DATA PRODUCT SPECIFICATION FOR SEAFLOOR PRESSURE FROM SEA-BIRD SBE 26PLUS INSTRUMENTS

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Document Control Sheet

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Signature Page

This document has been reviewed and approved for release to Configuration Management.

OOI Senior Systems Engineer: ______________________

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This document has been reviewed and meets the needs of the OOI Cyberinfrastructure for the purpose of coding and implementation.

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Table of Contents

1 Abstract

This document describes the computation used to calculate the OOI Level 1 Seafloor Pressure (SFLPRES) core data product, which is calculated using data from the Seafloor Pressure family of instruments (PRESF), specifically the Sea-Bird Electronics SBE 26plus instrument, and in some cases from the CTDBP series of instruments, SBE 16plus CTD instruments. This document is intended to be used by OOI programmers to construct appropriate processes to create the L1 Seafloor Pressure core data product.

2 Introduction

2.1 Author Contact Information

Please contact Michael Vardaro (mvardaro@coas.oregonstate.edu) or the Data Product Specification lead (DPS@lists.oceanobservatories.org) for more information concerning the computation and other items in this document.

2.2 Metadata Information

2.2.1 Data Product Name

The OOI Core Data Product Name for this product is

- SFLPRES

The OOI Core Data Product Descriptive Name for this product is

- Seafloor Pressure

2.2.2 Data Product Abstract (for Metadata)

The OOI Level 1 Seafloor Pressure core data products, SFLPRES and sub-parameters SFLPRES-RTIME, SFLPRES-TIDE, and SFLPRES-WAVE, are created from the Sea-Bird Electronics SBE 26plus member of the Pressure SF (PRESF) family of instruments by either a) polling, in real-time, for L0 ASCII text format data output and converting from psia to decibar units or b) converting, after instrument recovery, L0 hexadecimal pressure data into decimal format and the resulting tide and wave pressure data in psia to decibar units.

2.2.3 Computation Name

Not required for data products.

2.2.4 Computation Abstract (for Metadata)

The OOI Level 1 Seafloor Pressure core data products, SFLPRES and sub-parameters SFLPRES-RTIME, SFLPRES-TIDE, and SFLPRES-WAVE, are created from the Sea-Bird Electronics SBE 26plus member of the Pressure SF (PRESF) family of instruments by either a) polling, in real-time, for L0 ASCII text format data output and converting from psia to decibar units or b) converting, after instrument recovery, L0 hexadecimal pressure data into decimal format and the resulting tide and wave pressure data in psia to decibar units.

2.2.5 Instrument-Specific Metadata

See Section 4.4 for instrument-specific metadata fields that must be part of the output data.

2.2.6 Data Product Synonyms

Synonyms for this data product are

- Pressure

2.2.7 Similar Data Products

Similar products that this data product may be confused with are PRESWAT (pressure from CTD family of instruments) and SFLPRES (pressure from PREST instruments).

2.3 Instruments

For information on the instruments from which the L1 Seafloor Pressure core data product inputs are obtained, see the PRESF Processing Flow document (DCN 1342-00230). This document contains information on the Sea-Bird SBE 26plus instrument; it also describes the flow of data from this pressure sensor through all of the relevant QC, calibration, and data product computations and procedures.

Please see the Instrument Application in the SAF for specifics of instrument locations and platforms.

2.4 Literature and Reference Documents

Sea-Bird (2011), SBE 26plus SEAGAUGE Wave and Tide Recorder User's Manual. Manual Version #016.
(see *Data Product Specification Artifacts* **>>>** *1341-00230_SFLPRES* >>> *26plus_016_Manual.pdf* on Alfresco)

2.5 Terminology

2.5.1 Definitions

Definitions of general OOI terminology are contained in the Level 2 Reference Module in the OOI requirements database (DOORS).

2.5.2 Acronyms, Abbreviations and Notations

General OOI acronyms, abbreviations and notations are contained in the Level 2 Reference Module in the OOI requirements database (DOORS). The following acronyms and abbreviations are defined here for use throughout this document.

psia	pound(s) per square inch absolute (includes atmospheric pressure; relative to vacuum)
dbar	decibar, an accepted non-SI unit for pressure and equivalent to 10^4 Pa. The pascal (Pa) is the SI coherent derived units for pressure, also expressed as N/m^2.

2.5.3 Variables and Symbols

The following variables and symbols are defined here for use throughout this document.

p_psia =	absolute pressure, psia
p_dbar =	absolute pressure, dbar
p_hex =	first 3 bytes of the hex string, for both wave and tide measurements
p_dec_tide =	decimal conversion of tide measurement hex string
p_dec_wave =	decimal conversion of a wave burst hex string
temp_p =	temperature at the pressure sensor (inside housing) , °C
M =	internally calculated scaling parameter that depends on pressure sensor range
B =	internally calculated scaling parameter that depends on pressure sensor range
Slope correction =	used to make post-deployment corrections for sensor drift (default = 1.0)
Offset correction =	used to make post-deployment corrections for sensor drift (default = 0.0)
PTCF =	Pressure Temperature Compensation Frequency = pressure temperature compensation number / 256
PF =	Pressure Frequency (Hz) = p_dec_wave / 256

U0, C1, C2, C3, D1, D2, T1, T2, T3, T4, and POffset are calibration coefficients entered in the 26plus EEPROM by the vendor during factory testing.

3 Theory

3.1 Description

The Sea-Bird SBE 26plus member of the PRESF series of instruments uses an internal quartz transducer (a quartz crystal resonator whose frequency of oscillation varies with pressure induced stress) to measure absolute pressure: the pressure of the water column (hydrostatic pressure) plus the current atmospheric pressure at the sea surface (SBE 26plus manual & Paroscientific Digiquartz website). Seafloor pressure is directly measured by the SBE 26plus and is either output as ASCII (in real-time mode), or calculated from the raw hexadecimal data downloaded from the instrument after it is recovered.

For data downloaded after recovery, the instrument will be set to output “engineering units in Hex”, as it is referred to in the Sea-Bird manuals. This requires that the L0 Seafloor Pressure data product be converted from hex to decimal and scaled according to the SBE 26plus manual for quartz pressure transducer instruments. Conversion and scaling (described herein) results in absolute pressure in decibars (dbar). Measuring surface waves requires burst sampling for a minimum of 20 minutes at 1 Hz. Deeper deployments require only tidal measurements that involve continuous sampling at intervals of 1 minute to 12 hours. All of these options are user-programmable.

3.2 Mathematical Theory

In real-time mode, L0 Seafloor Pressure is output by the instrument as an ASCII string that only needs conversion from psia into dbar to become the L1 Seafloor Pressure data product.

L0 Seafloor Pressure files downloaded post-recovery are in the form of a hexadecimal string. The L1 pressure core data product algorithm uses the post-recovery L0 Seafloor Pressure data product as input, converts it from hex into decimal format, corrects for slope and offset (using variables supplied by SeaBird), and then converts the pressure from psia units into decibar (dbar) units.

3.3 Known Theoretical Limitations

No known theoretical limitations.

3.4 Revision History

No revisions to date.

4 Implementation

4.1 Overview

The production of L1 Seafloor Pressure core data product from the L0 Seafloor Pressure core data product consists of:

a) Real-time data – parsing of L0 ASCII data and converting psia to dbar units;

b) Post-recovery (instrument) data – parsing of L0 data, converting from hex to decimal, correcting for slope and temperature, and scaling. Existing code to perform these operations is not available, but modified examples from the SBE-26plus manual are provided.

4.2 Inputs

Inputs are:

- L0 Seafloor Pressure as an ASCII string (real-time mode)
  or
- L0 Seafloor Pressure as a hexadecimal string (post-recovery mode)

- Calibration coefficients file (.psa) from manufacturer

<u>Real-Time Input Data Format:</u>
The real-time L0 data from the Seafloor Pressure instrument will be output in ASCII text format The pressure data (p_psia) to be captured as the SFLPRES-RTIME seafloor pressure core data product parameter is marked in bold text:

*Tide: start time = 21 Nov 2004 13:40:01**, p =14.2135**, pt = 21.952, t = 21.0250, c = 4.81952, s = 34.3799*

where:
• start time = start of tide measurement
• p = calculated absolute pressure to be parsed and stored (p_psia_rtime)
• pt = calculated pressure temperature (not stored) (°C)
• t = calculated temperature (°C)

<u>Post-Recovery Input Data Format:</u>
The post-recovery L0 Seafloor Pressure data product is a hexadecimal string, with the number of digits (and order of bytes) varying by data parameter type. Tide data (SFLPRES-TIDE) is an 18 character hex string, while wave bursts (SFLPRES-WAVE) are 12 character hex strings, both preceded by ASCII text header information. See examples below (from the SBE 26plus manual):

```
*Sea-Bird SBE 26plus Data File:
*FileName = C:\26plus\QuartzNoCond.hex
*Software Version 1.07
*DS
*SBE 26plus V 6.1c SN 1022 10 Dec 2006 10:43:20
*user info= test file
*quartz pressure sensor: serial number = 12345, range = 45 psia
*internal temperature sensor
*conductivity = NO
*iop = 5.9 ma vmain = 18.5 V vlith = 9.1 V
*last sample: p = 14.8637, t = 18.8973
*
*tide measurement: interval = 5.000 minutes, duration = 120 seconds
*measure waves every 3 tide samples
*512 wave samples/burst at 4.00 scans/sec, duration = 128 seconds
*logging start time = do not use start time
*logging stop time = do not use stop time
*
*tide samples/day = 288.000
*wave bursts/day = 96.000
*memory endurance = 218.6 days
*nominal alkaline battery endurance = 319.5 days
*total recorded tide measurements = 17
*total recorded wave bursts = 5
*tide measurements since last start = 17
*wave bursts since last start = 5
*
```

```
*transmit real-time tide data = NO
*transmit real-time wave burst data = NO
*transmit real-time wave statistics = NO
*
*status = stopped by user
*logging = NO, send start command to begin logging
*S>DC
*Pressure coefficients:
* U0 = 5.856409e+00
* . . . (more pressure sensor calibration coefficients)
* M = 279620.2
* B = 18641.3
* offset = 0.000000e+00
*Temperature coefficients:
* TA0 = 5.473956e-04
* TA1 = 1.803112e-04
* TA2 = 3.899926e-06
* TA3 = 6.722141e-09
*S>DD
FFFFFFFFFBFFFFFFFF      (flag beginning of tide parameters)
091CB0510000000000      (time of beginning of first tide sample)
012C00010000000000      (tide sample interval, wave integration period)
FFFFFFFFFCFFFFFFFF      (flag end of tide parameters)
3FB78A6CA4091CB051      (tide data – pressure, temperature, and time)
3FB7DE6CEB091CB17D      (tide data – pressure, temperature, and time)
3FB8F66D33091CB2A9      (tide data – pressure, temperature, and time)
000000000000000000      (flag beginning of wave burst)
091CB3220200000000      (time of beginning of wave burst, number of samples in burst)
029B83E80000000000      (pressure temp. compensation #, number of samples in burst)
87CED887CED6            (wave burst pressure data)
…                       (wave burst pressure data)
87CEE087CEEA            (wave burst pressure data)
FFFFFFFFFFFFFFFFFF      (flag end of wave burst)
3FB8BE6D77091CB3D5      (tide data – pressure, temperature, and time)
3FB8DA6DBD091CB501      (tide data – pressure, temperature, and time)
3FB9826E01091CB62D      (tide data – pressure, temperature, and time)
000000000000000000      (flag beginning of wave burst)
```

4.2.1 Tide Data

Tide Line (lines following S>DD, above)	**26plus without Conductivity (all flags and tide data are 9 bytes = 18 Hex characters)**
1*	FFFFFFFFFBFFFFFFFF - Flag start of setup parameters
2*	091CB0510000000000 – First 4 bytes is start time (seconds since January 1, 2000) of integration of first tide sample. Remaining bytes are 0's.
3*	012C00010000000000 - First 2 bytes (012C) is tide sample interval (seconds); next 2 bytes (0001) is number of 0.25-second periods to integrate wave samples. Remaining bytes are 0's
4*	FFFFFFFFFCFFFFFFFF - Flag end of setup parameters.

5	3FB78A6CA4091CB051 - Tide record (pressure, temperature, and time). First 3 bytes (3FB78A) is pressure number (p_dec_tide), next 2 bytes (6CA4) is temperature number, and last 4 bytes (091CB051) is start time of tide measurement (seconds since January 1, 2000).
6	3FB7DE6CEB091CB17D - Tide record (pressure, temperature, and time). First 3 bytes (3FB7DE) is pressure number (p_dec_tide), next 2 bytes (6CEB) is temperature number, and last 4 bytes (091CB17D) is start time of tide measurement (seconds since January 1, 2000).
7	3FB8F66D33091CB2A9 - tide record (pressure, temperature, and time). First 3 bytes (3FB8F6) is pressure number (p_dec_tide), next 2 bytes (6D33) is temperature number, and last 4 bytes (091CB2A9) is start time of tide measurement (seconds since January 1, 2000).
8	000000000000000000 - Flag beginning of wave burst. Setup for this example was to measure waves every 3 tide samples, so there are 3 tide records (lines 5 to 7) before wave burst flag.

* An uploaded file that includes multiple logging sessions contains these four records at the start of each logging session, to provide sampling parameters for that logging session.

The tide data conversions are described below:
pressure (p_psia_tide)= [slope correction * (p_dec_tide - B) / M] + offset correction

where

- Pressure number (p_dec_tide) is the first 3 bytes (6 characters) of the tide data, converted from Hex to decimal.
- Slope and offset corrections are read from the Convert Hex calibration coefficients (.psa) file, and will usually be 1.0 and 0.0, respectively. Note that the pressure number already includes the effect of the offset entered in the 26plus EEPROM with the POffset= command.
- M and B are scaling parameters that depend on pressure sensor range. They are calculated by the 26plus and can be found in the header text.

temperature (° C) = (temperature number / 1000) – 10

where

- Temperature number is the next 2 bytes (4 characters) of the tide data, converted from Hex to decimal.

time = time number = number of seconds since January 1, 2000

- Time is the last 4 bytes (8 characters) of the tide data, converted from Hex to decimal.

4.2.2 Wave Burst Data

Wave Burst Line	26plus without Conductivity (all wave pressure data is 6 bytes = 12 Hex characters; all flags and other wave data is 9 bytes = 18 Hex characters)
1	000000000000000000 - Flag beginning of wave burst.
2	091CB3220200000000 – First 4 bytes (091CB322) is start time (seconds since January 1, 2000) of wave burst. Next byte (02) is MSB of number of samples in wave burst. Remaining bytes are 0's.
3	029B83E80000000000 - First 4 bytes (029B83E8) is pressure temperature compensation number. Next byte (00) is LSB of number of samples in wave burst. (For example shown, number of samples in wave burst = 0200 Hex = 512 decimal). Remaining bytes are 0's.
4 (and following)	87CED887CED6 - First 3 bytes (87CED8) is pressure number for first wave measurement (p_dec_wave), last 3 bytes (87CED6) is pressure number for second wave measurement (p_dec_wave). Each subsequent line also contains data for 2 wave measurements. There are a total of [(wave samples/burst) / 2] lines of wave pressure data.
Last	FFFFFFFFFFFFFFFFFF - Flag end of wave burst.

The wave burst data conversions are described below:

Pressure temperature compensation frequency (Hz) = PTCF = pressure temperature compensation number / 256

Pressure frequency (Hz) = PF = p_dec_wave / 256

Pressure is computed as follows:

U = [(1.0 / PTCF) * 1000000] - U0
C = C1 + (C2 * U) + (C3 * U^2)
D = D1 + D2 (but D2 = 0, so D = D1)
T0 = (T1 + T2 * U + T3 * U^2 + T4 * U^3) / 1,000,000
W = 1.0 - (T0 * T0 * PF * PF)

pressure (p_psia_wave) = slope correction * [{C * W * (1.0 - D * W)} + POffset] + offset correction

where

- U0, C1, C2, C3, D1, D2, T1, T2, T3, T4, and POffset are entered in the 26plus EEPROM at the factory using the calibration coefficient commands

header (in the DC command response).

- Slope and offset corrections are read from the Convert Hex calibration coefficients (.psa) file.

4.3 Processing Flow

The specific steps necessary to create all calibrated and quality controlled data products for each PRESF instrument are described in the instrument-specific Processing Flow documents (DCN 1342-00230). The processing flow documents contain flow diagrams detailing all of the specific procedures (data product and QC) necessary to compute all levels of data products from the instrument and the order in which these procedures should be carried out.

The processing flow for the Seafloor Pressure computation is as follows (in Matlab syntax):

1) The algorithm input is the L0 pressure data product in hex format (p_hex) and calibration coefficients (.psa) file.
    a. If the instrument is in real-time polled mode, the SFLPRES-RTIME data product will already be temperature-compensated L0 pressure in ASCII text format. **Skip to step 4**.

2) Convert the 18 or 12 character hexadecimal string (p_hex) to a decimal string (“p_dec_tide” for SFLPRES-TIDE data, or “p_dec_wave” for SFLPRES-WAVE data)

3) Slope and offset correction, using information provided by SeaBird in the L0 input header text and Convert Hex calibration coefficients (.psa) file. By default, the slope correction will be 1.0, and the offset correction will be 0.0.
    a. For tide data:
       p_psia_tide = [slope correction * (p_dec_tide - B) / M] + offset correction

    b. For wave data:
       p_psia_wave = slope correction * [{C * W * (1.0 - D * W)} + POffset] + offset correction

4) Scaling: To convert from psia to dbar, use the Sea-Bird-specified conversion:
       p_dbar = 0.689475728 *(p_psia)

5) Convert time from seconds since January 1, 2000 to standard OOI time.

6) The final product is the L1 Seafloor Pressure data product in dbar (SFLPRES-RTIME, SFLPRES-TIDE, or SFLPRES-WAVE depending on input data).

Examples taken from the SBE-26plus manual are included in Appendix A.

4.4 Outputs

The outputs of the L1 Seafloor Pressure computation are

- SFLPRES-RTIME, the real-time absolute pressure of seawater data parameter (aka. Tide record; p_dbar_rtime) in dbar, as a floating point number with four decimal places %.4f.

  or (in post-recovery mode)

- SFLPRES-TIDE, the absolute pressure of seawater (aka. Tide record; p_dbar_tide) in dbar, as a floating point number with four decimal places %.4f.
- SFLPRES-WAVE, the wave burst data in dbar (aka. p_dbar_wave), as a floating point number with four decimal places %.4f

The metadata that must be included with the output are

- Calibration coefficients file (.psa) from manufacturer
- Instrument self-description and configuration information from L0 input file header (see example in Section 4.2), which includes:
    - Instrument Description

  - File Name
  - Software Version
  - Instrument Serial Number and Calibration Date
  - User Info
  - Pressure Transducer Serial Number and Range
  - Temperature Sensor
  - Conductivity Sensor (yes/no)
  - Battery and Resistance Information
  - Last Sample (pressure and temperature)
  - Tide Measurement Interval and Duration
  - Wave Burst Interval, Samples per Burst, and Duration
  - Logging Start Time
  - Logging Stop Time
  - Tide Samples/Day
  - Wave Bursts/Day
  - Memory Endurance
  - Nominal Alkaline Battery Endurance
  - Total Recorded Tide Measurements
  - Total Recorded Wave Bursts
  - Tide Measurements since Last Start
  - Wave Bursts since Last Start
  - Real-Time Transmission Settings
  - Status
  - Logging (yes/no)
  - Pressure Coefficients (U0, C1, C2, C3, D1)
  - Scaling Parameters (M, B)
  - Offset
  - Temperature Coefficients (TA0, TA1, TA2, TA3)
- PRESTMP: Temperature as a floating point number with four decimal places %.4f
- TIDEINT: Tide sample interval in seconds, as a floating point number with zero decimal places, %.0f (**tide sample data only**)
- WAVEINT: Wave burst integration period in seconds, as a floating point number with two decimal places %.2f (**wave burst data only**)
- WAVEPNT: Number of points in wave burst, as a floating point number with zero decimal places, %.0f (**wave burst data only**)
- PRSSTRT: Logging Start Time
- PRSSTOP: Logging Stop Time
- Time

See Appendix B for a discussion of the accuracy of the output.

4.5 Computational and Numerical Considerations

4.5.1 Numerical Programming Considerations

There are no numerical programming considerations for this computation. No special numerical methods are used.

4.5.2 Computational Requirements

Computation estimate not required for algorithms that are not computationally intensive.

4.6 Code Verification and Test Data Set

The code will be verified using the test data set provided, which contains inputs and their associated correct outputs. CI will verify that the code is correct by checking that the output, generated using the test data inputs, is identical to the test data density output.

The test data set on Alfresco (Data Product Specification Artifacts **>** 1341-00230_SFLPRES > bath test-26p-1340-b1.hex) provides a post-recovery delayed mode data set in hex format from a water bath test at Sea-Bird. This data includes both tide (SFLPRES-TIDE) and wave (SFLPRES-WAVE) data.

Appendix A Example Data Processing

Example 1 (SFLPRES-TIDE):

tide record = 3FB78A6CA4091CB051 hex

The first 3 bytes are 3FB78A hex = 4175754 decimal = p_dec_tide

For this example, M = 279620.2 and B = 18641.3 (in DC response in .hex file)

Assume slope correction = 1.0 and offset correction = 0 in the .psa file.

p_psia_tide = [slope correction * (p_dec_tide - B) / M] + offset correction
p_psia_tide = [1.0 * (4175754 – 18641.3) / 279620.2] + 0 = 14.8670 psia
p_dbar = 0.689475728 *(p_psia_tide)
SFLPRES-TIDE = p_dbar = 0.689475728 *(14.8670) = 10.2504 dbar

The next 2 bytes are 6CA4 hex = 27812 decimal.

temperature = (temperature number / 1000) – 10 = (27812 / 1000) - 10 = 17.812 °C

The last 4 bytes are 091CB051 hex = 152875089 decimal

Time = 152875089 seconds since Jan. 1, 2000 = November 4, 2004, 09:18:09

Example 2 (SFLPRES-WAVE):

000000000000000000	(flag beginning of wave burst)
091CB3220200000000	(time of beginning of wave burst, number of samples in burst)
029B83E80000000000	(pressure temperature compensation number, number of samples in burst)
87CED887CED6	(wave burst pressure data)
...	(wave burst pressure data)
87CEE087CEEA	(wave burst pressure data)
FFFFFFFFFFFFFFFFFF	(flag end of wave burst)

Pressure temperature compensation & number of samples = 029B83E80000000000 hex

Pressure temperature compensation number = 029B83E8 hex = 43746280 decimal

Pressure number for first wave burst pressure data (first 3 bytes) = 87CED8 hex = 8900312 decimal = p_dec_wave

Pressure temperature compensation frequency = PTCF = pressure temperature compensation number / 256 = 43746280 / 256 = 170883.90 Hz

Pressure frequency = PF = **p_dec_wave** / 256 = 8900312 / 256 = 34766.843 Hz

Using calibration coefficients from uploaded hex file:
U0 = 5.856409e+00, Y1 = -3.987838e+03, Y2 = -1.049603e+04,
Y3 = 0.000000e+00, C1 = 2.305367e+02, C2 = 1.198422e+01,
C3 = -2.401512e+02, D1 = 4.095400e-02, D2 = 0.000000e+00,
T1 = 2.781994e+01, T2 = 6.760780e-01, T3 = 1.761829e+01,

T4 = 6.000932e+00, POffset = 0

U = [(1.0 / PTCF) * 1,000,000] - U0 = [(1.0 / 170883.90) * 1,000,000] - 5.856409e+00 = -0.004482634

C = C1 + (C2 * U) + (C3 * U^2) = 2.305367e+02 + (1.198422e+01 * U) + (-2.401512e+02 * U^2) = 2.305367e+02 - 0.05372087 - 0.004825600 = 2.304782e+02

D = D1 + D2 = 4.095400e-02+ 0 = 4.095400e-02

T0 = (T1 + T2 * U + T3 * U^2 + T4 * U^3) / 1,000,000 = (2.781994e+01 + 6.760780e-01* U + 1.761829e+01 * U^2 + 6.000932e+00 * U^3) / 1000000 = (2.781994e+01 - 3.030610e-03 + 3.540221e-04 - 5.405284e-07) / 1,000,000 = 2.7817266e-05

W = 1.0 - (T0 * T0 * PF * PF) = 1.0 - (2.7817266e-05 * 2.7817266e-05 * 34766.843 * 34766.843) = 6.468177e-02

p_psia_wave = slope correction * [{C * W * (1.0 - D * W)} + POffset] + offset correction

For this example, assume slope correction = 1.0, and offset correction = 0.

p_psia_wave = (2.304782e+02) * (6.468177e-02) * (1.0 – [4.095400e-02 * 6.468177e-02]) = 14.868 psia

SFLPRES-WAVE = p_dbar = 0.689475728 * 14.868 psia = 10.2511 dbar

Appendix B Output Accuracy

The accuracy of the L1 SFLPRES data product is a function of the pressure transducer accuracy only and any offset associated with sensor drift. The SeaBird instrument contains a transducer manufactured by Paroscientific, who list the nominal accuracy of the Digiquartz series of pressure transducers as 0.01 % of full scale or better over the operational pressure and temperature range, and 0.05% annual drift. The SeaBird SBE-26plus instrument provides resolution of between 0.005 to 0.055%, depending on the pressure range.

The DOORS requirements for accuracy and resolution of the Level 1 Seafloor Pressure data product calculated as described herein are:

> Seafloor pressure instruments shall have an accuracy of ±0.01% of the maximum value of the operational depth range. [L4-CG-IP-RQ-583]
>
> Seafloor pressure instruments shall have a resolution of 0.002% of the maximum value of the operational depth range. [L4-CG-IP-RQ-584]

Appendix C Sensor Calibration Effects

This instrument is calibrated at the factory, resulting in a series of coefficients that allow for raw counts and wave bursts to be transformed into a viable pressure value. The instrument data output in “real-time” mode is a pressure value that has been internally computed using the onboard calibration coefficients. These coefficients will be associated with each instrument instance deployment and periodically checked to insure that they remain constant over the deployment. Drift correction will be applied to the post-recovery data by comparing pre- and post-deployment calibration values following post-recovery data download.