

# Sea-Bird Electronics, Inc.

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

Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 9029  
CALIBRATION DATE: 29-Apr-16

Slocum Payload CTD PRESSURE CALIBRATION DATA  
1450 psia S/N 3701173

**COEFFICIENTS:**

PA0 =	3.407070e-001	PTCA0 =	5.247141e+005
PA1 =	4.624748e-003	PTCA1 =	1.069736e+000
PA2 =	-1.653960e-011	PTCA2 =	8.874616e-002
PTEMPA0 =	-7.083113e+001	PTCB0 =	2.545125e+001
PTEMPA1 =	5.215091e-002	PTCB1 =	-3.550000e-003
PTEMPA2 =	-6.251518e-007	PTCB2 =	0.000000e+000

**PRESSURE SPAN CALIBRATION**

**THERMAL CORRECTION**

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)	TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
14.65	527863.0	1841.0	14.62	-0.00	12.50	2031	527958.00
314.87	592587.0	1842.0	314.84	-0.00	29.00	1960	527934.00
614.91	657275.0	1842.0	614.76	-0.01	24.00	1860	527907.20
914.89	722035.0	1843.0	914.87	-0.00	18.50	1750	527880.20
1214.98	786804.0	1844.0	1214.90	-0.01	15.00	1680	527864.00
1464.91	840800.0	1843.0	1464.90	-0.00	4.50	1470	527836.10
1214.88	786819.0	1843.0	1214.96	0.01	1.00	1401	527830.50
914.86	722051.0	1843.0	914.95	0.01			
614.81	657302.0	1841.0	614.88	0.00			
314.83	592596.0	1842.0	314.88	0.00			
14.56	527860.0	1842.0	14.60	0.00			

					TEMPERATURE (°C)	SPAN (mV)
					-5.00	25.47
					35.00	25.33

y = thermistor output (counts)

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

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

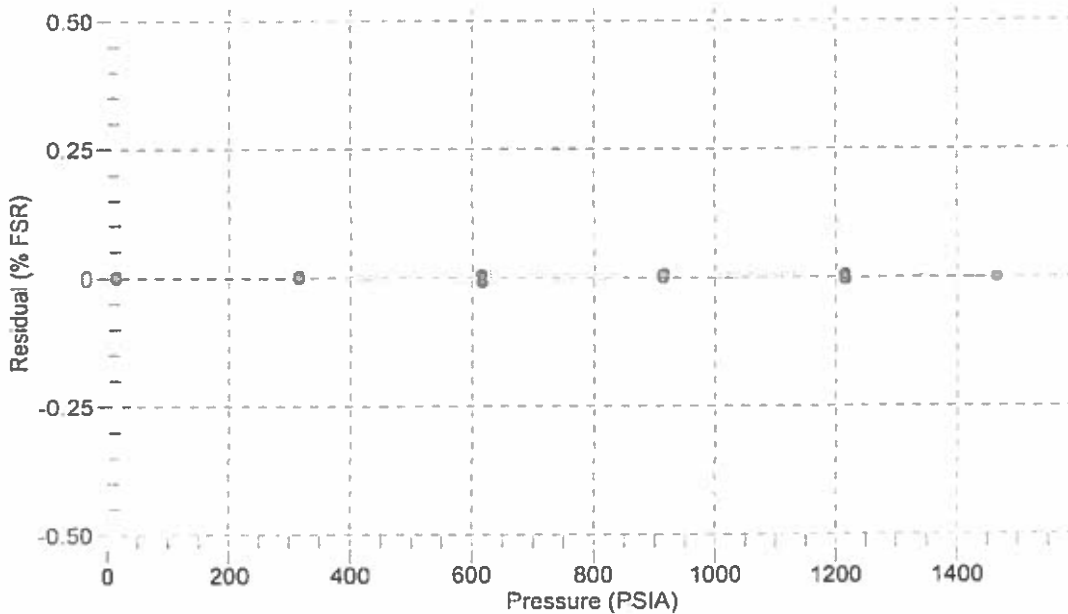
$$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$$

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

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

Date, Offset (%FSR)

● 29-Apr-16 0.00



# Sea-Bird Electronics, Inc.

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

Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 9029  
CALIBRATION DATE: 06-May-16

Slocum Payload CTD TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

### COEFFICIENTS:

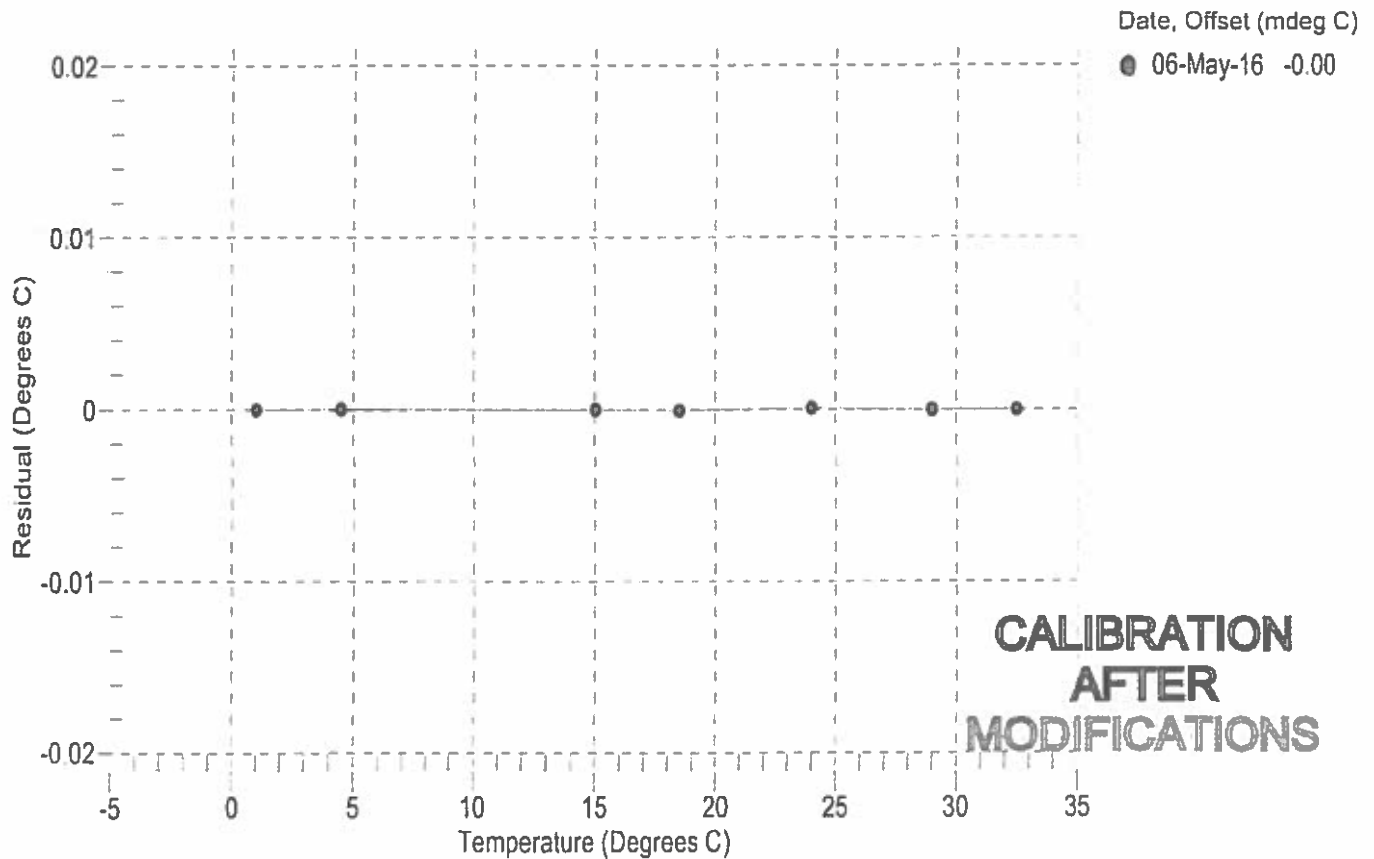
a0 = -1.345329e-004  
a1 = 3.113190e-004  
a2 = -4.743047e-006  
a3 = 2.078284e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	580609.3	1.0000	-0.0000
4.5000	496729.5	4.5000	0.0000
15.0000	317221.0	15.0000	-0.0000
18.5000	274887.3	18.4999	-0.0001
24.0000	220798.3	24.0001	0.0001
29.0000	182031.9	29.0000	-0.0000
32.5000	159552.2	32.5000	-0.0000

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



# Sea-Bird Electronics, Inc.

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

Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 9029  
CALIBRATION DATE: 06-May-16

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

**COEFFICIENTS:**

g = -9.881546e-001  
h = 1.437274e-001  
i = -1.813063e-004  
j = 3.409535e-005

CPcor = -9.5700e-008  
CTcor = 3.2500e-006  
WBOTC = -9.5261e-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	2624.26	0.00000	0.00000
1.0000	34.7071	2.96752	5246.38	2.96751	-0.00001
4.5000	34.6875	3.27377	5445.03	3.27378	0.00001
15.0000	34.6459	4.25292	6035.67	4.25291	-0.00001
18.5000	34.6371	4.59716	6229.78	4.59716	0.00001
24.0000	34.6273	5.15361	6531.07	5.15362	0.00001
29.0000	34.6221	5.67408	6800.47	5.67406	-0.00002
32.5000	34.6194	6.04553	6986.23	6.04554	0.00001

$f = \text{Instrument Output(Hz)} * \text{sqrt}(1.0 + \text{WBOTC} * t) / 1000.0$

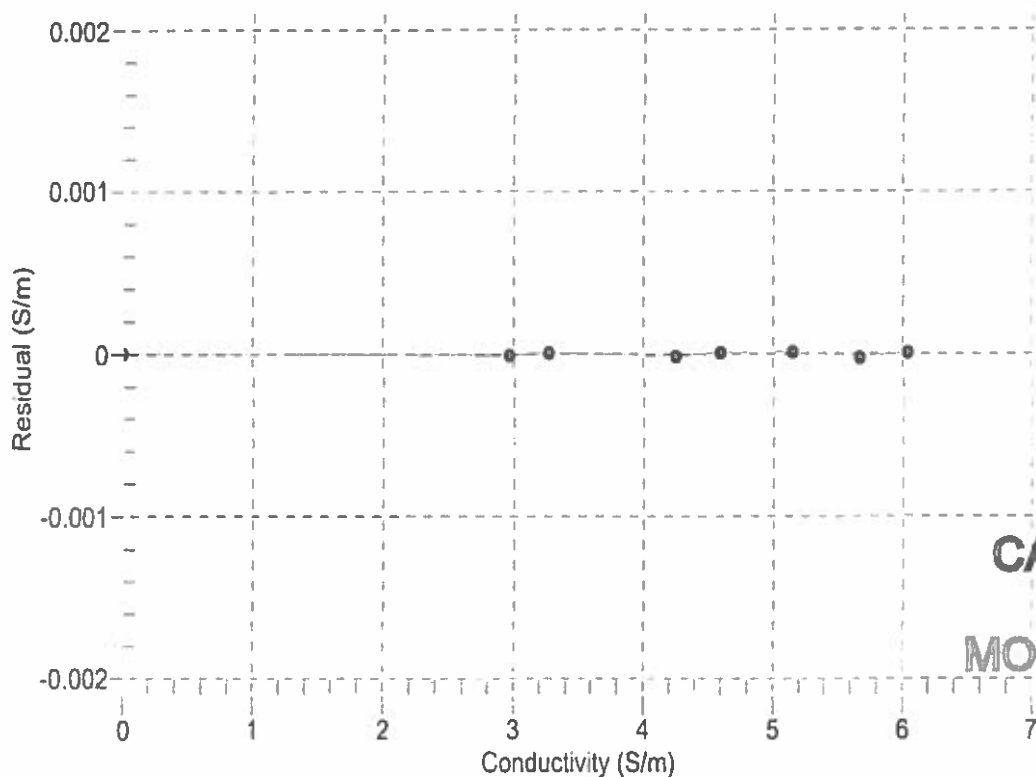
t = temperature (°C); p = pressure (decibars);  $\delta = \text{CTcor}$ ;  $\epsilon = \text{CPcor}$ ;

$\text{Conductivity (S/m)} = (g + h * f^2 + i * f^3 + j * f^4) / 10 (1 + \delta * t + \epsilon * p)$

$\text{Residual (Siemens/meter)} = \text{instrument conductivity} - \text{bath conductivity}$

Date, Slope Correction

● 06-May-16 1.0000000



**CALIBRATION  
AFTER  
MODIFICATIONS**

# SBE SEA-BIRD ELECTRONICS, INC.

13431 NE 20th St, Bellevue, Washington 98005 USA



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

<b>Service</b>
<b>Report</b>

<b>RMA Number</b>	89099
-------------------	-------

### Customer Information:

<b>Company</b>	WEBB RESEARCH CORPORATION	<b>Date</b>	5/10/2016
<b>Contact</b>	CHARLES STILL		
<b>PO Number</b>	PW04406		

<b>Serial Number</b>	SLOCUM-9029
<b>Model Number</b>	SLOCUM

### Services Requested:

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

### Problems Found:

1. The conductivity cell was found to be cracked and requires replacement.
2. The temperature probe was found to be bent and requires replacement.
3. The intake duct was found to be broken and requires replacement.
4. The TBT cover was found to be broken and requires replacement.

### Services Performed:

1. Performed initial diagnostic evaluation.
2. Installed NEW temperature probe assembly.
3. Replaced the conductivity cell.
4. Calibrated the pressure sensor.
5. Performed "Final" calibration of the temperature & conductivity sensors.
6. 233974.02: WEBB PAYLOAD CTD, INTAKE DUCT
7. 233975.01: WEBB PAYLOAD CTD, TBT COVER
8. Performed complete system check and full diagnostic evaluation.

### Special Notes:

--