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: 2019-05-10

Description: Slocum CTD

Sensor Information:

Model Number: Slocum

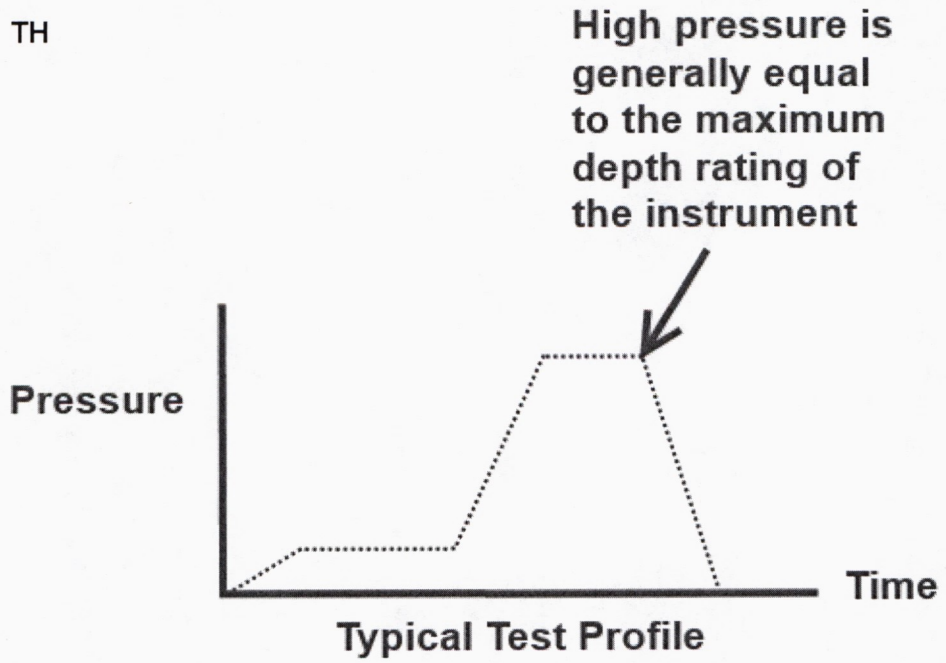
Serial Number: 9550

Pressure Test Protocol:

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

Passed Test: True

Tested By: TH



Typical Test Profile

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SENSOR SERIAL NUMBER: 9550
CALIBRATION DATE: 22-Mar-19

Slocum Payload CTD PRESSURE CALIBRATION DATA
1450 psia S/N 11201504

COEFFICIENTS:

PA0 =	1.226230e-001	PTCA0 =	5.243895e+005
PA1 =	4.518467e-003	PTCA1 =	-1.404437e+000
PA2 =	-9.558977e-012	PTCA2 =	1.263357e-001
PTEMPA0 =	-5.839755e+001	PTCB0 =	2.517850e+001
PTEMPA1 =	5.342248e-002	PTCB1 =	9.000000e-004
PTEMPA2 =	-4.676604e-007	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)
14.55	527614.0	1533.5	14.54	-0.00
301.20	591125.0	1536.0	301.23	0.00
588.26	654717.2	1537.4	588.22	-0.00
875.42	718358.4	1538.1	875.35	-0.00
1162.84	782098.0	1539.3	1162.84	0.00
1449.99	845778.4	1540.4	1449.99	-0.00
1162.77	782086.0	1540.4	1162.78	0.00
875.60	718428.2	1540.2	875.66	0.00
588.11	654685.9	1540.1	588.07	-0.00
301.19	591134.5	1542.1	301.27	0.01
14.54	527611.1	1543.2	14.51	-0.00

THERMAL CORRECTION

TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
32.50	1728	527732.20
29.00	1660	527698.20
24.00	1564	527687.20
18.50	1458	527659.60
15.00	1390	527645.20
4.50	1189	527637.20
1.00	1123	527640.40

TEMPERATURE (°C)	SPAN
-5.00	25.17
35.00	25.21

y = thermistor output (counts)

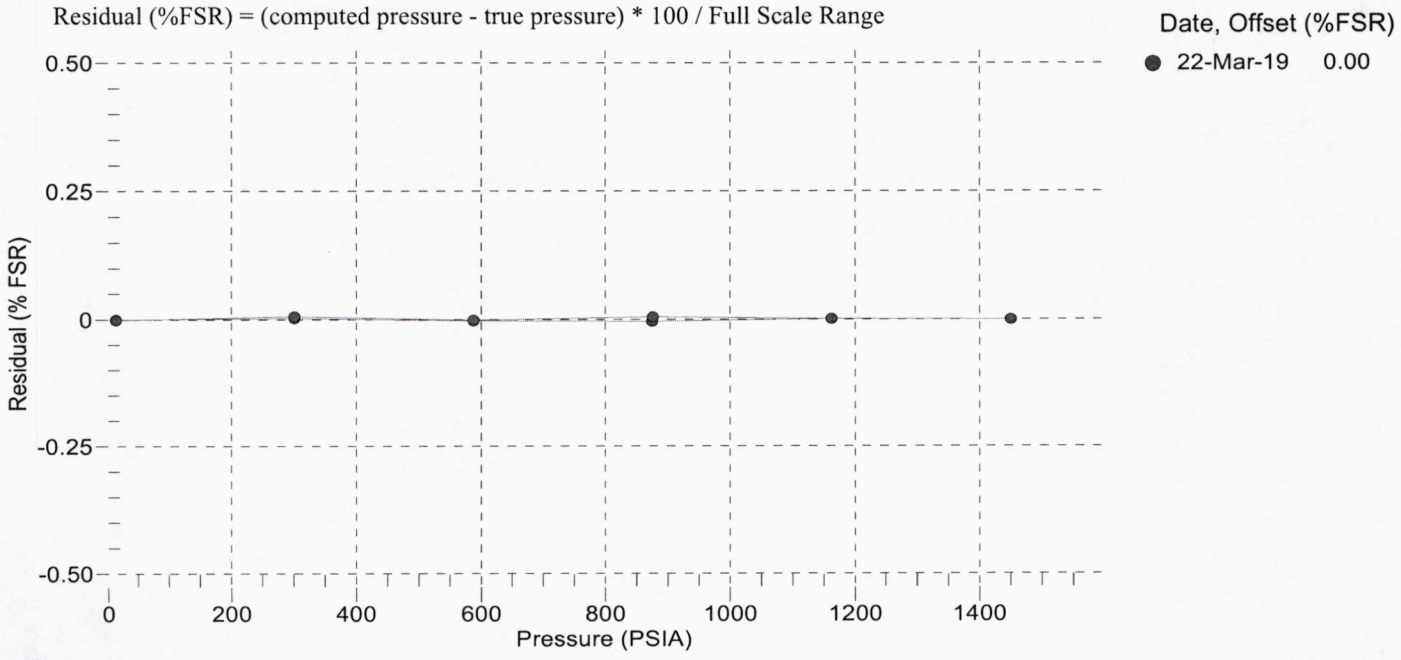
$t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

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

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

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

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



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SENSOR SERIAL NUMBER: 9550
CALIBRATION DATE: 24-Mar-19

Slocum Payload CTD TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

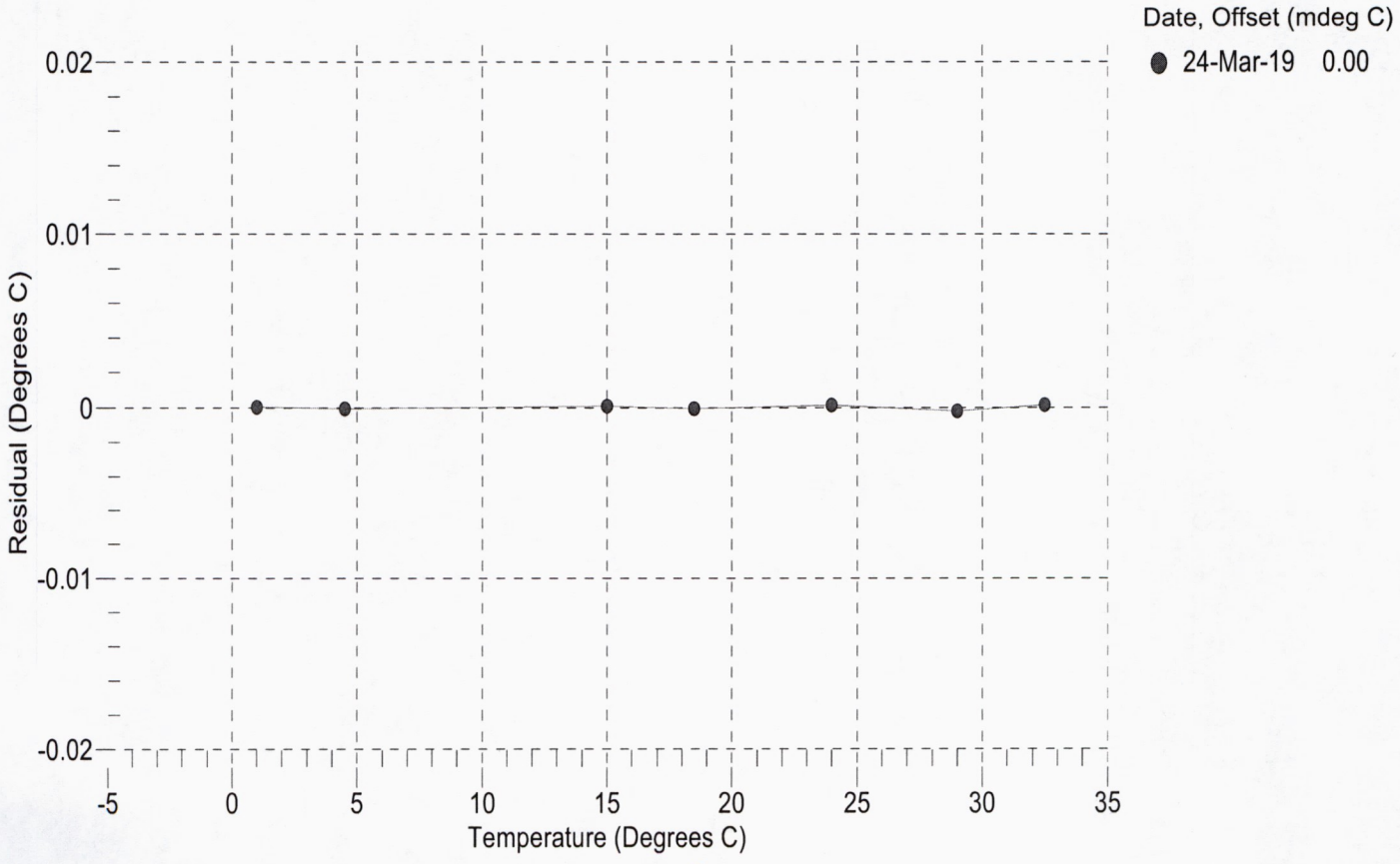
a0 = -5.342495e-005
a1 = 2.953908e-004
a2 = -3.604141e-006
a3 = 1.775922e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	581328.2	1.0000	0.0000
4.5000	496909.4	4.4999	-0.0001
15.0000	316528.8	15.0001	0.0001
18.5000	274065.4	18.4999	-0.0001
24.0000	219861.0	24.0001	0.0001
29.0000	181057.4	28.9998	-0.0002
32.5000	158573.0	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



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SENSOR SERIAL NUMBER: 9550
CALIBRATION DATE: 24-Mar-19

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

COEFFICIENTS:

```
g = -1.004967e+000
h =  1.384242e-001
i = -2.114736e-004
j =  3.341513e-005

CPcor = -9.5700e-008
CTcor =  3.2500e-006
WBOTC = -3.0888e-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	2697.64	0.00000	0.00000
1.0000	34.8694	2.98007	5368.85	2.98007	0.00000
4.5000	34.8494	3.28754	5571.51	3.28754	-0.00000
15.0000	34.8065	4.27054	6174.25	4.27053	-0.00001
18.5000	34.7975	4.61614	6372.38	4.61616	0.00001
24.0000	34.7876	5.17483	6679.94	5.17483	0.00000
29.0000	34.7821	5.69735	6954.97	5.69733	-0.00001
32.5000	34.7787	6.07017	7144.57	6.07018	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) = $(g + h * f^2 + i * f^3 + j * f^4) / (1 + \delta * t + \varepsilon * p)$

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