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: 7792
CALIBRATION DATE: 22-Mar-17

SBE 19plus V2 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

```
g = -1.017709e+000
h =  1.328397e-001
i = -1.413619e-004
j =  2.733806e-005

CPcor = -9.5700e-008
CTcor =  3.2500e-006
```

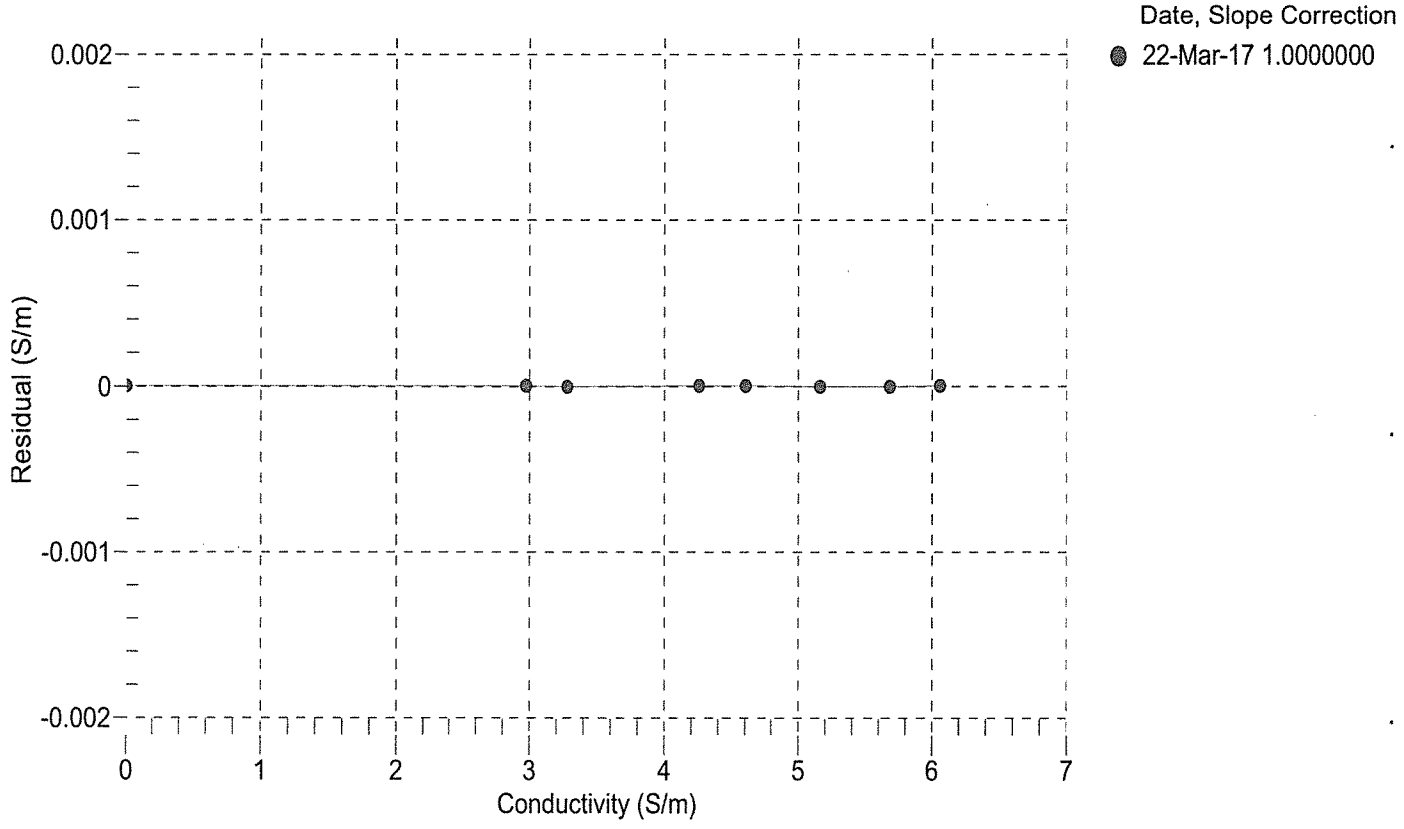
BATH TEMP (° C)	BATH SAL (PSU)	BATH COND (S/m)	INSTRUMENT OUTPUT (Hz)	INSTRUMENT COND (S/m)	RESIDUAL (S/m)
22.0000	0.0000	0.00000	2769.78	0.0000	0.00000
1.0000	34.7872	2.97371	5480.56	2.9737	0.00000
4.5000	34.7676	3.28058	5686.63	3.2806	-0.00000
15.0000	34.7255	4.26165	6299.67	4.2617	0.00000
18.5000	34.7169	4.60660	6501.23	4.6066	0.00000
24.0000	34.7077	5.16425	6814.18	5.1643	-0.00000
29.0000	34.7029	5.68583	7094.09	5.6858	-0.00000
32.5000	34.7006	6.05809	7287.11	6.0581	0.00000

f = Instrument Output (Hz) / 1000.0

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

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

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



SYSTEM CONFIGURATION

Model SBE 19plusV2	**S/N 19-7792**
Instrument Type	**SBE 19plusV2 Seacat**
Firmware Version	**3.1.8**
Communications	**9600 baud, 8 data bits, no parity, one stop bit**
Memory	**64MB**
Housing	**600 meter (Acetron plastic)**
Pressure Sensor	**Strain Gauge: 350 dBar, S/N 10595352**
Zero Conductivity Raw Frequency	**2769.78 Hz**
Number of Voltages Sampled:	**0**
Serial Rs-232c Sensor	**SBE 63 Optical Dissolved Oxygen**
Pump (SBE 5)	**05-9030**
Oxygen (SBE 63)	**63-1533**

Common SBE Factory Default Values for Sensor Delays:
Seacat without external sensors..... 0 Seconds
Minimum delay for external sensors (voltage or serial)..... 4 Seconds
Common sensors with a 4 second delay include:
Wet Labs ECO sensors, Seapoint STM and SCF, PAR sensors, SBE38, SBE50, Cylcops-7, & OBS3+
Wet Labs C-Star..... 10 Seconds
SBE43 (0.5 mil membrane) ..... 30 Seconds
SBE43 (1.0 mil membrane) ..... 40 Seconds
SBE63..... 40 Seconds
SBE18 or SBE27..... 60 Seconds

Configured Overall Delay Setting for this CTD (Moored Mode): 40 Seconds

Note: Overall Voltage Delay Setting is based on the longest time delay as needed. A list is provided above of common sensor delay values programmed into CTD when integrated and shipped from Sea-Bird Electronics. To recalculate this value when adding or removing sensors, please refer to CTD manual.

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: 7792
CALIBRATION DATE: 20-Mar-17

SBE 19plus V2 PRESSURE CALIBRATION DATA
508 psia S/N 10595352

COEFFICIENTS:

PA0 =	3.113398e-001	PTCA0 =	5.240590e+005
PA1 =	1.538578e-003	PTCA1 =	1.093591e+001
PA2 =	6.921156e-012	PTCA2 =	-6.848369e-002
PTEMPA0 =	-6.932351e+001	PTCB0 =	2.514300e+001
PTEMPA1 =	5.009211e+001	PTCB1 =	-0.000000e+000
PTEMPA2 =	-2.541175e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE (PSIA)	INSTRUMENT OUTPUT (counts)	THERMISTOR OUTPUT (volts)	COMPUTED PRESSURE (PSIA)	RESIDUAL (%FSR)
14.62	533555.0	1.8	14.61	-0.00
104.86	592184.0	1.8	104.85	-0.00
204.87	657123.0	1.8	204.85	-0.00
304.88	722020.0	1.8	304.85	-0.01
404.87	786887.0	1.8	404.86	-0.00
504.87	851722.0	1.8	504.88	0.00
404.87	786907.0	1.8	404.89	0.00
304.88	722053.0	1.8	304.90	0.00
204.88	657152.0	1.8	204.89	0.00
104.88	592220.0	1.8	104.90	0.00
14.61	533557.0	1.8	14.61	-0.00

THERMAL CORRECTION

TEMP (°C)	THERMISTOR OUTPUT (volts)	INSTRUMENT OUTPUT (counts)
32.50	2.05	533732.83
29.00	1.98	533710.10
24.00	1.88	533671.59
18.50	1.77	533628.56
15.00	1.70	533599.08
4.50	1.49	533497.94
1.00	1.41	533460.31

TEMPERATURE (°C)	SPAN (mV)
-5.00	25.14
35.00	25.14

y = thermistor output (counts)

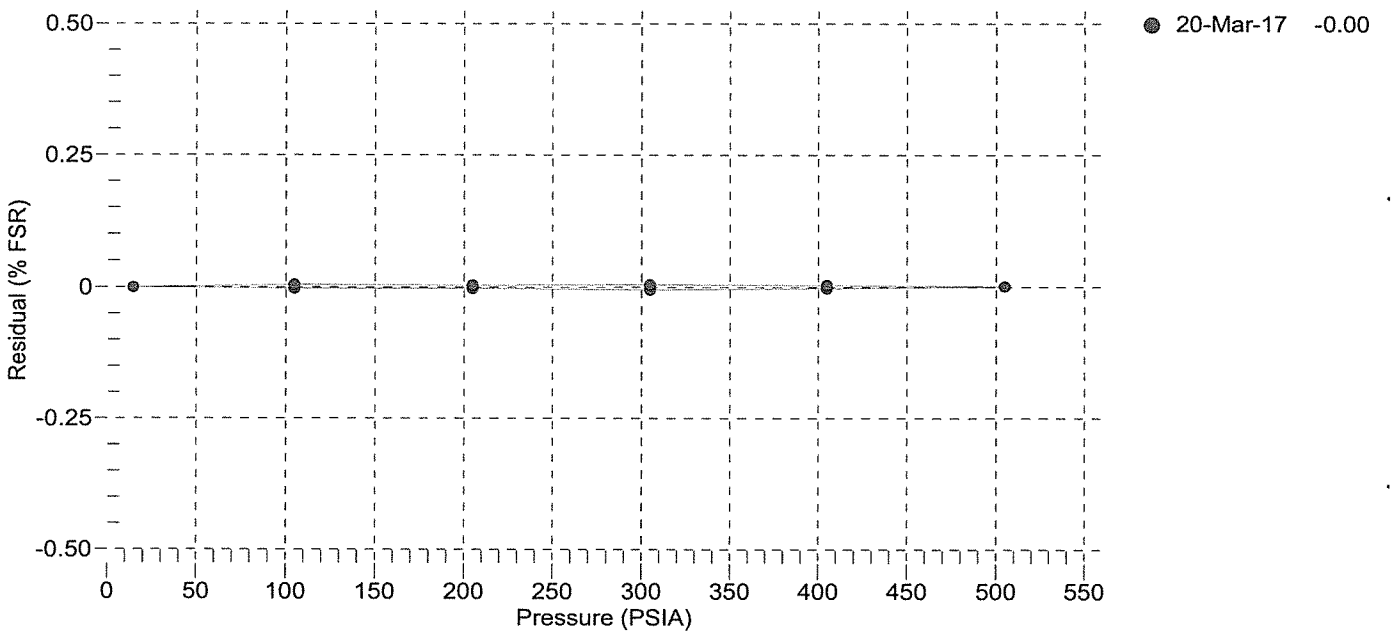
$t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

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

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

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

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



Sea-Bird Electronics, Inc.
13431 NE 20th St. Bellevue, Washington 98005 USA
www.seabird.com
Phone: (425) 643-9866
Fax: (425) 643-9954
Email: seabird@seabird.com

Pressure Test Certificate

Test Date: 2017-03-17 Description: SBE-19Plus SeaCat Profiler

Sensor Information:

Model Number: SBE-19P

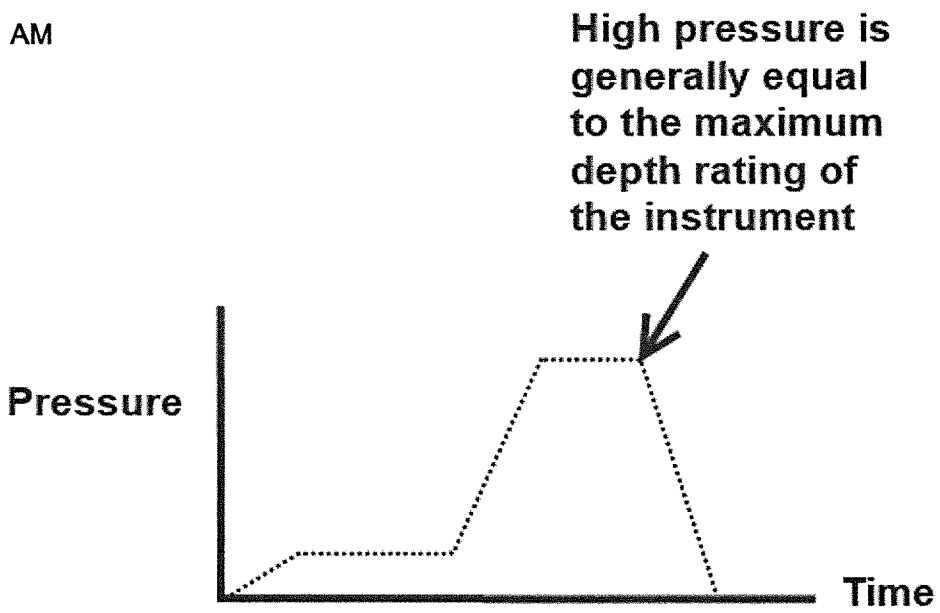
Serial Number: 7792

Pressure Test Protocol:

Low Pressure Test: 40	PSI	Held For: 15	Minutes
High Pressure Test: 500	PSI	Held For: 15	Minutes

Passed Test: True

Tested By: AM



Typical Test Profile

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: 7792
CALIBRATION DATE: 22-Mar-17

SBE 19plus V2 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

COEFFICIENTS:

a0 = 1.212524e-003
a1 = 2.785129e-004
a2 = -8.176058e-007
a3 = 1.688228e-007

BATH TEMP (° C)	INSTRUMENT OUTPUT (counts)	INST TEMP (° C)	RESIDUAL (° C)
1.0000	549684.345	1.0000	-0.0000
4.5000	486084.373	4.5001	0.0001
15.0000	330551.136	15.0000	0.0000
18.5000	289294.483	18.4999	-0.0001
24.0000	233574.000	24.0000	0.0000
29.0000	191356.845	29.0001	0.0001
32.5000	165928.051	32.4999	-0.0001

n = Instrument Output (counts)

MV = (n - 524288) / 1.6e+007

R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)

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

Residual (°C) = instrument temperature - bath temperature