Data Conversion

Data Conversion:

1. Converts raw data to engineering units from:
   - .dat file from SBE 911*plus*, acquired with Seasave version < 6.0, or
   - .hex file from SBE 911*plus* (acquired with Seasave version ≥ 7.0), or
   - .hex file from other CTDs, acquired with any version of Seasave or by uploading data from memory (if applicable), or
   - .xml file uploaded from SBE 25*plus*.
2. Stores the converted data in a .cnv file and (optional) .ros file.

The File Setup and Header View tabs in the dialog box for all the modules are similar. See File Setup Tab and Header View Tab.

This topic covers:

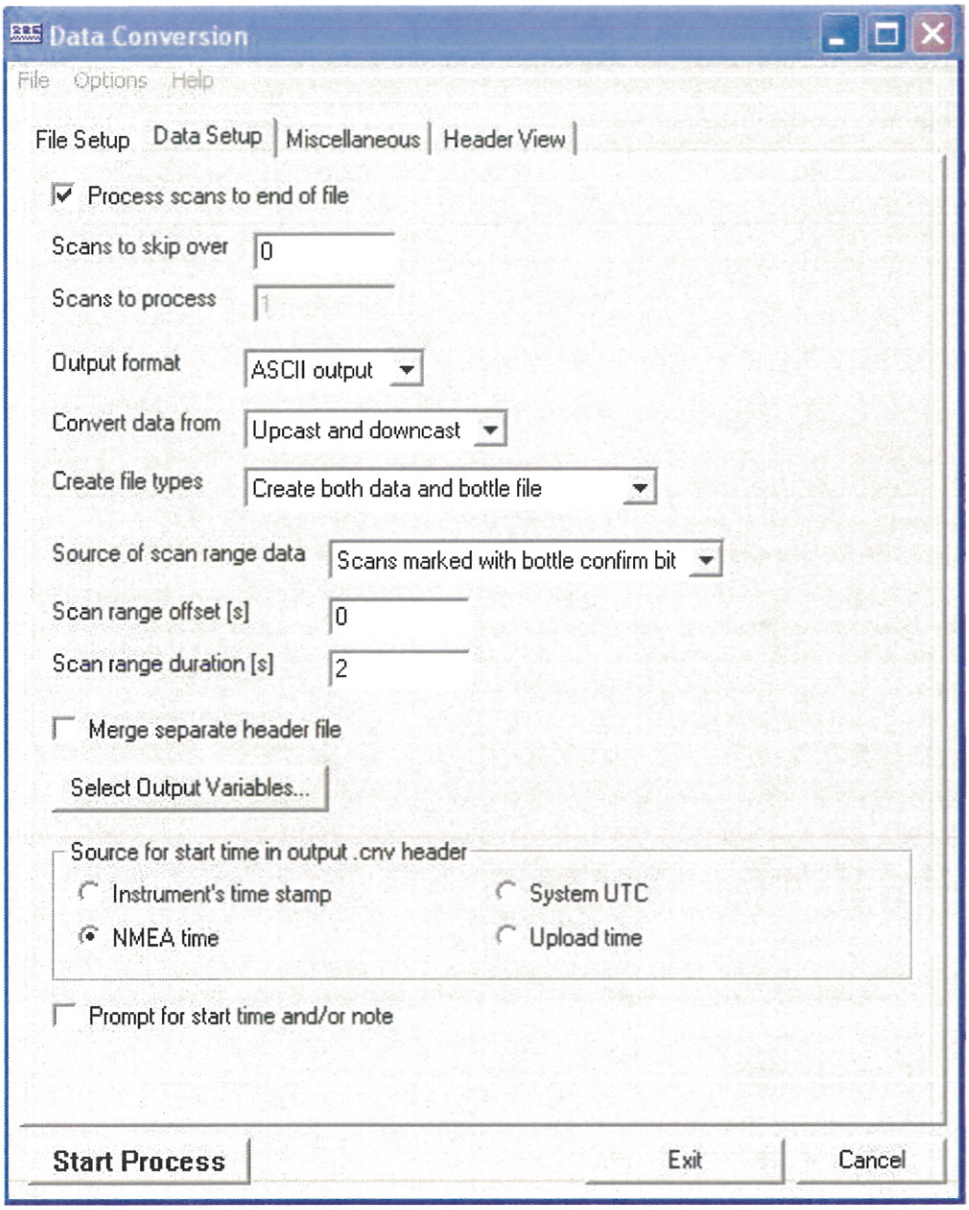
- Data Setup tab for Data Conversion
- Miscellaneous tab for Data Conversion
- Creating Water Bottle (.ros) files
- Notes and General Information

NOTE

- Algorithms used for calculation of derived parameters in Data Conversion, Derive, Sea Plot, SeaCalc III [EOS-80 (Practical Salinity) tab], and Seasave are identical, except as noted in Derived Parameter Formulas (EOS-80; Practical Salinity), and are based on EOS-80 equations.

Data Setup Tab

The Data Setup tab in the dialog box looks like this:



The dialog box entries and buttons are:

- **Process scans to end of file**: If selected, process all remaining scans (upcast and downcast if *upcast and downcast* selected; downcast scans only if *downcast* selected) after **Scans to skip over**. If not selected, process next **Scans to process**.
- **Output format**: Select binary (smaller file, processed faster than ASCII file by other SBE Data Processing modules) or ASCII (larger file, can be viewed with a text editor). Note that Translate can translate converted data file from binary to ASCII or vice versa.
- **Convert data from**: Select downcast or upcast and downcast.
- **Create file types**: Select create converted data file only, bottle file only (for subsequent processing by Bottle Summary), or both.
- **Source of scan range data** (for creating bottle file):
    - In same directory as input data file, with same file name - auto fire module or ECO .afm file, bottle log .bl file, or bottle scan range .bsr file, **or**
    - scans marked with bottle confirm bit in input data file

  See Creating Water Bottle (.ros) Files.

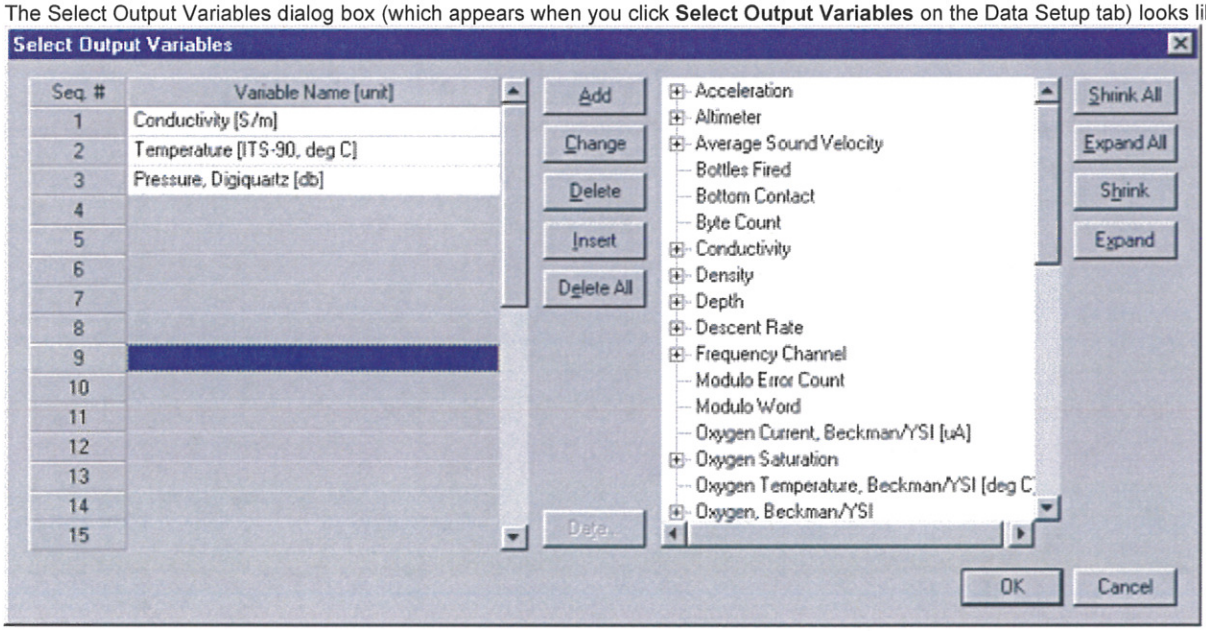
- **Scan range offset** and **Scan range duration**: Define scans from CTD data file to be included in bottle file for each bottle. See Creating Water Bottle (.ros) Files.
- **Merge separate header file**: Select to replace existing header in input file with header in .hdr file. Program looks for a file with a matching name (but .hdr extension) in same directory as input file.
- **Select Output Variables**: Select which variables to convert and output. See discussion below.
- **Source for start time in output .cnv header**:

- Instrument's time stamp -- Instrument's time stamp in first data scan (if available) or in header of input raw data file.
- NMEA time -- time from a NMEA device that was integrated with system; time in first data scan (if available) or in header of input raw data file.
- System UTC -- computer time in first data scan (if available) or in header of input raw data file.
- Upload time -- time that data was uploaded from instrument's memory.

- **Prompt for start time and/or note**: Select to have software prompt you to modify start time to put in output .cnv header (instead of using one of sources for start time listed above), or to add a note to output .cnv header.
- **Start Process**: Begin processing data. Status field on File Setup tab shows *Processing complete* when done.
- **Exit** or **Save & Exit**: Return to SBE Data Processing window:

  - If *Confirm Program Setup Change* was selected in Options menu Button says **Exit**. If you made changes and did not Save or Save As, program asks if you want to save changes.
  - If *Confirm Program Setup Change* was not selected in Options menu Button says **Save & Exit**. If you do not want to save changes, use Cancel button to exit.

The Select Output Variables dialog box (which appears when you click **Select Output Variables** on the Data Setup tab) looks like this:



The list on the right includes all variables that can be converted from the input data file or derived from variables in the input data file. Add, change, and insert variables in the variable-to-output list:

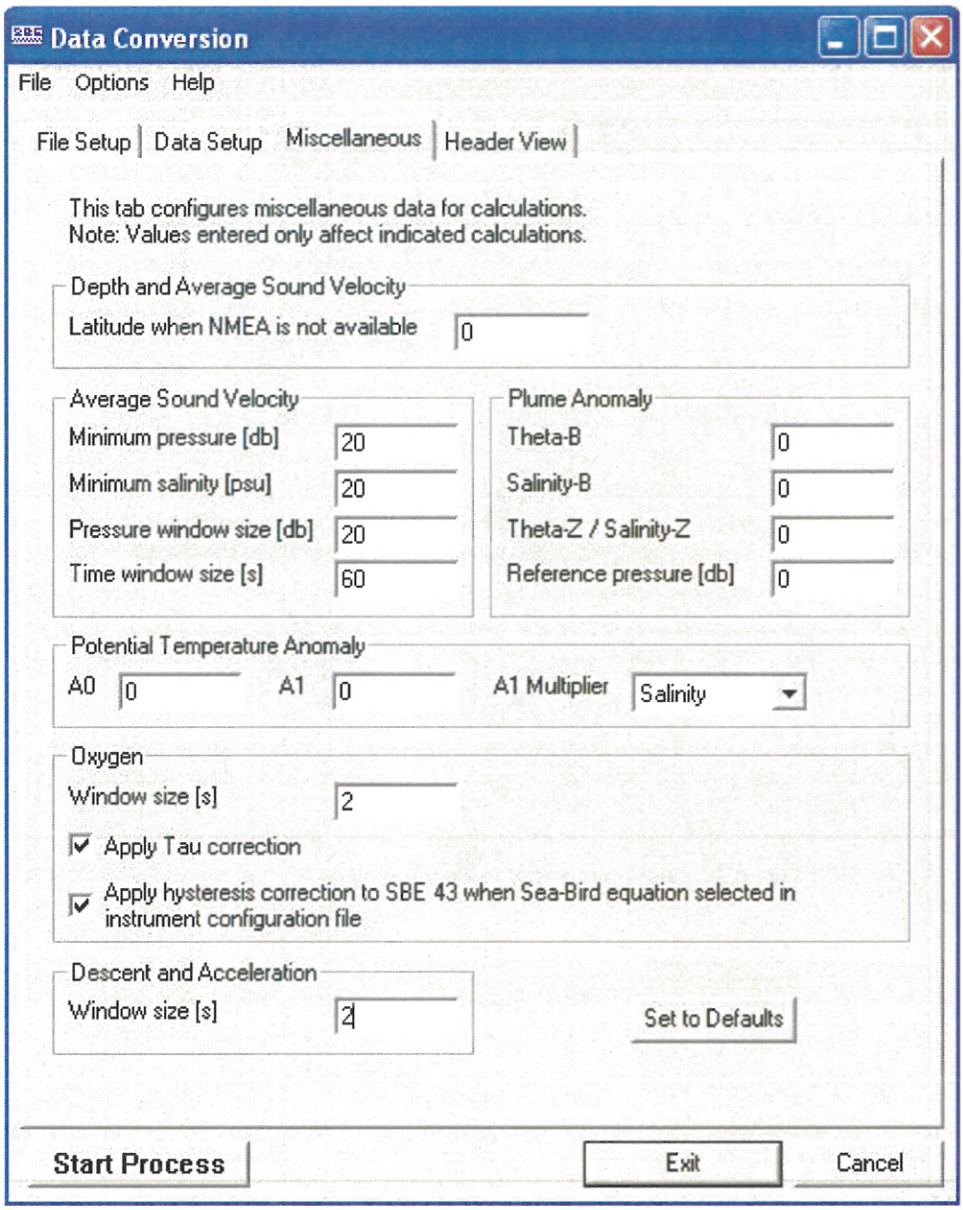
- **Add** a variable to bottom of list: click blank field in Variable Name column, click desired variable in list, click **Add**.
- **Change** a variable from one to another: click existing variable in Variable Name column, click desired variable in list, click **Change**.
- **Insert** a variable in list: click existing variable ***below*** desired sequence # in Variable Name column, click desired variable in list, click **Insert**.

NOTE: If Data Conversion requires additional information to compute a variable, a dialog box appears after variable is selected, with fields for required user-input parameters. Some variables *share* a user-input parameter, so changing a user-input parameter for one variable automatically changes it for other variable: Depth and average sound velocity use the same latitude (if NMEA data not available); descent rate and acceleration use same time window size; all SBE 13, 23, and 43 oxygen sensors use same time window size, Tau correction, and (SBE 43 only) hysteresis correction.

Click the **Data** button to view / modify user-input parameters for the selected variable (if applicable).
Note: An alternate method of entering these parameters is on the Miscellaneous tab in the Data Conversion dialog box.

Miscellaneous Tab

The Miscellaneous tab in the Data Conversion dialog box looks like this:



The Miscellaneous tab defines parameters required for output of specific variables (depth, average sound velocity, plume anomaly, potential temperature anomaly, oxygen, descent rate, and acceleration). Entries on this tab are used only if you are calculating and outputting the associated variable to the .cnv file. For example, if you do not select data from a voltage Oxygen sensor in the Select Output Variables dialog box, Data Conversion ignores the value entered for Oxygen window size and the enabling of hysteresis and Tau corrections on the Miscellaneous tab.
Note: Values for these parameters can be changed on the Miscellaneous tab or using the Data button in the Select Output Variables dialog box; changes made in one location are automatically made in the other location.

NOTE
Oxygen selections on the Miscellaneous tab apply to SBE 43 and Beckman/YSI sensors. They do not apply to SBE 63 or Aanderaa Oxygen Optode.

Creating Water Bottle (.ros) Files

A .ros water bottle file contains:

- data for each scan associated with a bottle firing, and
- data for user-selected range of scans before and after each bottle firing

Scan range data for creation of a water bottle file can come from:

- *Scans marked with bottle confirm bit in input data file* if used
  - SBE 9*plus* with SBE 11*plus* Deck Unit and G.O. 1015 Rosette **or**

- SBE 9*plus* with SBE 17*plus* Searam and SBE 32 Carousel Water Sampler.
  For these systems, the bottle confirm bit in the input (.hex or .dat) data file is set for all scans within a 1.5-second duration after a bottle firing confirmation is received from the water sampler.
- *Bottle log (.bl) file* if used Seasave to interface with
  - SBE 9*plus* with SBE 11*plus* Deck Unit and G.O. 1016 Rosette or SBE 32 Carousel Water Sampler, **or**
  - SBE 19, 19*plus*, 19*plus* V2, 25, or 49 with SBE 33 Deck Unit and SBE 32 Carousel Water Sampler, **or**
  - SBE 19, 19*plus*, 19*plus* V2, 25, or 49 with SBE 33 Deck Unit and SBE 55 ECO Water Sampler.

  For these systems, Seasave creates the .bl file. Each time a bottle fire confirmation is received, the bottle sequence number, position, date, time, and beginning and ending scan numbers (1.5-second duration for each bottle) are written to the .bl file.
- *Auto Fire Module or ECO (.afm) file* if used
  - Carousel Auto Fire Module (AFM) with SBE 19, 19*plus*, 19*plus* V2, 25, or 50 and SBE 32 Carousel Water Sampler, **or**
  - SBE 55 ECO Water Sampler (autonomous operation) with SBE 19, 19*plus*, 19*plus* V2, 25, or 50.

  For these systems, the .afm file contains five scans of data recorded by the AFM or SBE 55 ECO Water Sampler for each bottle firing.
- *Bottle scan range (.bsr) file* if used Mark Scan feature in Seasave during data acquisition to create a .mrk file; use Mark Scan to convert the .mrk file to a .bsr file before running Data Conversion. The format for the .bsr file is:
  beginning scan # for bottle #1, ending scan # for bottle #1
  &
  beginning scan # for last bottle, ending scan # for last bottle
  Example: test.bsr contains

```
1000, 1020
2000, 2020
4000, 4020
```

  The .ros file created using test.bsr would contain scans 1000 - 1020 for bottle #1, 2000 - 2020 for bottle #2, and 4000 - 4020 for bottle #3.

NOTES

- You may have more than one source of scan range data available. For example, if Seasave is used with an SBE 911*plus* and SBE 32 Carousel Water Sampler, a bottle log (.bl) file is created. Additionally, if you used the Mark Scan feature in Seasave, a .mrk file is created.
- If scan range data is defined by a .afm file, Data Conversion creates a .bl file (same name as input data file, with .bl extension). The .bl file is used when processing the water bottle data in Bottle Summary.
- You can create a .bsr file in a text editor if scan range data is not available in any of these forms.

The amount of data written to the .ros file is based on:

- *Scan range offset* determines the first scan output to the .ros file for each bottle, relative to the first scan with a confirmation bit set or written to a .afm, .bsr, or .bl file.
- *Scan range duration* determines the number of scans output to the .ros file for each bottle.

Example: A bottle confirmation for an SBE 911*plus* is received at scan 10,000 (scan 10,000 and subsequent scans for 1.5 seconds have confirmation bit set). In Data Conversion, *Scan range offset* is set to -2 seconds, and *Scan range duration* is set to 5 seconds. If the scan rate is 24 scans/second,
10,000 - 2 second offset (24 scans/second) = 9,952
9,952 + 5 second duration (24 scans/second) = 10,072
Therefore, scans 9,952 through 10,072 will be written to the .ros file.

Notes and General Information

Data Conversion was written to accommodate most sensors that have been installed on Sea-Bird products. See the configuration page at the beginning of your instrument manual for the sensors that were installed on your system.

- If you plan to process the data with other modules, select only the primary variables to be converted, and then use Derive to compute derived parameters such as salinity, density, sound velocity, and oxygen.
  If you choose to compute derived parameters in Data Conversion, note that the algorithms are the same as used in Derive (with the exception of the oxygen, descent rate, and acceleration calculations); see Derived Parameter Formulas for algorithms for derived variables.
- If desired, you can select the same variable multiple times for the output .cnv file. If you do, data processing operations on that variable in other modules will use the *last* occurrence of the variable in the file.
  Example: Select Primary Conductivity, Primary Temperature, Pressure, and Primary Conductivity (again) for output variables (columns 1, 2, 3, and 4 respectively). Then, if you run Cell Thermal Mass, it will correct the conductivity in column 4 only, leaving column 1 uncorrected; you could plot the corrected and uncorrected conductivity to see the changes. If you then run Derive to calculate salinity, it will use the corrected conductivity in column 4 in the salinity calculation.
- If you will use Derive to compute:
  - Salinity, density, or other parameters that depend on salinity -- include pressure, temperature, and conductivity in the output file. For a moored instrument without optional pressure sensor (SBE 16, 16*plus*, 16*plus*-IM, 16*plus* V2, 16*plus*-IM V2), if you select pressure as an output variable, Data Conversion inserts a column with the moored pressure (entered in the configuration file *Data* dialog) in the output .cnv file. For a thermosalinograph (SBE 21 or 45), if you select pressure as an output variable, Data Conversion inserts a column of 0s for the pressure in the output .cnv file. The pressure column is needed for Derive to calculate salinity, density, etc.
  - Oxygen -- include in the output file (along with pressure, temperature, and conductivity):

For SBE 13 or 23: oxygen current and oxygen temperature
For SBE 43: oxygen value

- If you will use Bin Average:
  - With depth bins -- include depth in the output file
  - With pressure bins -- include pressure in the output file

- Pressure temperature is computed using a backward-looking, 30-second running average, to prevent bit transitions in pressure temperature from causing small jumps in computed pressure. Because the heavily insulated pressure sensor has a thermal time constant on the order of one hour, the 30-second average does not significantly alter the computed pressure temperature.
- Oxygen, descent rate, and acceleration computed by Seasave and Data Conversion is somewhat different from values computed by Derive, because the algorithms use the derivative of the signal (oxygen signal for oxygen, pressure signal for descent rate and acceleration) with respect to time, using a linear regression to determine the slope. Seasave and Data Conversion compute the derivative looking backward in time, since they share common code and Seasave cannot use future values of oxygen while acquiring data in real time. Derive uses a centered window (equal number of points before and after the scan; time window size is user input) to obtain a better estimate of the derivative. Use Seasave and Data Conversion to obtain a quick look at oxygen, descent rate, and acceleration; use Derive to obtain the most accurate values.
- For an SBE 21 or 45 with a remote temperature sensor, Seasave, Data Conversion, Derive, and Derive TEOS-10 all use the remote temperature data when calculating density and sound velocity.

Data Conversion has the following /x parameters when running from the Command Line Options dialog box, from the command line, or with batch file processing:

LABEL	DESCRIPTION
/xdatcnv:skipN	N = number of scans to skip in Data Conversion
/xdatcnv:pump	For SBE 911*plus*, do not output scans if pump status = off.
/xdatcnv:nomatch	Disable matching of header information to .con or .xmlcon file -- program will continue to run even if there is a discrepancy in header information.

See Command Line Options, Command Line Operation, and Batch File Processing for details on using parameter.

Data Conversion adds the following to the data file header for a **.cnv converted data file**:

LABEL	DESCRIPTION
Nquan	Number of columns (fields) of converted data. **NOTE**: Data Conversion automatically adds 1 field to the number selected by the user (i.e., if the user selects 3 variables to convert, then nquan=4). This added field, initially set to 0, is used by Loop Edit to mark bad scans.
Nvalues	Number of scans converted.
Units	Specified (indicates units are specified separately for each variable).
Name n	Sensor (and units) associated with data in column n.
Span n	Span (highest - lowest value) of data in column n.
Interval	Scan rate (seconds).
Start_time	Data start time.
Bad_flag	Provided for information only; value that Loop Edit will use to mark bad scans and Wild Edit will use to mark bad data values.
Sensors	Sensor description, serial number, and calibration date and coefficients, all in XML format.
Datcnv_date	Date and time that module was run. Also shows how many columns of data were output (not including flag column).
Datcnv_in	Input .hex (or .dat) data file and .con or .xmlcon configuration file.
Datcnv_skipover	Number of scans to skip over in processing.
Datcnv_ox_hysteresis_correction	Whether hysteresis correction was performed on oxygen data.
Datacnv_ox_tau_correction	Whether tau correction was performed on oxygen data.

File type	Selected output file type ascii or binary.

NOTES

- Each SBE Data Processing module that modifies a .cnv file adds information to the header and updates nquan, nvalues, name n, span n, interval, and file_type, as applicable.
- Calibration coefficients were added to the file header for a .cnv file and for a .ros water bottle file in SBE Data Processing version 7.19.

Data Conversion adds the following to the data file header for a **.ros water bottle file**:

LABEL	DESCRIPTION
Nquan	Number of columns (fields) of converted data. **NOTE**: Data Conversion automatically adds 1 field to the number selected by the user (i.e., if the user selects 3 variables to convert, then nquan=4). This added field, initially set to 0, is used by Loop Edit to mark bad scans.
Nvalues	Number of scans converted.
Units	Specified (indicates units are specified separately for each variable).
Name n	Sensor (and units) associated with data in column n.
Interval	Scan rate (seconds).
Start_time	Data start time.
Sensor	Sensor description, serial number, and calibration date and coefficients, all in XML format.
Datcnv_date	Date and time that module was run.
Datcnv_in	Input .hex (or .dat) data file and .con or .xmlcon configuration file.
Datcnv_bottle_ scan_range_ source	Source of data for creating bottle file, and scan range offset and duration.

See Also