



SEA-BIRD ELECTRONICS, INC.

13431 NE 20th St. Bellevue, Washington 98005 USA

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

Service	RMA Number	88183
Report		

Customer Information:

Company	WEBB RESEARCH CORPORATION	Date	3/14/2016
Contact	CHARLES STILL		
PO Number	TBD		

Serial Number	SLOCUM-9158
Model Number	SLOCUM

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. Calibrated the pressure sensor.
3. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
4. installed NEW AF24173 Anti-foulant cylinder(s).
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

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SENSOR SERIAL NUMBER: 9158
CALIBRATION DATE: 13-Feb-16

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

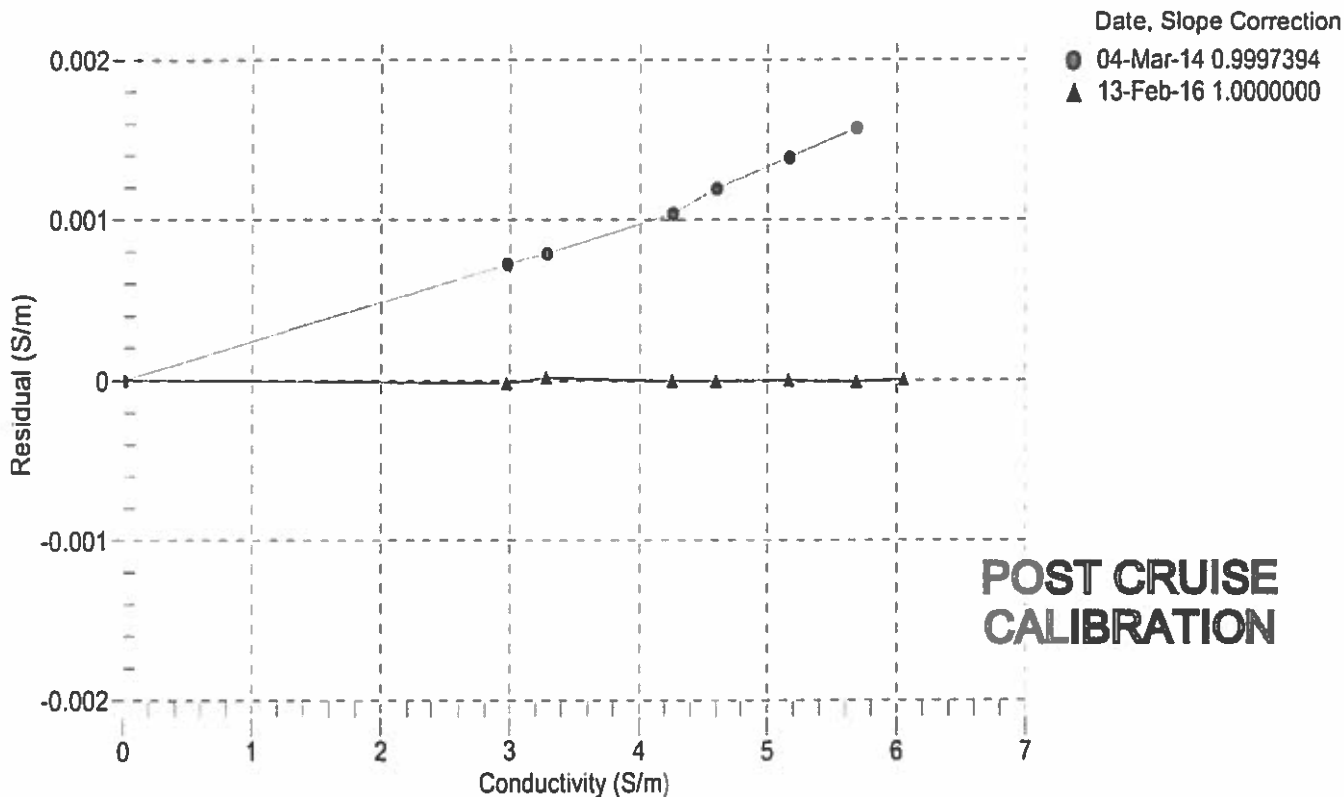
COEFFICIENTS:

g = -9.952092e-001
h = 1.297147e-001
i = -3.778080e-004
j = 4.458220e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006
WBOTC = 3.0001e-008

BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
22.0000	0.0000	0.00000	2777.45	0.00000	0.00000
1.0000	34.7632	2.97186	5545.69	2.97184	-0.00002
4.5000	34.7432	3.27851	5755.49	3.27853	0.00002
15.0000	34.7008	4.25894	6379.18	4.25894	-0.00000
18.5000	34.6919	4.60364	6584.10	4.60364	-0.00000
23.9999	34.6824	5.16090	6902.14	5.16090	0.00000
29.0000	34.6774	5.68212	7186.47	5.68212	-0.00001
32.5000	34.6747	6.05408	7382.45	6.05409	0.00001

f = Instrument Output(Hz) * sqrt(1.0 + WBOTC * t) / 1000.0
t = temperature (°C); p = pressure (decibars); δ = CTcor; ε = CPcor;
Conductivity (S/m) = (g + h * f + i * f² + j * f³) / 10 (1 + δ * t + ε * p)
Residual (Siemens/meter) = instrument conductivity - bath conductivity





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Conductivity Calibration Report

Customer:	WEBB RESEARCH CORPORATION		
Job Number:	88183	Date of Report:	2/18/2016
Model Number	SLOCUM	Serial Number:	SLOCUM-9158

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:

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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SENSOR SERIAL NUMBER: 9158
 CALIBRATION DATE: 13-Feb-16

Slocum Payload CTD TEMPERATURE CALIBRATION DATA
 ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

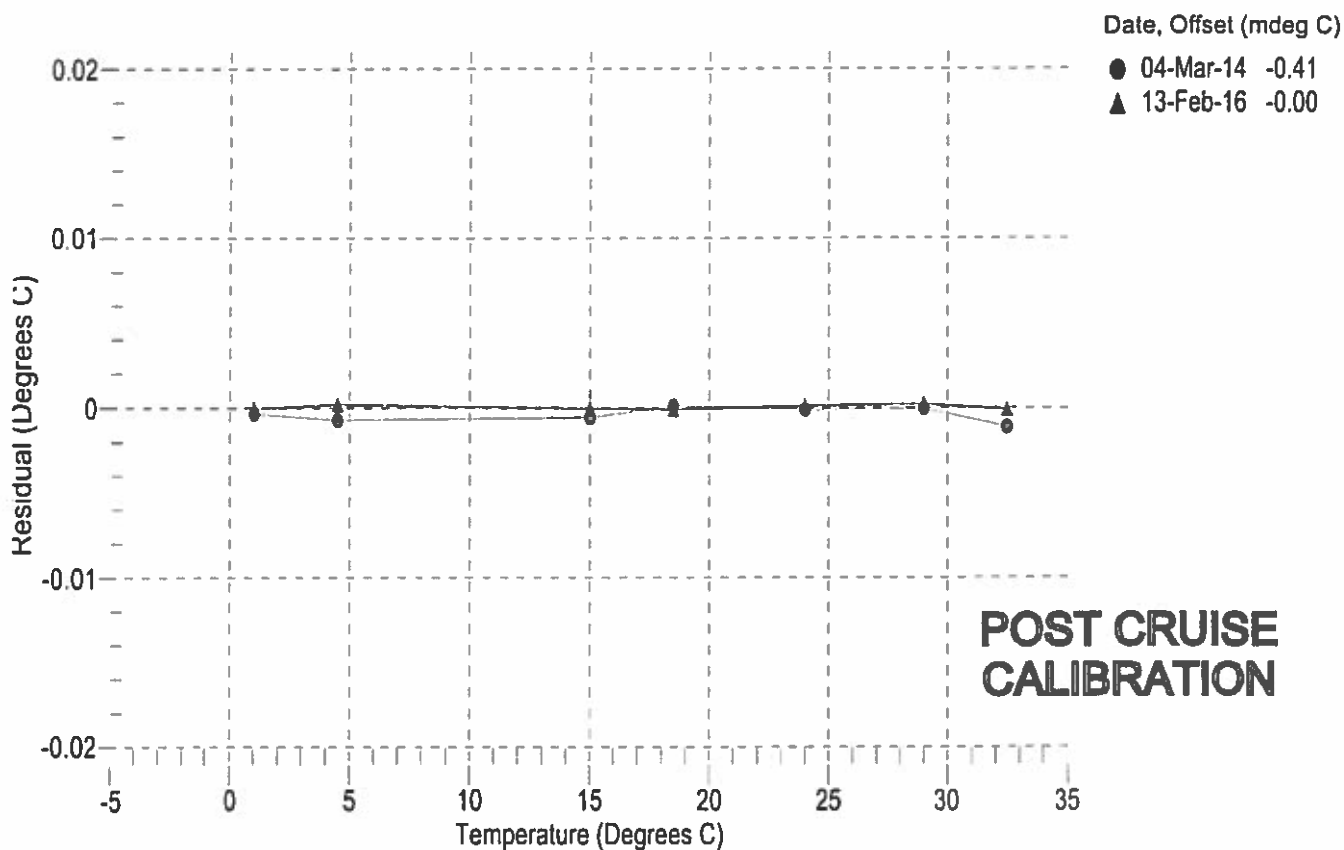
a0 = -5.188342e-005
 a1 = 2.934738e-004
 a2 = -3.359536e-006
 a3 = 1.726583e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	566467.4	0.9999	-0.0001
4.5000	484658.6	4.5002	0.0002
15.0000	309574.6	14.9999	-0.0001
18.5000	268276.8	18.4999	-0.0001
23.9999	215504.2	24.0000	0.0001
29.0000	177673.2	29.0002	0.0002
32.5000	155736.2	32.4999	-0.0001

n = Instrument Output (counts)

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

Residual (°C) = instrument temperature - bath temperature





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Temperature Calibration Report

Customer:	WEBB RESEARCH CORPORATION		
Job Number:	88183	Date of Report:	2/18/2016
Model Number	SLOCUM	Serial Number:	SLOCUM-9158

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:

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: 9158
CALIBRATION DATE: 12-Feb-16

Slocum Payload CTD PRESSURE CALIBRATION DATA
1450 psia S/N 4101192

COEFFICIENTS:

PA0 =	6.325860e-002	PTCA0 =	5.245714e+005
PA1 =	4.502212e-003	PTCA1 =	-4.334875e-002
PA2 =	-1.417957e-011	PTCA2 =	2.698609e-002
PTEMPA0 =	-6.983027e+001	PTCB0 =	2.495337e+001
PTEMPA1 =	5.145120e-002	PTCB1 =	-9.250000e-004
PTEMPA2 =	-6.148914e-007	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)	TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
14.63	527821.0	1821.0	14.65	0.00	32.50	2038	527909.00
314.89	594452.0	1824.0	314.81	-0.01	29.00	1967	527906.60
614.90	661072.0	1824.0	614.80	-0.01	24.00	1865	527901.00
914.91	727719.0	1825.0	914.78	-0.01	18.50	1754	527890.80
1214.90	794416.0	1825.0	1214.86	-0.00	15.00	1682	527887.40
1464.84	849994.0	1826.0	1464.83	-0.00	4.50	1470	527885.00
1214.83	794422.0	1825.0	1214.89	0.00	1.00	1400	527883.60
914.77	727741.0	1825.0	914.88	0.01			
614.76	661088.0	1825.0	614.87	0.01			
314.82	594465.0	1825.0	314.87	0.00	TEMPERATURE (°C)	SPAN (mV)	
14.65	527819.0	1825.0	14.64	-0.00	-5.00	24.96	
					35.00	24.92	

THERMAL CORRECTION

y = thermistor output (counts)

$$t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$$

$$x = \text{instrument output} - PTCA0 - PTCA1 * t - PTCA2 * t^2$$

$$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$$

$$\text{pressure (PSIA)} = PA0 + PA1 * n + PA2 * n^2$$

$$\text{Residual (\%FSR)} = (\text{computed pressure} - \text{true pressure}) * 100 / \text{Full Scale Range}$$

Date, Offset (%FSR)

● 12-Feb-16 0.00

