.152
8014.946	35826.72	21.2	8018.023	8015.105	0.159
10014.920	36478.28	21.3	10017.400	10014.406	-0.514
8014.654	35826.69	21.3	8017.912	8014.993	0.339
6014.675	35161.03	21.3	6018.080	6015.237	0.562
4014.738	34480.45	21.3	4017.843	4015.075	0.338
2014.833	33784.07	21.3	2017.377	2014.684	-0.148
14.642	33071.24	21.3	17.648	15.031	0.390

Residual = corrected instrument pressure - reference pressure

Date, Avg Offset (psia)





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Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	61468	Date of Report:	10/7/2010
Model Number:	SBE 03P	Serial Number:	03P5026

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

SENSOR SERIAL NUMBER: 5026
CALIBRATION DATE: 07-Oct-10

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.33089545e-003
h = 6.33783306e-004
i = 2.09813150e-005
j = 1.86226659e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.68121206e-003
b = 5.95763477e-004
c = 1.50933091e-005
d = 1.86367578e-006
f0 = 2882.664

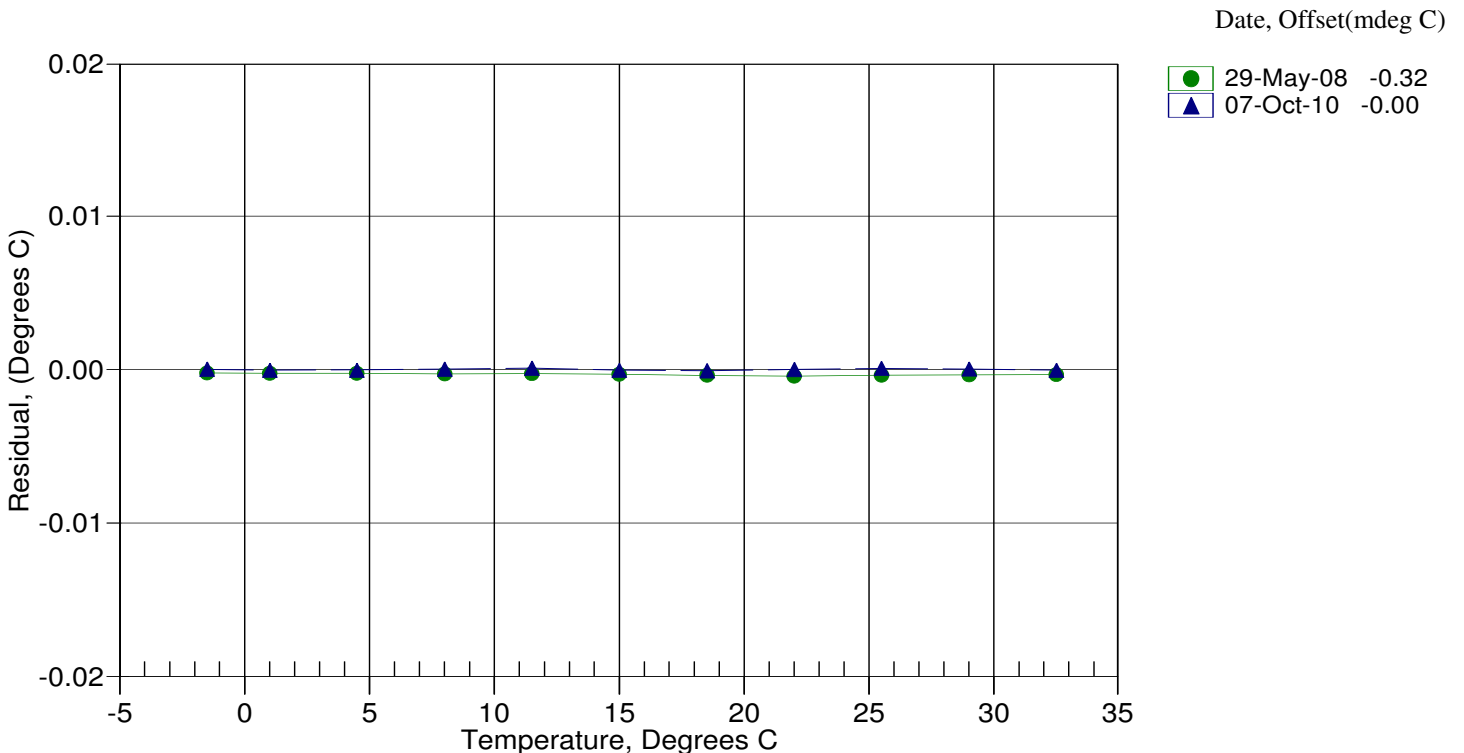
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	2882.664	-1.5000	0.00002
1.0000	3050.038	1.0000	-0.00003
4.5001	3296.043	4.5001	-0.00002
8.0000	3556.005	8.0000	0.00003
11.5000	3830.330	11.5001	0.00008
15.0001	4119.379	15.0001	-0.00004
18.5001	4423.520	18.5000	-0.00009
22.0001	4743.123	22.0001	-0.00000
25.5001	5078.515	25.5002	0.00006
29.0001	5430.021	29.0001	0.00003
32.5001	5797.962	32.5001	-0.00003

Temperature ITS-90 = $1 / \{g + h[\ln(f_0/f)] + i[\ln^2(f_0/f)] + j[\ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature IPTS-68 = $1 / \{a + b[\ln(f_0/f)] + c[\ln^2(f_0/f)] + d[\ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be $1.00024 * T_{90}$ (-2 to 35 °C)

Residual = instrument temperature - bath temperature





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Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	61468	Date of Report:	10/7/2010
Model Number:	SBE 03P	Serial Number:	03P5023

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: 5023
CALIBRATION DATE: 07-Oct-10

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.39256402e-003
h = 6.38948462e-004
i = 2.20884900e-005
j = 2.01978171e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.68121205e-003
b = 5.96165860e-004
c = 1.51195858e-005
d = 2.02121523e-006
f0 = 3172.564

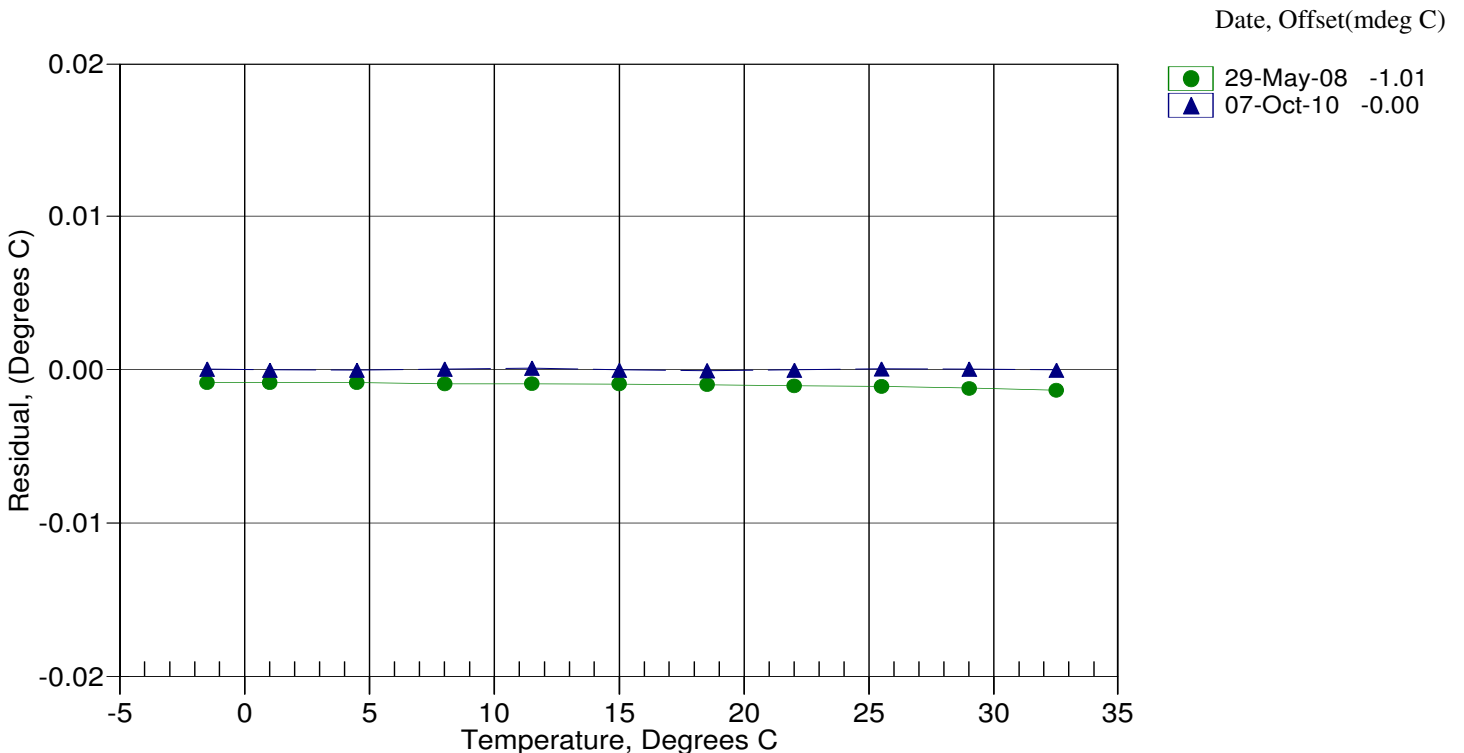
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	3172.564	-1.5000	0.00002
1.0000	3356.643	1.0000	-0.00002
4.5001	3627.184	4.5001	-0.00003
8.0000	3913.058	8.0000	0.00002
11.5000	4214.703	11.5001	0.00008
15.0001	4532.513	15.0001	-0.00002
18.5001	4866.881	18.5000	-0.00009
22.0001	5218.211	22.0001	-0.00001
25.5001	5586.858	25.5002	0.00005
29.0001	5973.168	29.0001	0.00002
32.5001	6377.490	32.5001	-0.00002

Temperature ITS-90 = $1/\{g + h[\ln(f_0/f)] + i[\ln^2(f_0/f)] + j[\ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature IPTS-68 = $1/\{a + b[\ln(f_0/f)] + c[\ln^2(f_0/f)] + d[\ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be $1.00024 * T_{90}$ (-2 to 35 °C)

Residual = instrument temperature - bath temperature





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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	61468	Date of Report:	10/21/2010
Model Number:	SBE 04	Serial Number:	043456

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: 10/6/2010 Drift since last cal: -0.00060 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' Performed Not Performed

Date: 10/21/2010 Drift since 03 Jun 08 +0.00060 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: 3456
CALIBRATION DATE: 06-Oct-10

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

GHIJ COEFFICIENTS

g = -9.96454007e+000
h = 1.51930592e+000
i = -2.90432419e-003
j = 3.18746543e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 3.39596875e-007
b = 1.51159775e+000
c = -9.94912940e+000
d = -8.44186659e-005
m = 6.6
CPcor = -9.5700e-008 (nominal)

BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.56550	0.00000	0.00000
-1.0000	34.8742	2.80880	5.01543	2.80882	0.00002
1.0000	34.8748	2.98049	5.12726	2.98049	-0.00000
15.0000	34.8753	4.27808	5.90393	4.27804	-0.00004
18.5000	34.8750	4.62531	6.09486	4.62531	-0.00001
29.0000	34.8738	5.71067	6.65599	5.71078	0.00010
32.5001	34.8684	6.08406	6.83812	6.08399	-0.00007

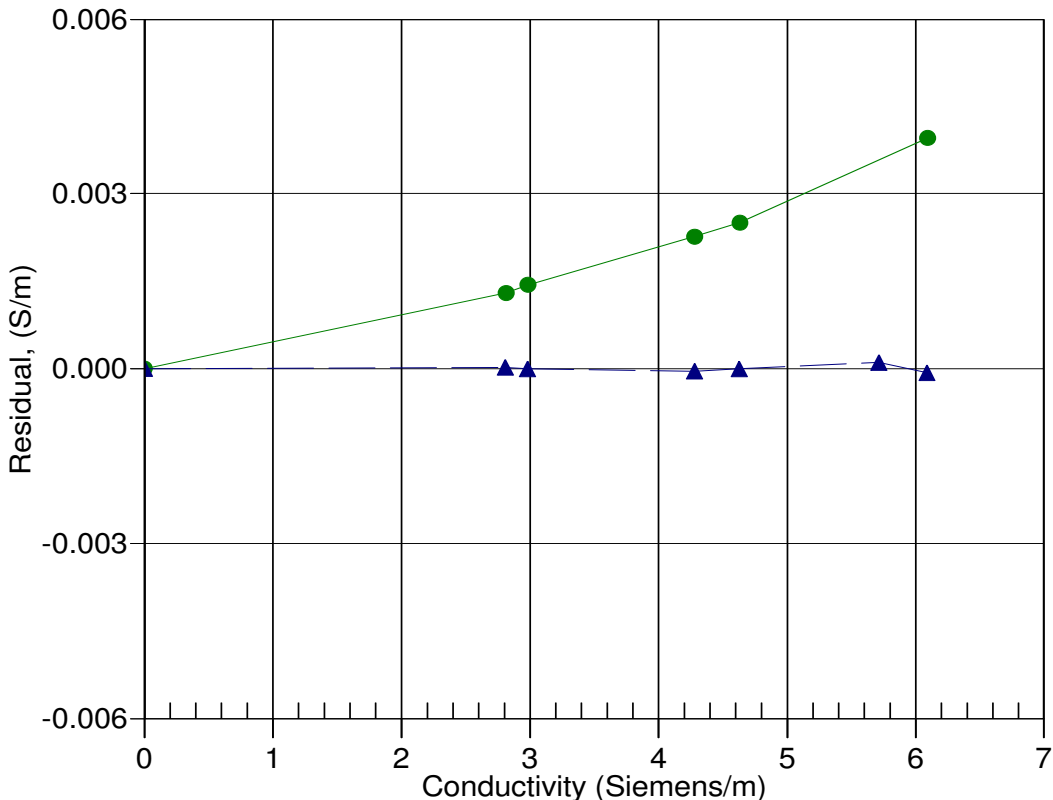
Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 + \epsilon p)]$ Siemens/meter

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

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients

Date, Slope Correction



● 03-Jun-08 0.9994316
▲ 06-Oct-10 1.0000000

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SENSOR SERIAL NUMBER: 3456
CALIBRATION DATE: 21-Oct-10

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

GHIJ COEFFICIENTS

g = -9.94593539e+000
h = 1.51466957e+000
i = -1.93533528e-003
j = 2.33088179e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 1.91360253e-006
b = 1.50969118e+000
c = -9.93595371e+000
d = -8.00345676e-005
m = 5.7
CPcor = -9.5700e-008 (nominal)

BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.56541	0.00000	0.00000
-1.0000	34.9209	2.81221	5.01964	2.81221	-0.00000
1.0000	34.9216	2.98411	5.13165	2.98411	0.00001
15.0000	34.9225	4.28326	5.90950	4.28325	-0.00001
18.5000	34.9219	4.63086	6.10071	4.63087	0.00001
29.0000	34.9207	5.71749	6.66274	5.71749	0.00000
32.5000	34.9159	6.09139	6.84533	6.09139	-0.00000

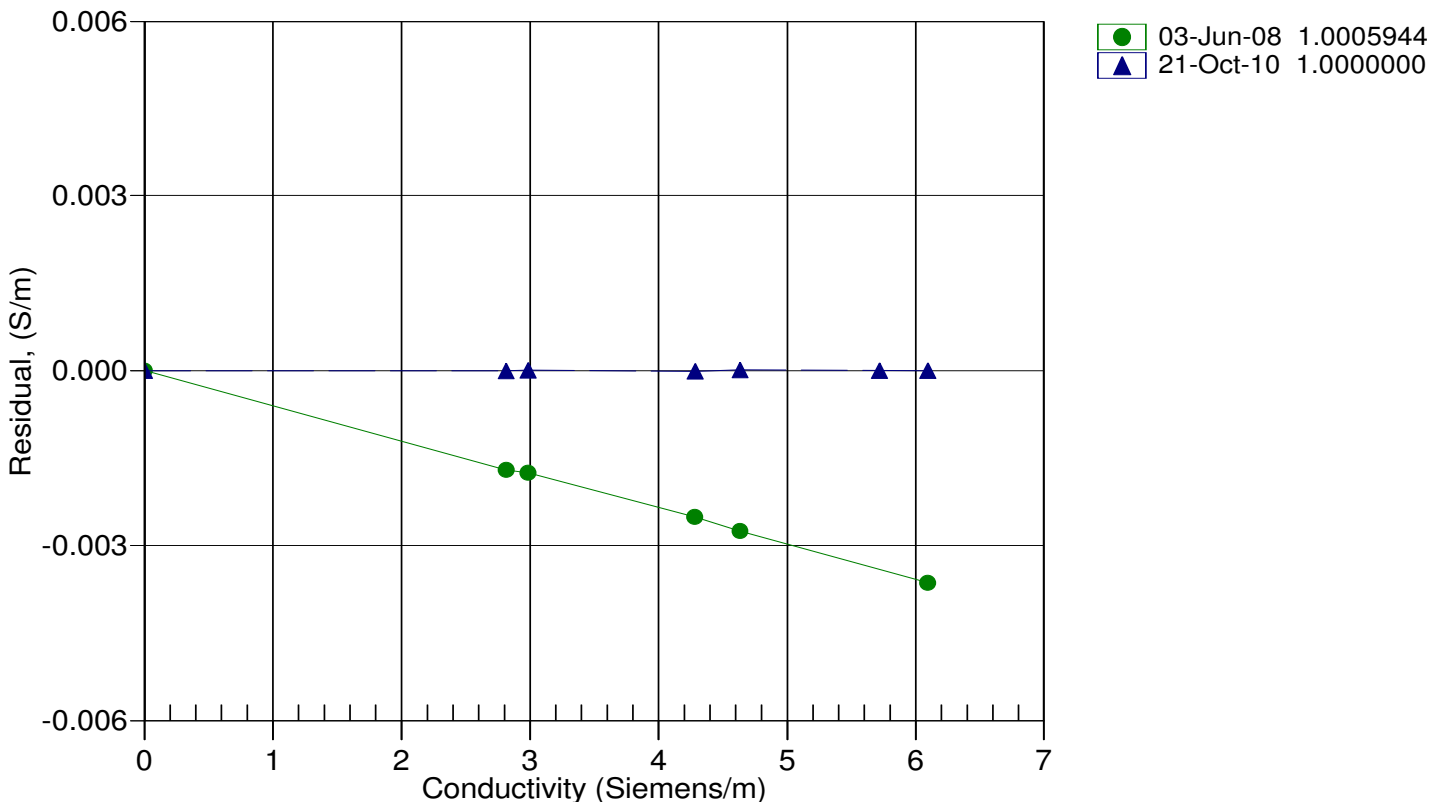
Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 + \epsilon p)]$ Siemens/meter

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

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients

Date, Slope Correction





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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	61468	Date of Report:	10/21/2010
Model Number:	SBE 04	Serial Number:	043455

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: 10/6/2010 Drift since last cal: -0.00100 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' Performed Not Performed

Date: 10/21/2010 Drift since 03 Jun 08 +0.00030 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: 3455
CALIBRATION DATE: 06-Oct-10

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

GHIJ COEFFICIENTS

g = -1.01015541e+001
h = 1.56359240e+000
i = -2.75154266e-003
j = 3.27472528e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 1.42702337e-006
b = 1.55660940e+000
c = -1.00882224e+001
d = -8.32159161e-005
m = 6.0
CPcor = -9.5700e-008 (nominal)

BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.54572	0.00000	0.00000
-1.0000	34.8742	2.80880	4.95097	2.80883	0.00002
1.0000	34.8748	2.98049	5.06093	2.98049	-0.00000
15.0000	34.8753	4.27808	5.82484	4.27804	-0.00005
18.5000	34.8750	4.62531	6.01268	4.62531	-0.00001
29.0000	34.8738	5.71067	6.56478	5.71079	0.00011
32.5001	34.8684	6.08406	6.74399	6.08398	-0.00008

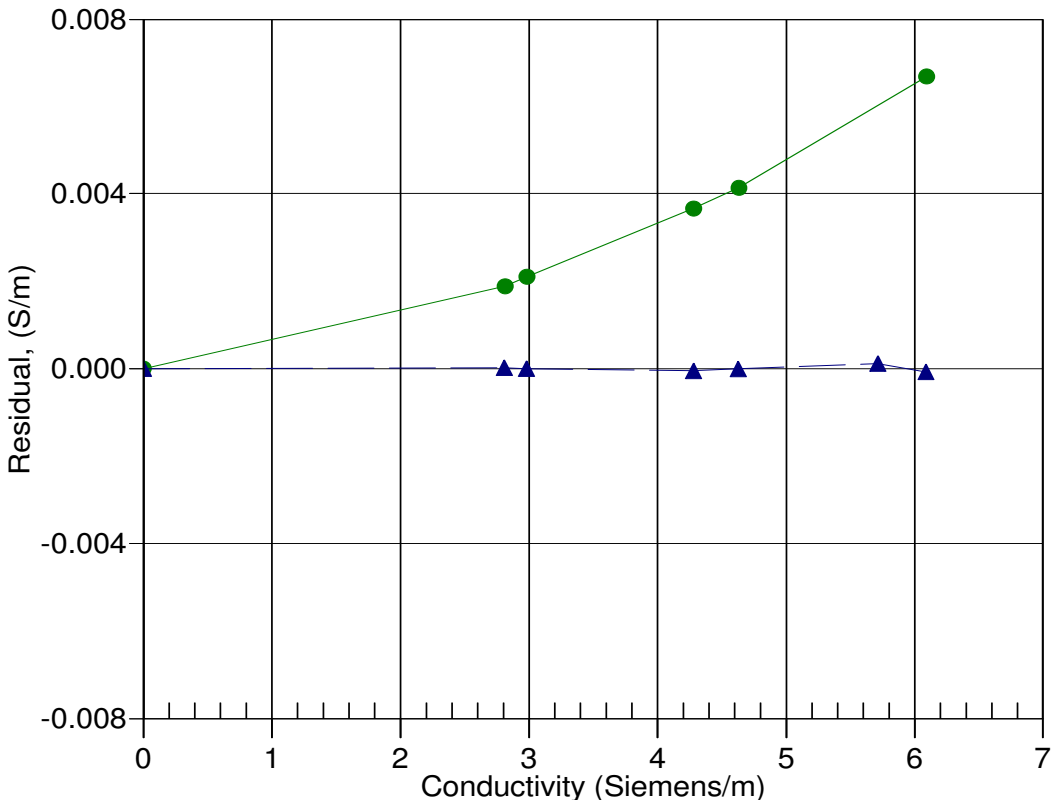
Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 + \epsilon p)]$ Siemens/meter

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

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients

Date, Slope Correction



● 03-Jun-08 0.9990719
▲ 06-Oct-10 1.0000000

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

SENSOR SERIAL NUMBER: 3455
CALIBRATION DATE: 21-Oct-10

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

GHIJ COEFFICIENTS

g = -1.00890875e+001
h = 1.56057637e+000
i = -2.07284857e-003
j = 2.45573797e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 1.28587841e-006
b = 1.55525825e+000
c = -1.00786422e+001
d = -8.09129834e-005
m = 5.9
CPcor = -9.5700e-008 (nominal)

BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.54564	0.00000	0.00000
-1.0000	34.9209	2.81221	4.95500	2.81221	-0.00000
1.0000	34.9216	2.98411	5.06517	2.98411	0.00000
15.0000	34.9225	4.28326	5.83046	4.28325	-0.00001
18.5000	34.9219	4.63086	6.01864	4.63087	0.00001
29.0000	34.9207	5.71749	6.57183	5.71749	0.00000
32.5000	34.9159	6.09139	6.75158	6.09139	-0.00000

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 + \epsilon p)]$ Siemens/meter

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

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients

Date, Slope Correction

