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

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

Pressure Test Certificate

Test Date: 2019-02-13

Description: Slocum CTD

Sensor Information:

Model Number: Slocum

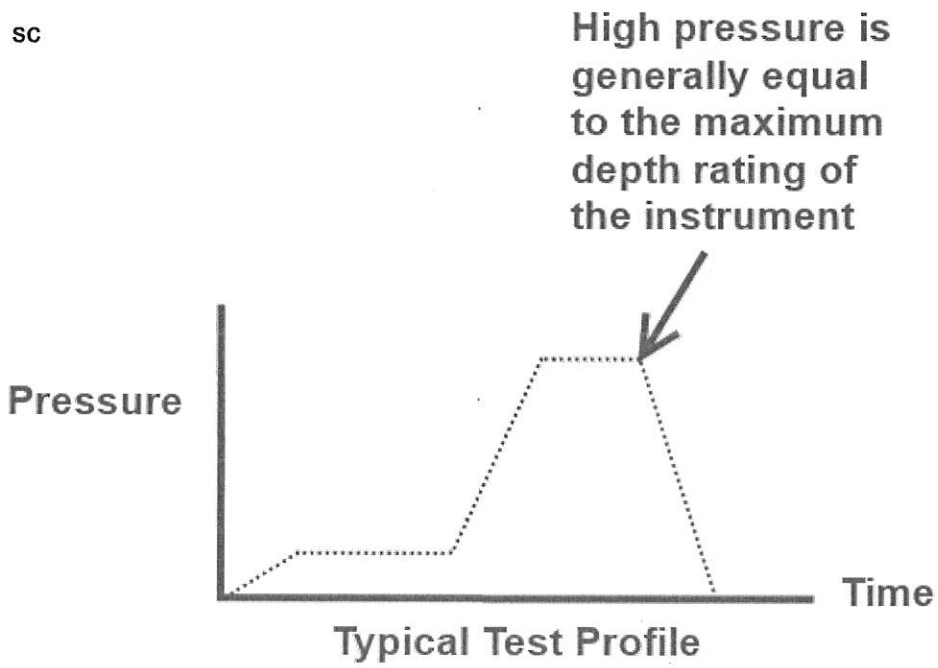
Serial Number: 9547

Pressure Test Protocol:

Low Pressure Test:	40	PSI	Held For:	15	Minutes
High Pressure Test:	1450	PSI	Held For:	15	Minutes

Passed Test: True

Tested By: sc



Typical Test Profile

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SENSOR SERIAL NUMBER: 9547
CALIBRATION DATE: 13-Feb-19

Slocum Payload CTD PRESSURE CALIBRATION DATA
1450 psia S/N 11151149

COEFFICIENTS:

PA0 =	1.216188e-001	PTCA0 =	5.239926e+005
PA1 =	4.528622e-003	PTCA1 =	2.130615e+000
PA2 =	-7.197683e-012	PTCA2 =	-4.897662e-002
PTEMPA0 =	-6.715397e+001	PTCB0 =	2.504613e+001
PTEMPA1 =	5.181634e-002	PTCB1 =	-5.750000e-004
PTEMPA2 =	-4.528451e-007	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)
14.42	527168.2	1761.1	14.41	-0.00
300.95	590421.6	1765.8	300.98	0.00
588.04	653760.8	1766.6	587.88	-0.01
875.45	717255.7	1766.2	875.42	-0.00
1162.90	780719.7	1767.1	1162.78	-0.01
1450.04	844183.6	1767.5	1450.07	0.00
1162.77	780719.7	1767.0	1162.78	0.00
875.24	717258.0	1766.8	875.44	0.01
588.28	653854.1	1767.0	588.30	0.00
300.97	590429.6	1771.4	301.01	0.00
14.41	527170.1	1772.0	14.41	-0.00

THERMAL CORRECTION

TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
32.50	1957	527271.20
29.00	1887	527278.00
24.00	1787	527273.80
18.50	1678	527273.40
15.00	1608	527280.80
4.50	1400	527261.60
1.00	1331	527256.60

TEMPERATURE (°C)	SPAN
-5.00	25.05
35.00	25.03

y = thermistor output (counts)

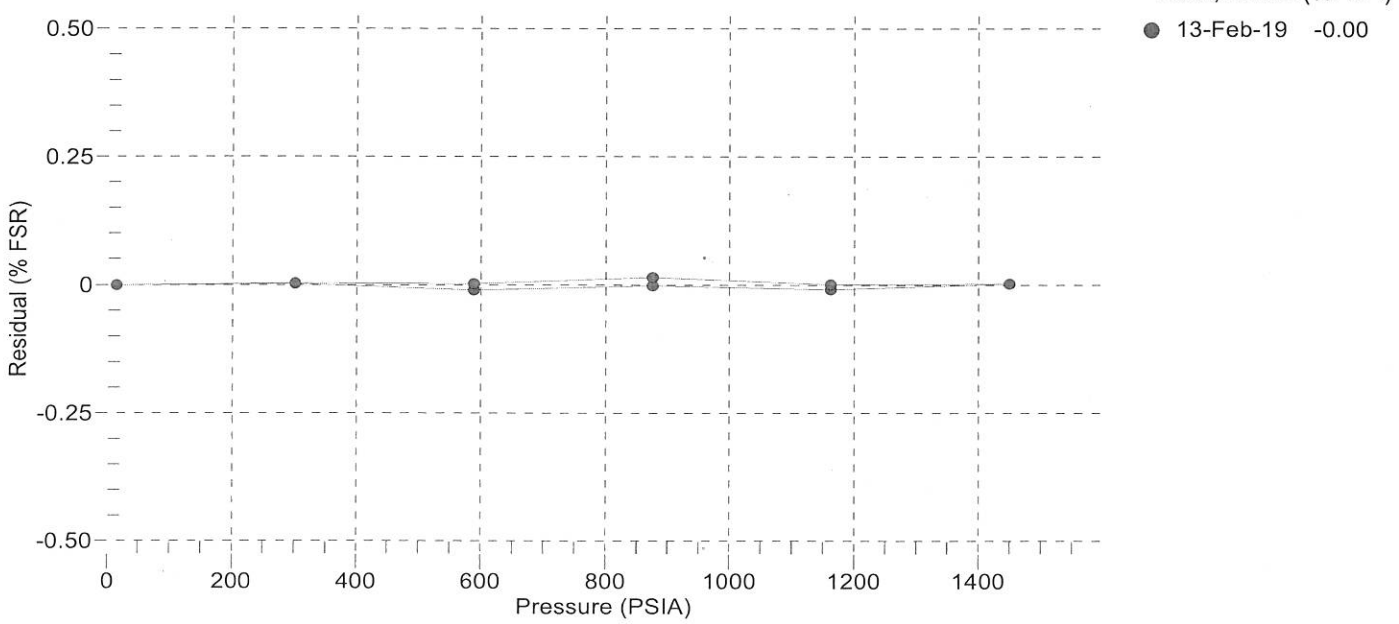
$t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

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

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

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

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



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SENSOR SERIAL NUMBER: 9547
CALIBRATION DATE: 17-Feb-19

Slocum Payload CTD TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

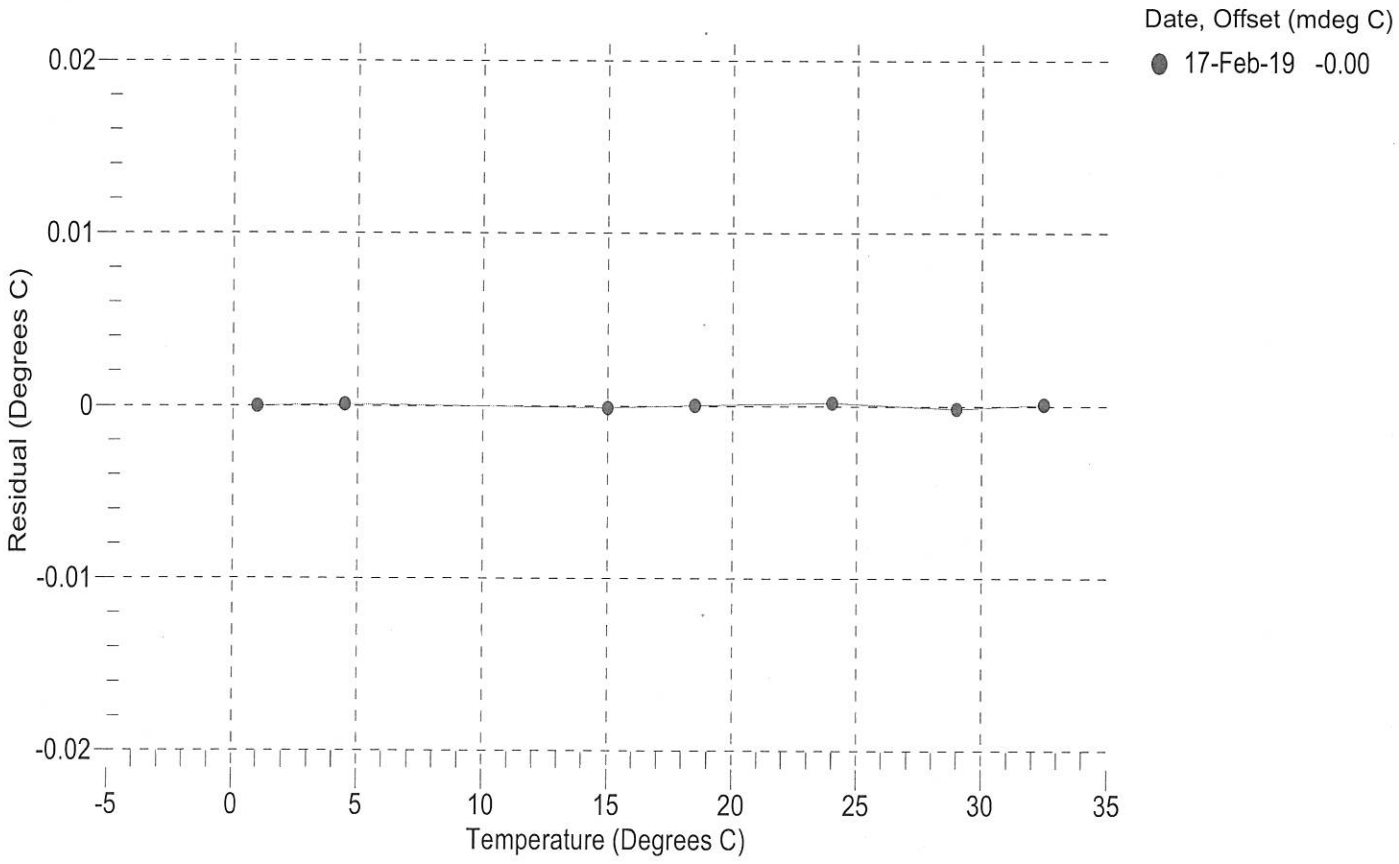
a0 = -1.895000e-004
a1 = 3.210765e-004
a2 = -5.384225e-006
a3 = 2.247653e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	578290.2	1.0000	-0.0000
4.5000	495176.2	4.5001	0.0001
15.0000	317031.6	14.9999	-0.0001
18.5000	274944.8	18.5000	0.0000
24.0000	221122.6	24.0002	0.0002
29.0000	182506.0	28.9998	-0.0002
32.5000	160090.2	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



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SENSOR SERIAL NUMBER: 9547
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Slocum Payload CTD CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

```
g = -1.002279e+000
h =  1.370315e-001
i = -1.561279e-004
j =  2.907920e-005

CPcor = -9.5700e-008
CTcor =  3.2500e-006
WBOTC =  2.7708e-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	2706.54	0.00000	0.00000
1.0000	34.7998	2.97469	5387.18	2.97469	-0.00000
4.5000	34.7808	3.28170	5590.61	3.28171	0.00000
15.0000	34.7401	4.26325	6195.59	4.26326	0.00001
18.5000	34.7321	4.60840	6394.47	4.60839	-0.00001
24.0000	34.7233	5.16632	6703.23	5.16633	0.00001
29.0000	34.7188	5.68814	6979.35	5.68814	-0.00000
32.5000	34.7156	6.06041	7169.68	6.06046	0.00005

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