SEA-BIRD

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 Request **1005508829**
Date 11-OCT-2019
Sales Order 315749641

SERVICE REPORT

CUSTOMER INFORMATION

Name: TELEDYNE WEBB RESEARCH
Account : 40280819
CHUCK 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.50
Item Description: SLOCUM GLIDER CTD, 1000 dBar, DIRECT GROUND
Serial: 712-9362

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

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 20th Street
Bellevue, WA 98005
USA

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

SENSOR SERIAL NUMBER: 9362
CALIBRATION DATE: 27-Sep-19

Slocum Payload CTD TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

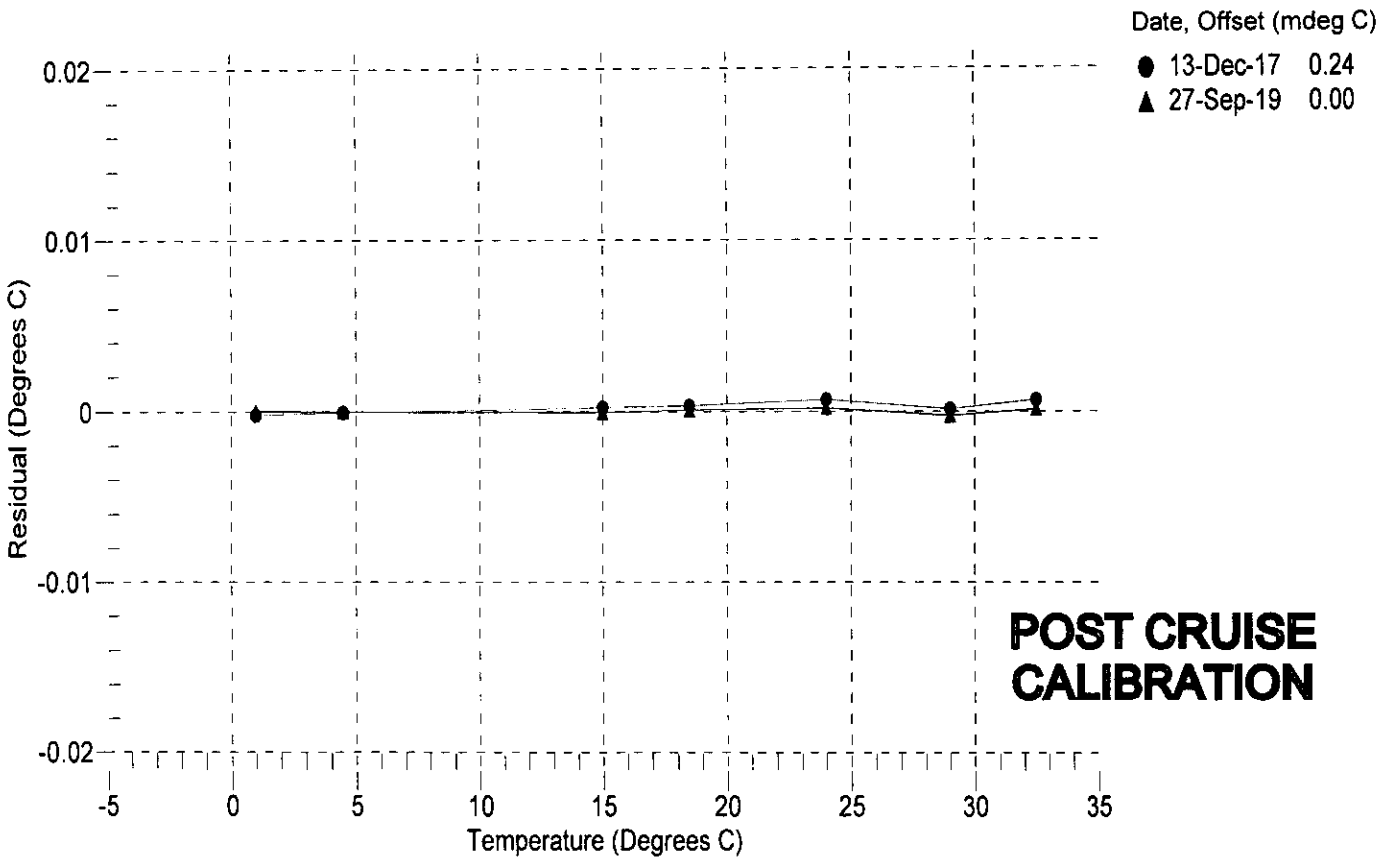
a0 = -1.451553e-004
a1 = 3.096219e-004
a2 = -4.380586e-006
a3 = 1.991815e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	560568.8	1.0000	0.0000
4.5000	480368.4	4.5000	-0.0000
15.0000	308232.0	14.9999	-0.0001
18.4999	267506.4	18.5000	0.0001
24.0000	215375.8	24.0002	0.0002
29.0001	177933.4	28.9998	-0.0003
32.5000	156181.0	32.5001	0.0001

n = Instrument Output (counts)

Temperature ITS-90 (°C) = $1/\{a0 + a1[ln(n)] + a2[ln^2(n)] + a3[ln^3(n)]\} - 273.15$

Residual (°C) = instrument temperature - bath temperature



SEA-BIRD SCIENTIFIC

Sea-Bird Scientific
13431 NE 20th Street
Bellevue, WA 98005
USA

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

SENSOR SERIAL NUMBER: 9362
CALIBRATION DATE: 27-Sep-19

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

COEFFICIENTS:

g = -9.900803e-001
h = 1.474709e-001
i = -1.997951e-004
j = 3.556832e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006
WBOTC = 4.4980e-007

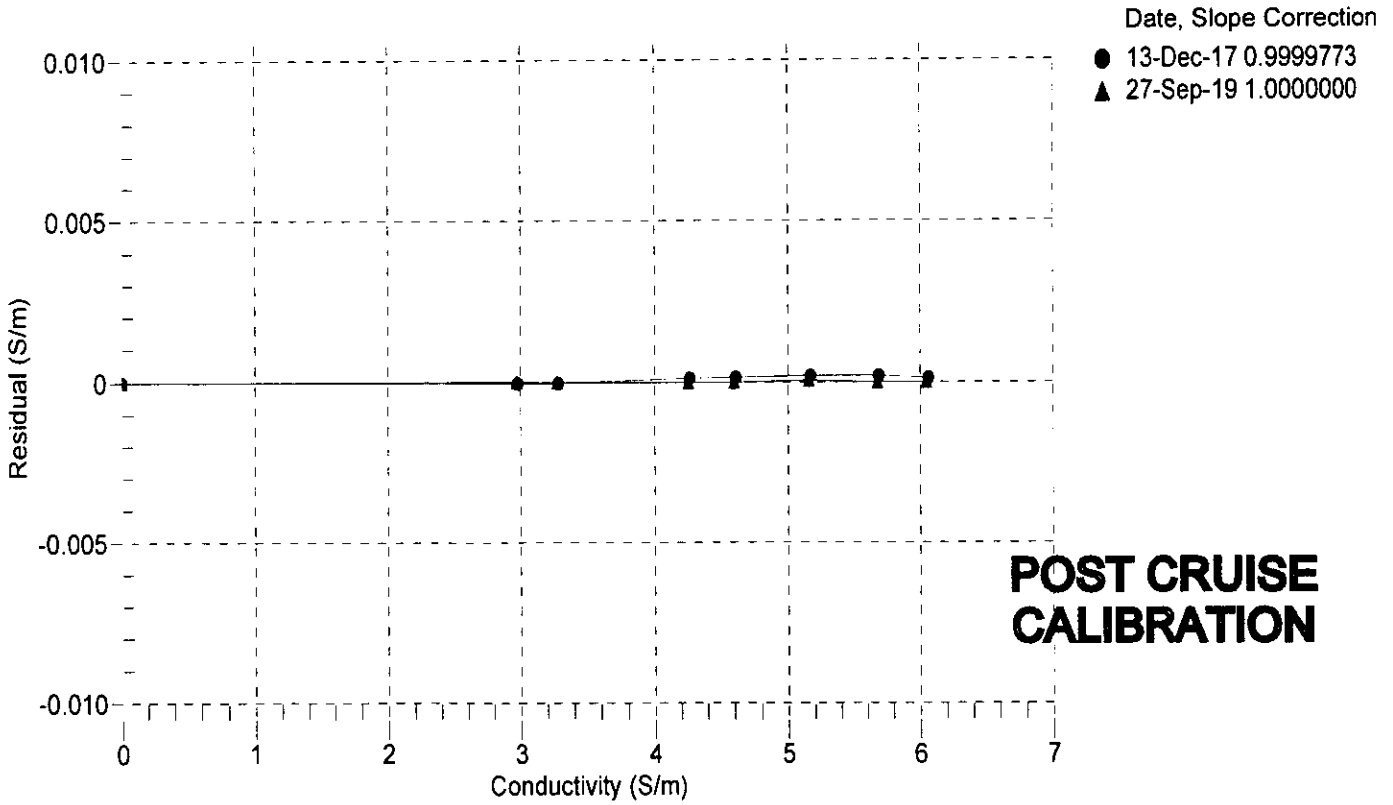
BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
22.0000	0.0000	0.00000	2593.53	0.00000	0.00000
1.0000	34.7320	2.96945	5183.07	2.96945	0.00001
4.5000	34.7128	3.27592	5379.30	3.27592	-0.00000
15.0000	34.6714	4.25571	5962.81	4.25571	-0.00001
18.4999	34.6627	4.60018	6154.57	4.60017	-0.00001
24.0000	34.6526	5.15696	6452.24	5.15699	0.00003
29.0001	34.6460	5.67757	6718.32	5.67756	-0.00000
32.5000	34.6405	6.04879	6901.62	6.04879	-0.00000

f = Instrument Output(Hz) * sqrt(1.0 + WBOTC * t) / 1000.0

t = temperature (°C); p = pressure (decibars); δ = CTcor; ε = CPcor;

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

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



SEA-BIRD SCIENTIFIC
Sea-Bird Scientific
13431 NE 20th Street
Bellevue, WA 98005
USA

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

SENSOR SERIAL NUMBER: 9362
CALIBRATION DATE: 24-Sep-19

Slocum Payload CTD PRESSURE CALIBRATION DATA
1450 psia S/N 10087783

COEFFICIENTS:

PA0 =	4.861117e-002	PTCA0 =	5.258520e+005
PA1 =	4.519057e-003	PTCA1 =	4.139730e+000
PA2 =	-2.678397e-011	PTCA2 =	-1.464059e-001
PTEMPA0 =	1.317435e+002	PTCB0 =	2.510788e+001
PTEMPA1 =	-7.134121e-002	PTCB1 =	-2.500000e-005
PTEMPA2 =	-2.583941e-007	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)
14.62	529098.0	1483.0	14.67	0.00
314.86	595527.0	1483.0	314.74	-0.01
614.87	662021.0	1482.0	614.88	0.00
914.84	728542.0	1480.0	914.89	0.00
1214.84	795106.0	1481.0	1214.87	0.00
1464.79	850593.0	1479.0	1464.74	-0.00
1214.82	795101.0	1482.0	1214.84	0.00
914.85	712051.0	1950.0	840.76	-5.11
614.88	662025.0	1485.0	614.89	0.00
314.91	595562.0	1486.0	314.90	-0.00
14.63	529095.0	1483.0	14.66	0.00

THERMAL CORRECTION

TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
32.50	1384	529073.60
29.00	1433	529090.00
24.00	1502	529102.40
18.50	1578	529120.00
15.00	1627	529122.80
4.50	1772	529110.80
1.00	1821	529093.80

TEMPERATURE (°C)	SPAN
-5.00	25.11
35.00	25.11

y = thermistor output (counts)

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

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

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

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

Residual (%FSR) = (computed pressure - true pressure) * 100 / Full Scale Range