



**Sea-Bird Electronics, Inc.**  
 13431 NE 20th Street  
 Bellevue, WA 98005 United States

Phone +1-425-643-9866  
 Fax +1-425-643-9954  
 www.seabird.com

**SERVICE REPORT**

**Service Request** 1005507782  
**Date** 11-JUN-2019  
**Sales Order** 315598587

**CUSTOMER INFORMATION**

Name: TELEDYNE WEBB RESEARCH  
 Account : 40280819  
 CHARLES STILL  
 CHARLES.STILL@TELEDYNE.COM  
 508-563-1000

PO Number:

**Bill To Address**  
 ATTN: ACCOUNTS PAYABLE;1026 N. Williamson Blvd.;  
 Daytona Beach,FL,32114,US

**Ship To Address**  
 BUSINESS UNIT OF TELEDYNE INSTRUMENT INC;49  
 EDGERTON DRIVE;  
 NORTH FALMOUTH,MA,02556,US

**PRODUCT INFORMATION**

**Item:** SLOCUM.LEGACY  
**Item Description:** (LEGACY) Slocum Glider  
**Serial:** 9014

**Special Notes**  
 Services Requested:  
 Evaluate/Repair Instrumentation.  
 Perform Routine Calibration Service.

**Problems Found:**  
 The lithium backup batteries had reached the end of their life expectancy.

**Services Performed:**  
 Perform initial diagnostic evaluation.  
 Performed pressure calibration.  
 Performed "POST" cruise calibration.  
 Replaced the lithium back-up battery(s).  
 Installed NEW AF24173 Anti-foulant cylinder(s).

Item	Item Description	Qty
CAL_SLOCUM	Calibrate SLOCUM conductivity and temperature sensors	1
CNCRTSLOCUM	Confirm & Re-certify Webb SLOCUM Glider CTD	1
REPLACEAF	Extra charge to install one antifoulant device, includes one 801542.1.	1
PCAL_SLOCUM	Calibrate SLOCUM pressure sensor	1

**Unbilled Items**

Item	Item Description	Qty
801542.1	AF24173 ANTI-FOULANT, SINGLE CYLINDER, V2	1
22096	LITHIUM COIN BATTERY, WITH TABS, BR1632A/HA	1



**SEA-BIRD**  
SCIENTIFIC

Sea-Bird Scientific  
13431 NE 20<sup>th</sup> Street  
Bellevue, WA 98005  
USA

+1 425-643-9866  
seabird@seabird.com  
www.seabird.com

SENSOR SERIAL NUMBER: 9014  
CALIBRATION DATE: 01-Jun-19

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

**COEFFICIENTS:**

g = -9.799606e-001  
h = 1.331987e-001  
i = -1.582465e-004  
j = 2.771556e-005

CPcor = -9.5700e-008  
CTcor = 3.2500e-006  
WBOTC = -3.6836e-007

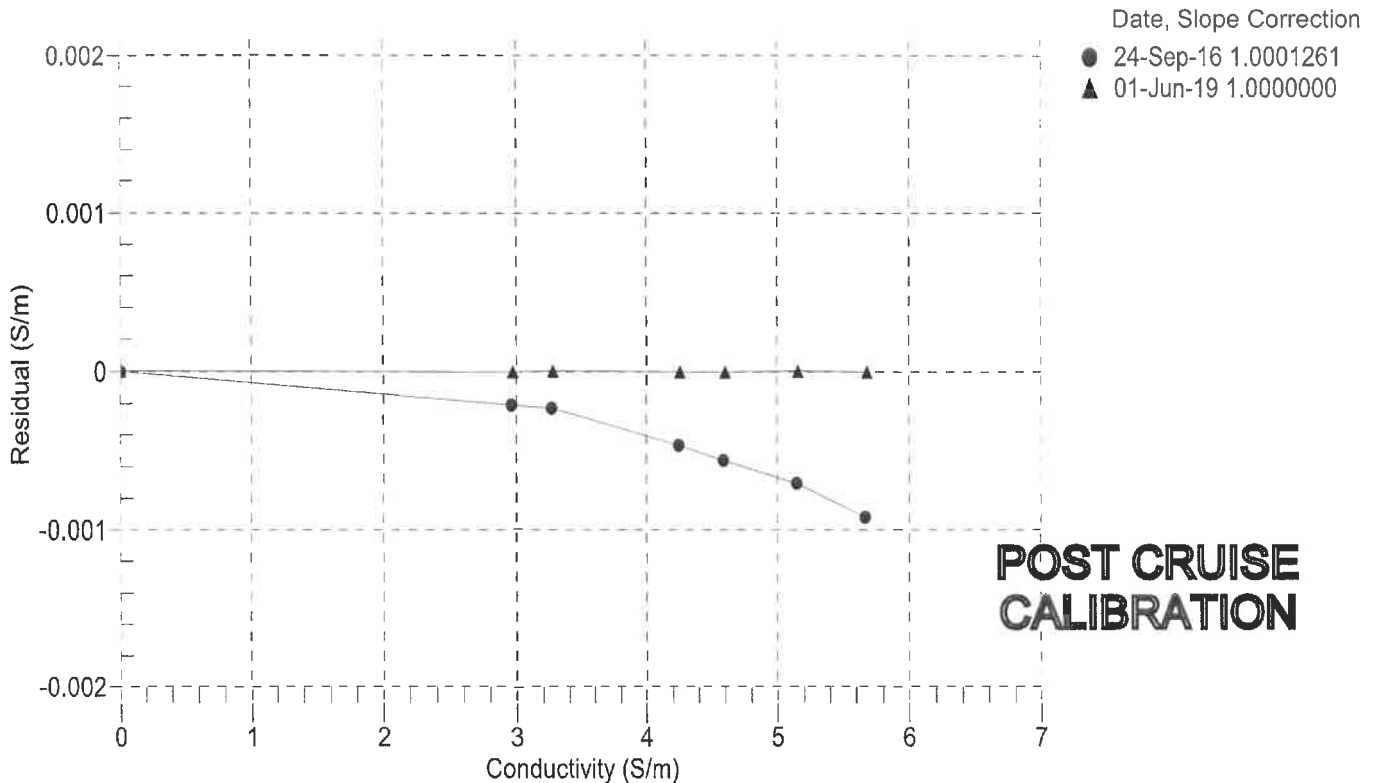
BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
22.0000	0.0000	0.00000	2714.71	0.00000	0.00000
1.0000	34.7698	2.97237	5448.06	2.97237	-0.00000
4.5000	34.7497	3.27906	5654.86	3.27906	0.00000
15.0000	34.7069	4.25961	6269.73	4.25961	-0.00000
18.5000	34.6977	4.60433	6471.78	4.60433	-0.00000
24.0000	34.6868	5.16149	6785.35	5.16149	0.00000
29.0000	34.6782	5.68224	7065.55	5.68224	-0.00000
32.5000	34.6707	6.05347	7258.45	6.05331	-0.00016

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

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

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

Residual (Siemens/meter) = instrument conductivity - bath conductivity





**SEA-BIRD**  
SCIENTIFIC

Sea-Bird Scientific  
13431 NE 20<sup>th</sup> Street  
Bellevue, WA 98005  
USA

+1 425-643-9866  
seabird@seabird.com  
www.seabird.com

SENSOR SERIAL NUMBER: 9014  
CALIBRATION DATE: 01-Jun-19

Slocum Payload CTD TEMPERATURE CALIBRATION DATA  
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

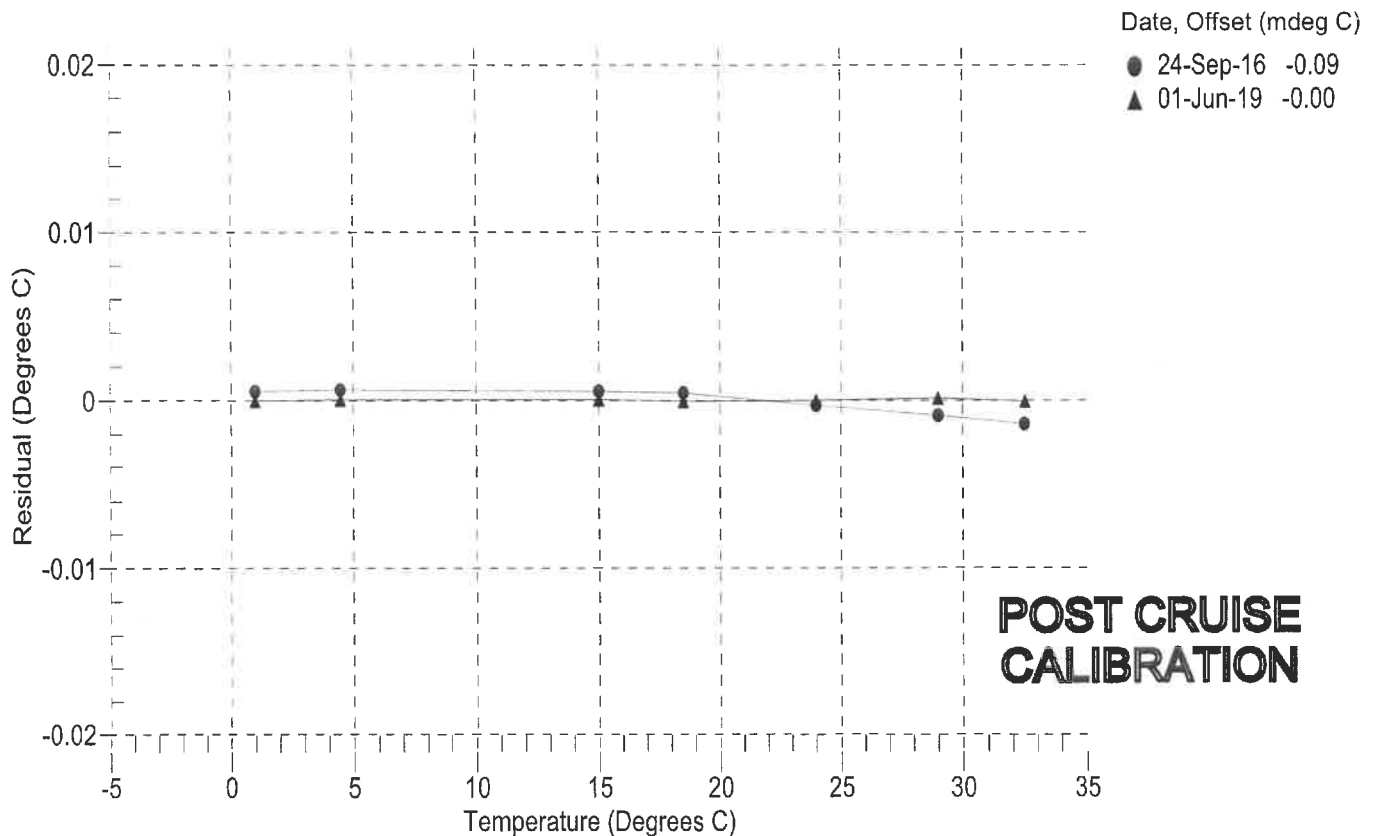
a0 = -1.171890e-004  
a1 = 3.105154e-004  
a2 = -4.795955e-006  
a3 = 2.104118e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	573944.2	1.0000	-0.0000
4.5000	490784.0	4.5000	0.0000
15.0000	312959.0	15.0000	0.0000
18.5000	271061.2	18.4999	-0.0001
24.0000	217559.2	24.0000	-0.0000
29.0000	179235.8	29.0001	0.0001
32.5000	157027.4	32.4999	-0.0001

n = Instrument Output (counts)

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

Residual (°C) = instrument temperature - bath temperature





**SEA-BIRD**  
SCIENTIFIC

Sea-Bird Scientific  
13431 NE 20<sup>th</sup> Street  
Bellevue, WA 98005  
USA

+1 425-643-9866  
seabird@seabird.com  
www.seabird.com

SENSOR SERIAL NUMBER: 9014  
CALIBRATION DATE: 15-May-19

Slocum Payload CTD PRESSURE CALIBRATION DATA  
1450 psia S/N 3626943

COEFFICIENTS:

PA0 =	2.909312e-001	PTCA0 =	5.249617e+005
PA1 =	4.799023e-003	PTCA1 =	4.802299e+000
PA2 =	-1.602107e-011	PTCA2 =	-9.478005e-002
PTEMPA0 =	-7.309022e+001	PTCB0 =	2.550800e+001
PTEMPA1 =	5.015502e-002	PTCB1 =	-2.000000e-004
PTEMPA2 =	-3.658782e-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)
14.52	527982.0	1914.8	14.50	-0.00	32.50	2139	528047.40
301.28	587747.2	1917.7	301.30	0.00	29.00	2066	528041.80
588.34	647567.5	1918.5	588.25	-0.01	24.00	1964	528040.20
875.50	707442.6	1918.7	875.35	-0.01	18.50	1851	528044.20
1158.45	767201.1	1919.5	1161.78	0.23	15.00	1779	528041.40
1449.93	827347.1	1920.2	1449.94	0.00	4.50	1565	528007.80
1162.76	767415.5	1920.3	1162.80	0.00	1.00	1493	527988.20
875.63	707507.8	1920.1	875.66	0.00			
588.44	647621.6	1920.2	588.51	0.00			
301.19	587752.2	1922.7	301.33	0.01			
14.51	527972.5	1925.4	14.46	-0.00			

	TEMPERATURE (°C)	SPAN
	-5.00	25.51
	35.00	25.50

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)

● 15-May-19 -0.00

