TAMU Southern Ocean Research Group CTD processing manual

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Before going to sea/shipping equipment

Before shipping the CTD computer, make a copy of the most recent "*.con" file. Note: If you do not have the "*.con" file, but you have the configuration sheets for each instrument provided by SeaBird, you can use Seasave to make a "*con" file. Refer to the help menu in Seasave for instructions.

Before going to sea, download the most recent version of SeaBird's software and supporting documents from http://www.seabird.com/software/softrev.htm The most commonly used software is SeaSave and SBE Data Processing.

Data Processing

Folder Structure

Before processing data set up a folder for each processing step (Figure 1). The parent folder should be named "*CRUISE*_CTD_SeaSoft" where *CRUISE* is the name of the current program, e.g. for the 2009 ACROSS cruise, the parent folder was named "ACROSS_CTD_SeaSoft."

Inside this parent folder is a series of folders that are numbered and named to correspond to the processing steps in the SBE Data Processing program. They are set up with this nomenclature so that the step in which the data in each folder was created is obvious, they are listed in order in a computer directory, and no step writes over another.

Special settings (source/destination/ processing settings /etc) for each processing step are contained in the *.psa files. Any time a parameter is changed to a processing step, it is recorded in the psa file. These are only found inside the parent folder and not inside any other folder. It is a good idea to make a backup of these files e.g. "*CRUISE*_CTD_PSA_backup".

Note: The GERG deck units have NOT been set to do any processing for you (e.g. advancing conductivity, see AlignCTD help).

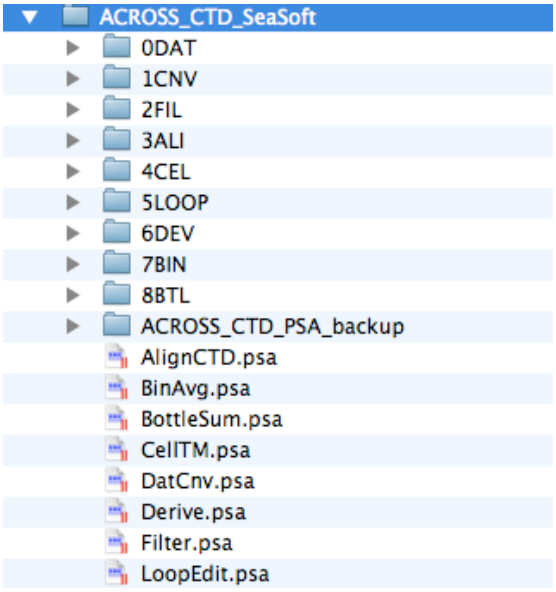

Figure 1: Folder structure needed to process CTD data using SBE Data Processing software.

Raw Data: "0DAT"

Copies of all raw data created from Seasave should be placed in the "0DAT" folder. Each station should have 4-5 files depending on whether or not bottles are fired during the upcast. If no bottles are fired each station should have: "*station*.hex" , "*station*.mrk", "*station*.hdr", and "*STATION*.CON". If bottles are fired, each station will have these 4 files plus "*station*.bl". The *STATION*.CON files will be exactly the same for all stations if no sensors are changed during the cruise. If a sensor is changed mid-cruise, the *STATION*.CON files for those stations will reflect those changes. Note: Typical station naming is sXXXcX where "s" indicates the station and "c" indicates the cast, e.g. s001c1,s002c1,s003c1, etc.

Data Conversion: "1CNV"

After starting the SBE Data Processing software click on Run > 1. Data Conversion…
This program converts the raw data from the SeaSave program in to readable cnv files.

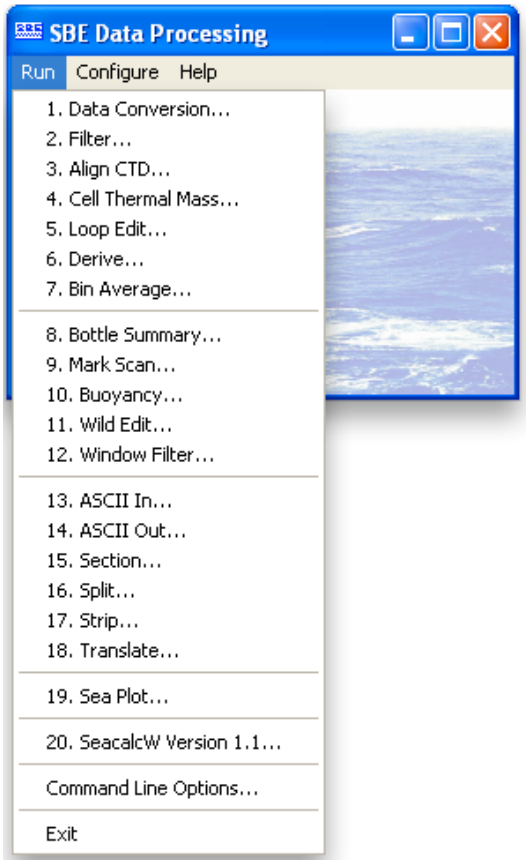

Figure 2: Menu options for SBE Data Processing

File Setup Tab:

-Program setup file:

If you don't have pre-formatted program setup files ("*.psa"), SBE Data Processing will create ones for you. If you do have an existing DatCnv.psa, choose it by clicking "Open" in the Program setup file section. Note: Selection of a *.psa files will be required for all steps of processing.

-Instrument configuration file:

These are located in the 0DAT folder (*STATION*.CON). Click "Select" and choose one. Check the "Match instrument configuration to input file" box.

-Input files: ~/0DAT/*.hex (select all or specific stations you want to process)

-Output directory: ~/1CNV

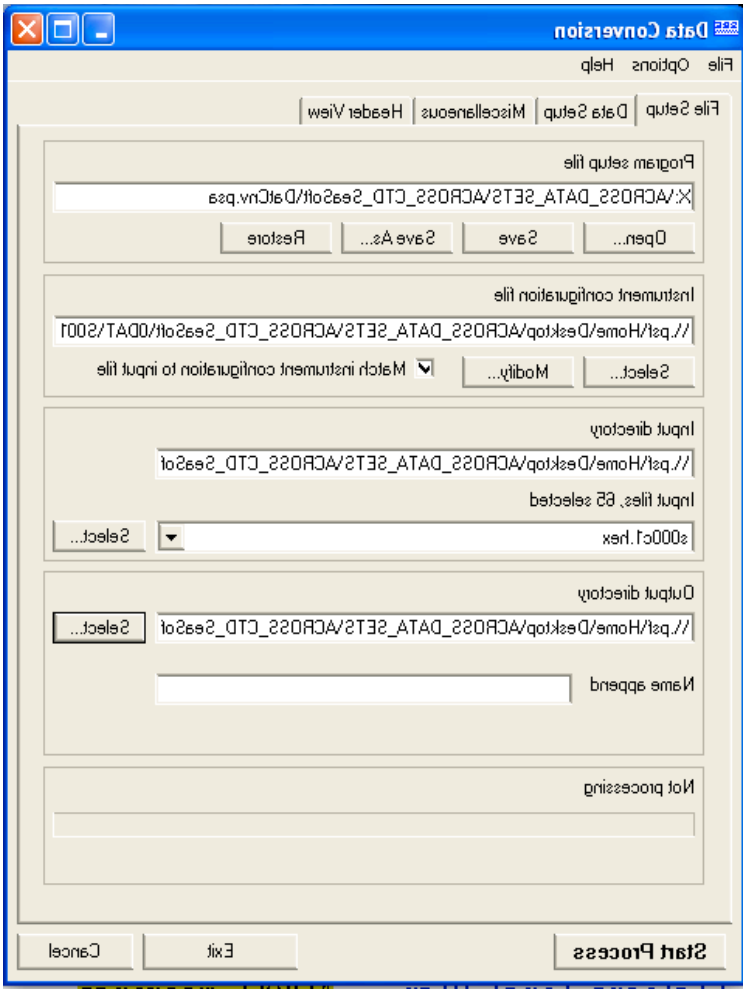

Figure 3: Example of Data Conversion> File Setup screen.

Data Setup tab: Refer to Figure 4 for correct inputs.

Modifications to Figure 4:

-Data files only: select "Create converted data (.CNV) file only" under "Create file types".

-Bottle files only: select "Create bottle (.ROS) file only" under "Create file types".

Note: Refer to *SeaBird Application Note No. 64-2: SBE 43 Dissolved Oxygen Sensor Calibration and Data Corrections using Winkler Titrations* for explanation of "Scan range offset(s)" and "Scan range duration(s)."

Once finished with the Data Setup tab, click on "Select Output Variables…"

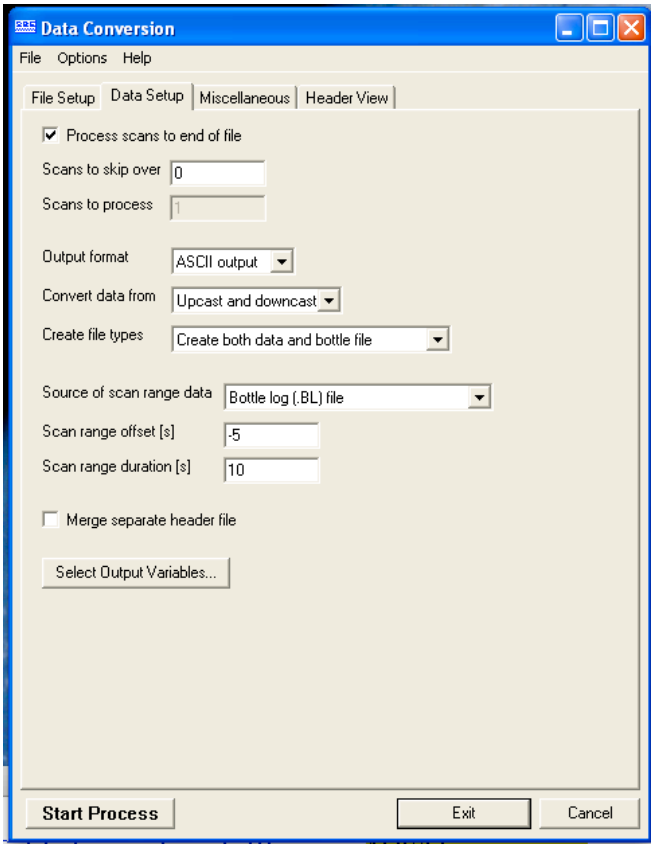

Figure 4: Example of Data Conversion> Data Setup screen.
(*normally I just use downcast and create cnv file)*

Select Output Variables:

For a typical TAMU Southern Ocean Research Group hydrographic cruise, the left side of Figure 5 lists the variables processed in the Data Conversion step. Depending on the cruise, some of these variables may not be available (e.g. no altimeter on the package).

Note: If a SBE 43 Oxygen sensor is on the package, "Oxygen Voltage, SBE 43" and "Oxygen Saturation [ml/l]" must be selected.

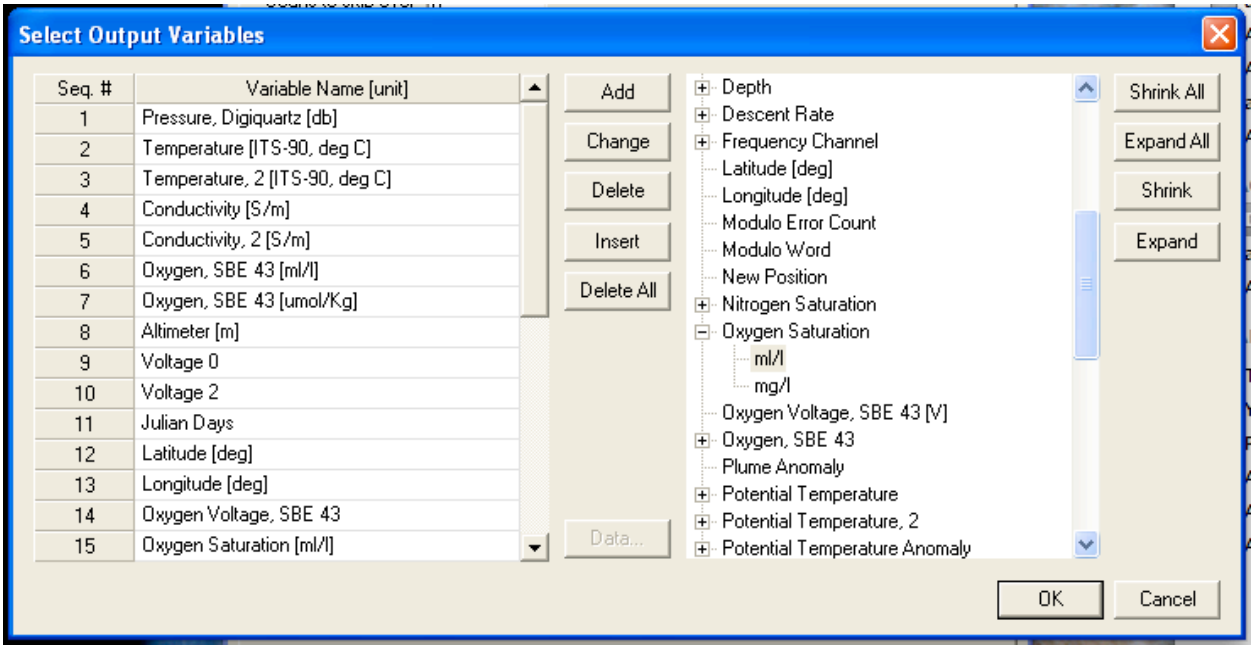

Figure 5: List of variables selected to be processed in the Data Conversion step.

Miscellaneous tab:

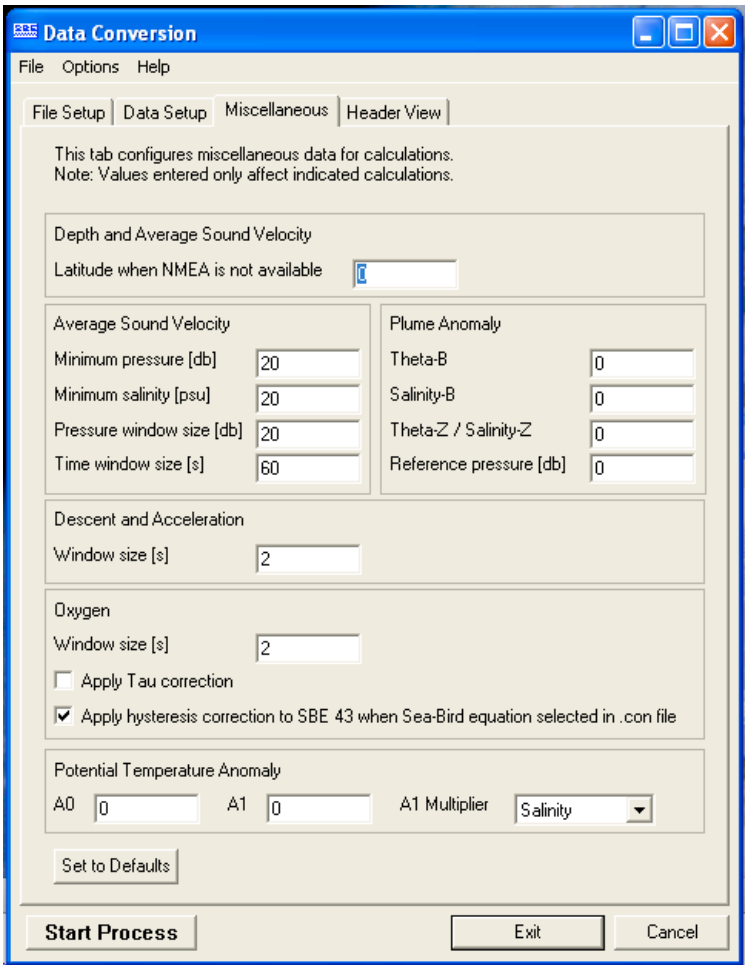

Figure 6: Example of Miscellaneous tab in Data Conversion step.
(Normally no hysteresis correction)

Filter: "2FIL"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted Filter.psa

-Input files: ~/1CNV/*.cnv

-Output directory: ~/2FIL

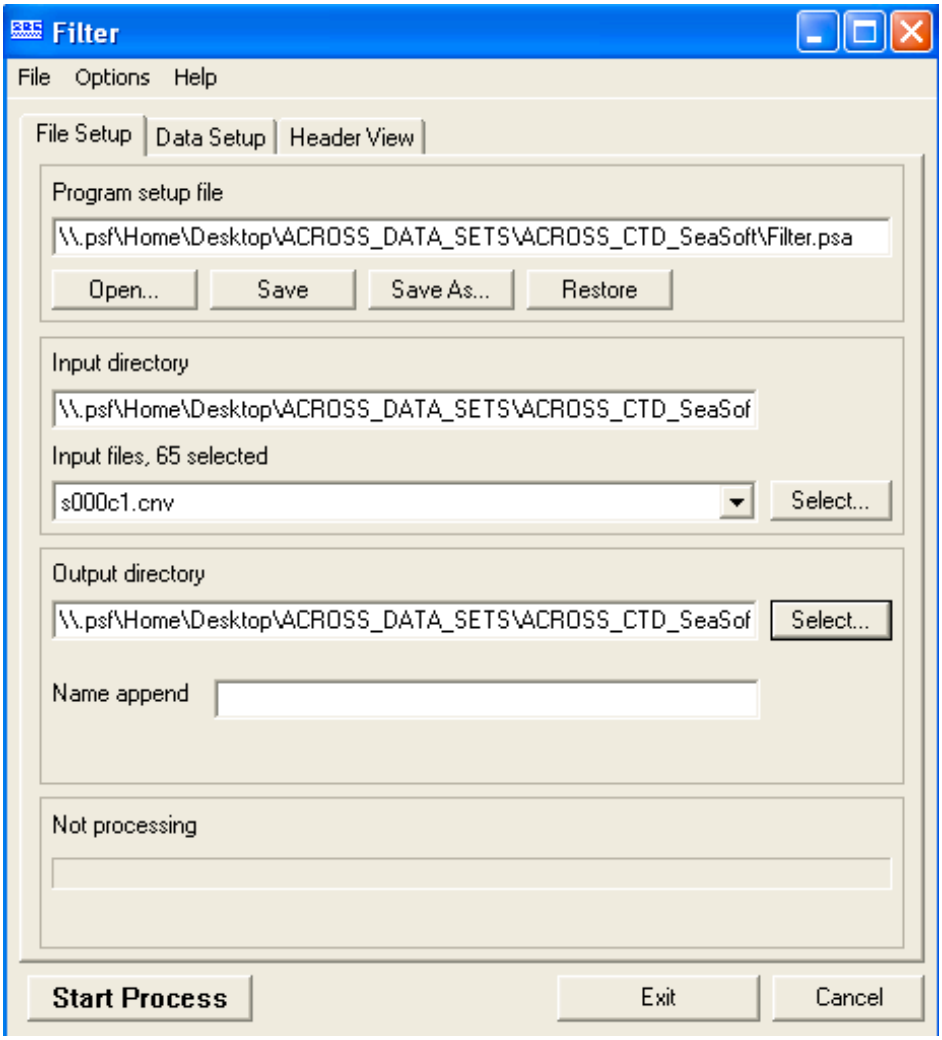

Figure 7: Example of Filter> File Setup screen

Data Setup tab:

Refer to the help menu (Help > Get Current Topic) for the correct low pass filter time constants which depend on the model of CTD you are using. To select filtered variables, click on "Specify Filters…" Note: For the SBE 9 plus apply 0.15 s low pass filter to Pressure only (Figures 8 and 9).

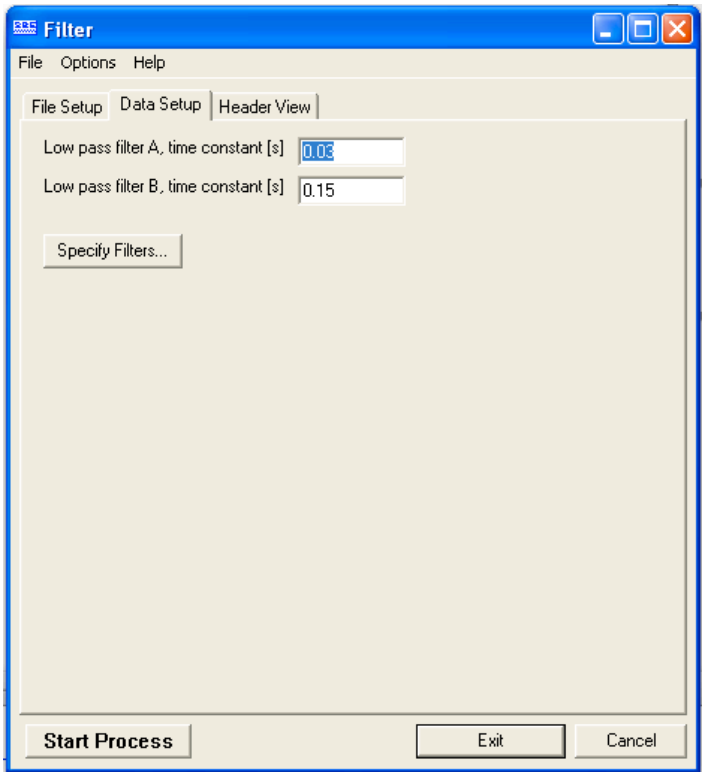

Figure 8 Example of Filter > Data Setup screen for SBE 9 plus.

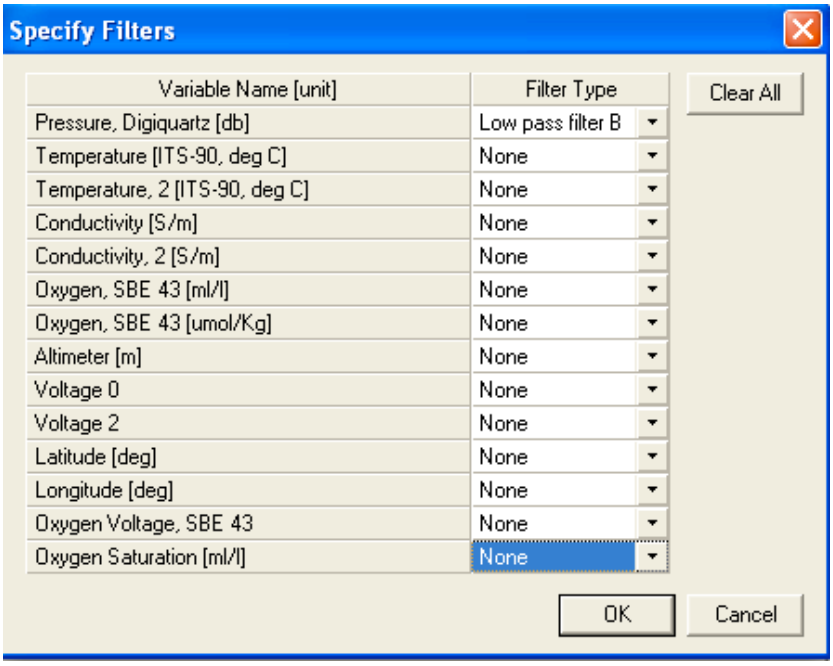

Figure 9: Example of Specify Filters for SBE 9 plus.

Align CTD: "3ALI"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted AlignCTD.psa

-Input files: ~/2FIL/*.cnv

-Output directory: ~/3ALI

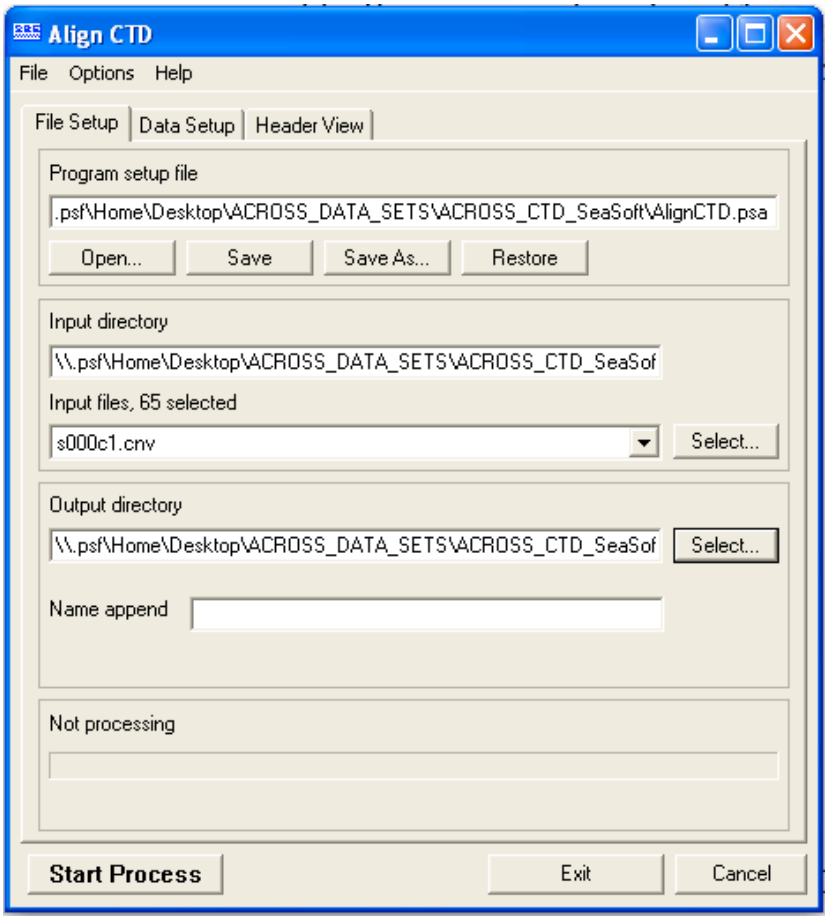

Figure 10: Example of Align CTD> File Setup screen

Data Setup tab > Enter Advanced Values:
Refer to the help menu (Help > Get Current Topic) for the correct Advance values for the CTD you are using. Note: For the SBE 9 plus apply 0.073 s to Conductivity. For the SBE 43 Dissolved Oxygen Sensor enter a range of +2 s to +5 s. For the Southern Ocean apply + 5 s to all Oxygen variables (Figures 11 and 12). (For the dissolved oxygen sensor I was told to use 3.5

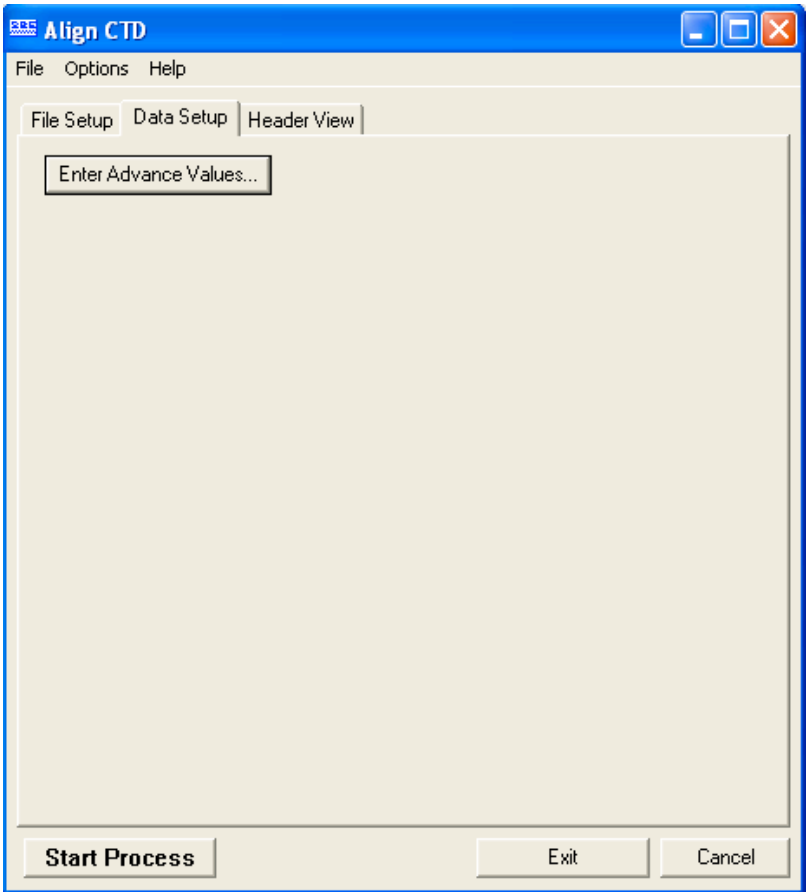

Figure 11: Example of Align CTD > Data Setup screen

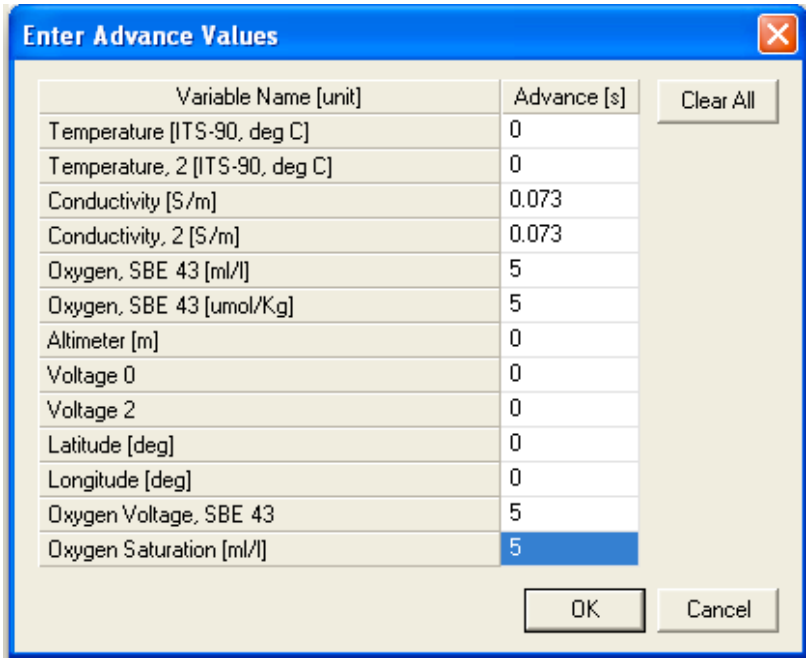

Figure 12: Example of Enter Advance Values screen for SBE 9 plus and SBE 43.
(For the dissolved oxygen sensor I was told to use 3.5 instead of 5.

Cell Thermal Mass: "4CEL"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted CellTM.psa

-Input files: ~/3ALI/*.cnv

-Output directory: ~/4CEL

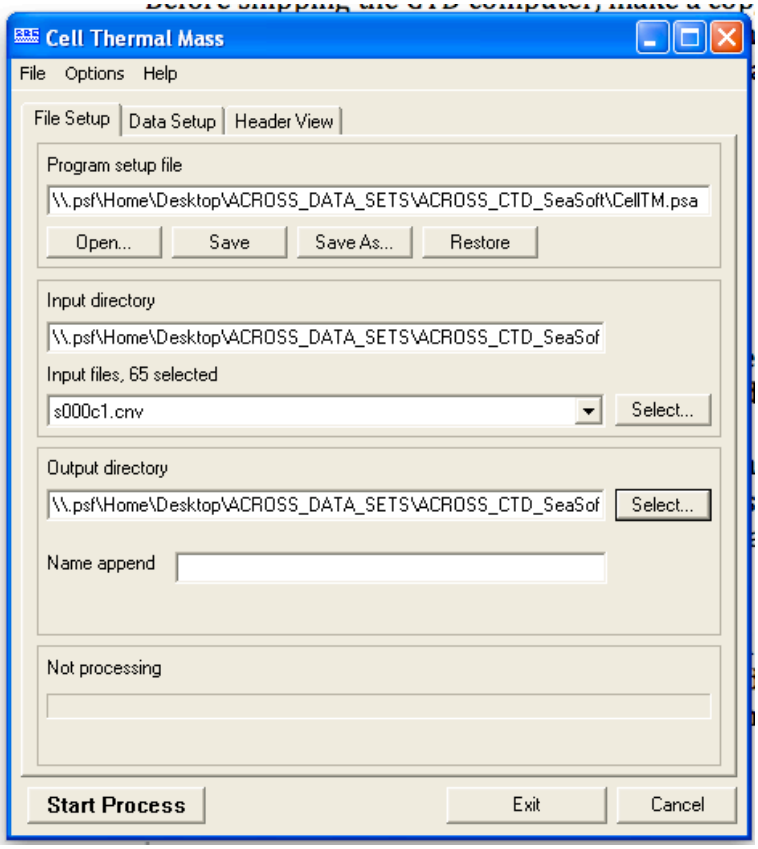

Figure 13: Example of Cell Thermal Mass > File Setup screen

Data Setup tab:
Refer to the help menu (Help > Get Current Topic) for the correct alpha and 1/beta values. If the package has a primary and secondary conductivity and temperature sensor, apply the corrections to all. Note: For the SBE 9 plus use an amplitude = 0.03 [alpha] and time constant = 7 [1/beta]. (Figure 14).

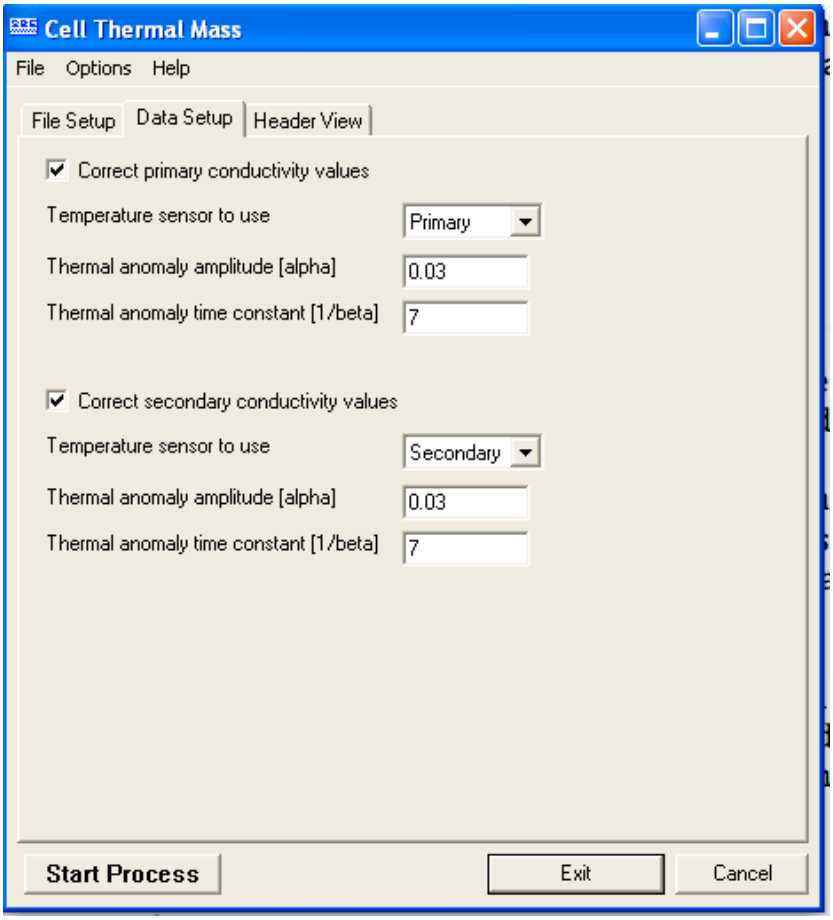

Figure 14: Example of Cell Thermal Mass > Data Setup screen for SBE 9 plus with primary and secondary sensors.

Loop Edit: "5LOOP"

Note: A copy of all the *STATION*.CON files must be in this directory.

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted LoopEdit.psa

-Input files: ~/4CEL/*.cnv

-Output directory: ~/5LOOP

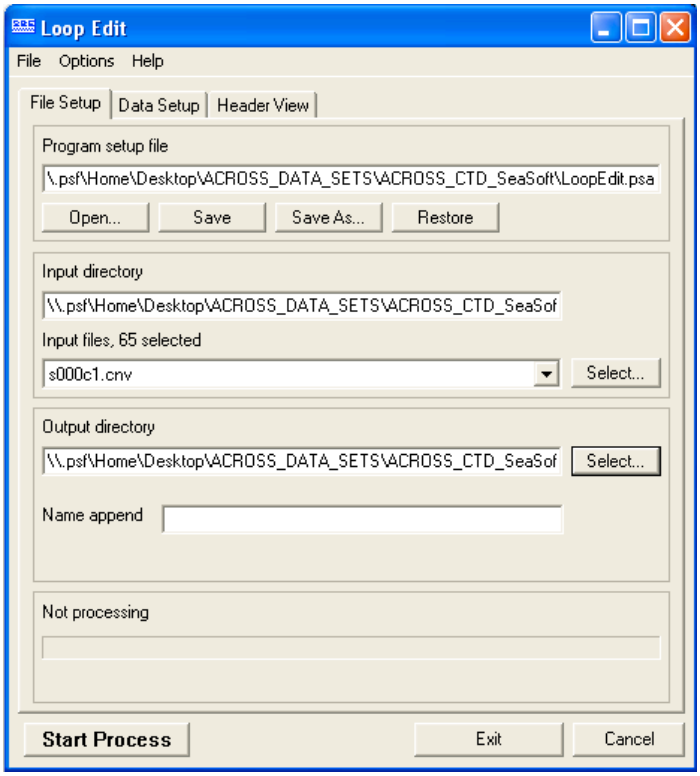

Figure 15: Example of Loop Edit > File Setup screen

Data Setup tab:
This step can vary depending on the type of cruise, ship, etc to get correct. For a typical TAMU Southern Ocean cruise use a Fixed Minimum Velocity of 0.01 m/s. Always remove the surface soak. Typically surface soaks occur at z = 10 m, and never shallower than z = 5 m or deeper than z = 20 m (Figure 16). (For the Gulf of Mexico I use for soak, z=1, zmin=0.5 and zmax =2.

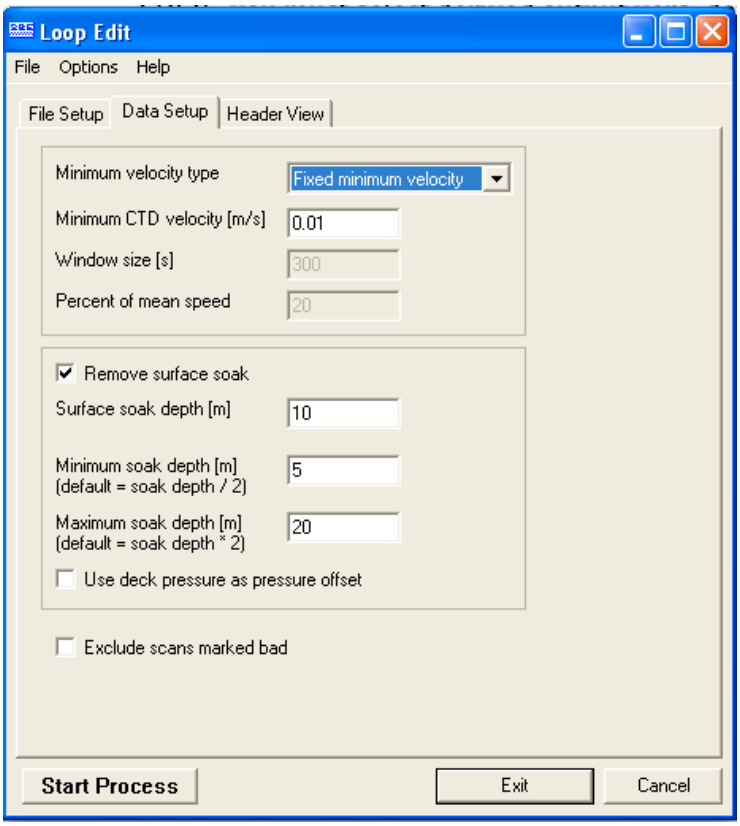

Figure 16: Example of Loop Edit > Data Setup screen for a typical TAMU Southern Ocean cruise

Derive: "6DEV"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted Derive.psa

-Instrument configuration file: ~/5LOOP/*.CON

-Input files: ~/5LOOP/*.cnv

-Output directory: ~/6DEV

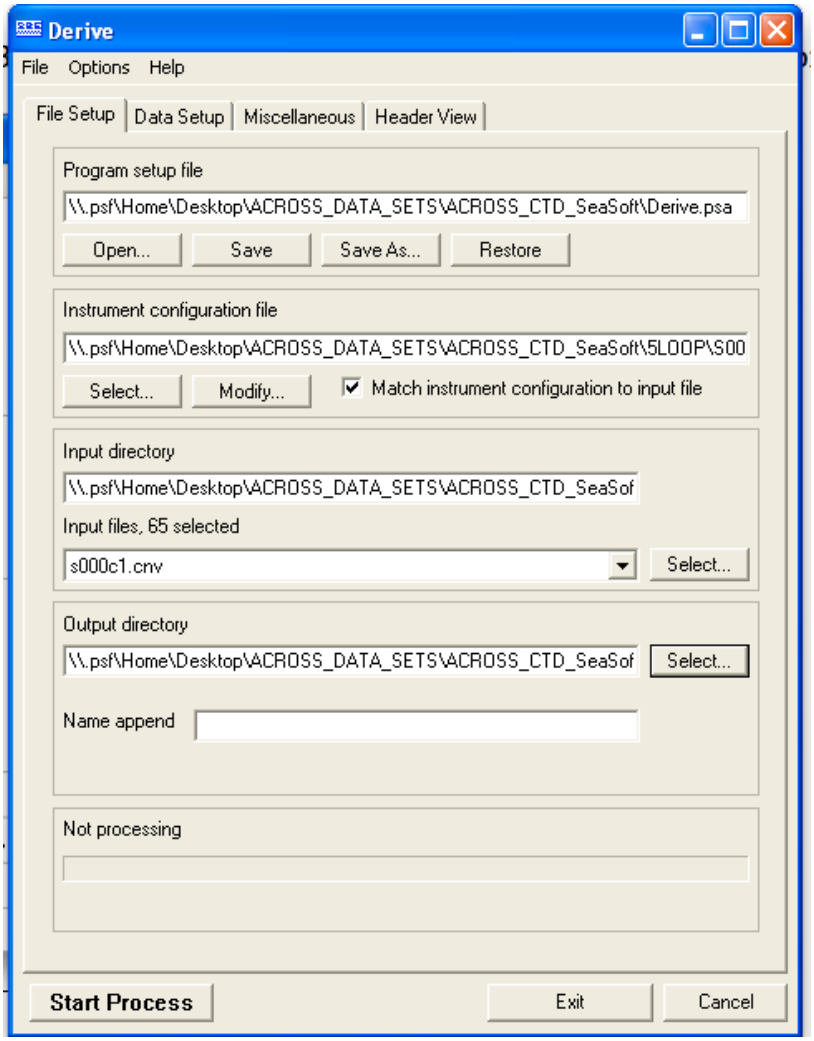

Figure 17: Example of Derive > File Setup screen

Data Setup tab > Select Derived Variables…:
Select Variables:

Salinity and Salinity, 2 (if secondary sensor)
Oxygen (ml/l) –Window size = 2, no Tau correction (if SBE 43 sensor)
Oxygen (umol/kg) –Window size = 2, no Tau correction (if SBE 43 sensor)

Note: Oxygen is calculated in both the Data Conversion and Derive steps. Oxygen values calculated in the Derive step are more accurate and should be used for the final data set. For deep stations, we do not apply the Tau corrections. Refer to "Help > About Current

Topic" for a more detailed explanation of how oxygen is calculated in each of these two steps as well as an explanation of the Tau correction and its pros and cons.

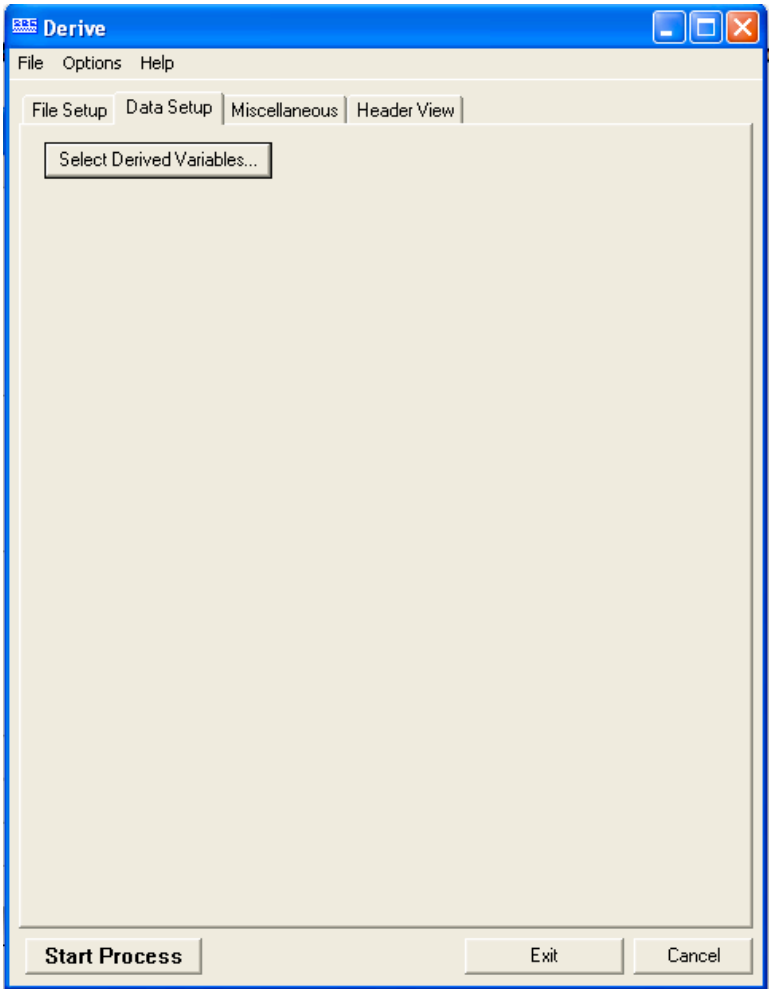

Figure 18: Example of Derive > Data Setup screen

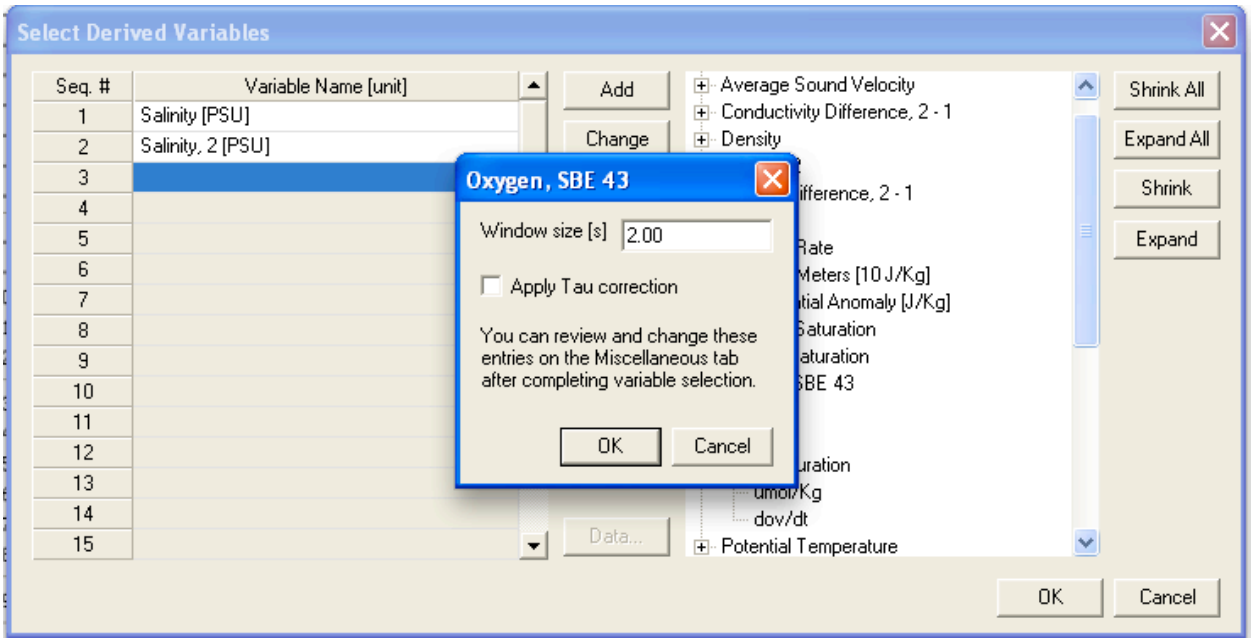

Figure 19: Selection of Oxygen as a derived variable.

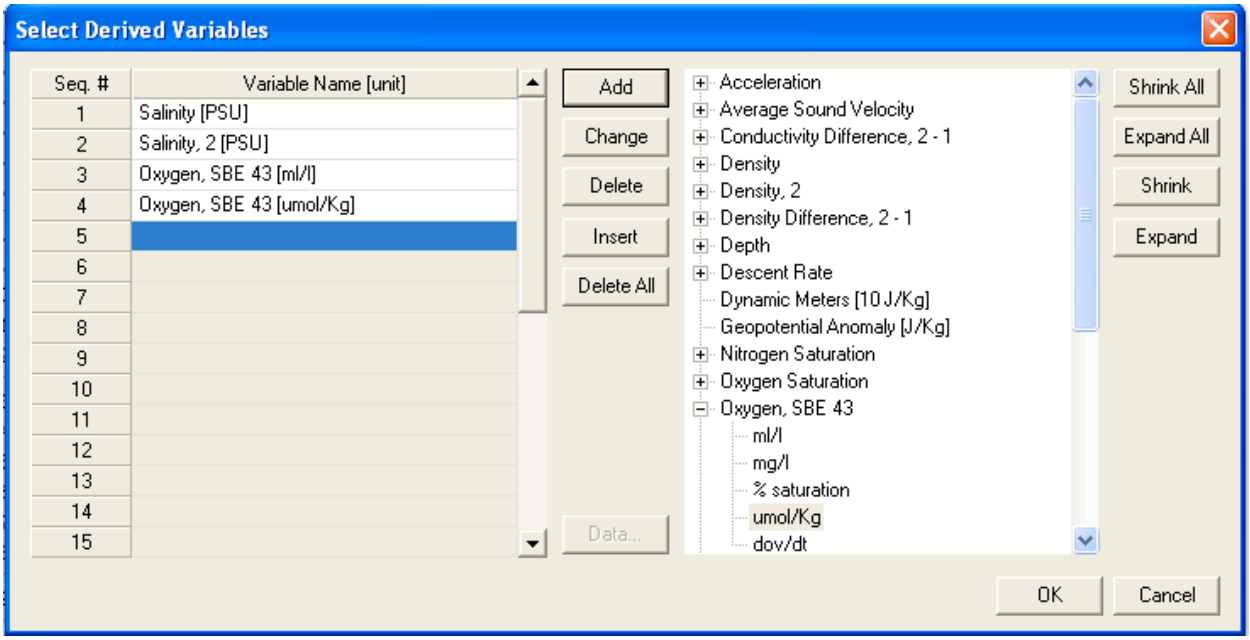

Figure 20: Example of selected derived variables for SBE 9 plus with primary and secondary sensors and SBE 43.

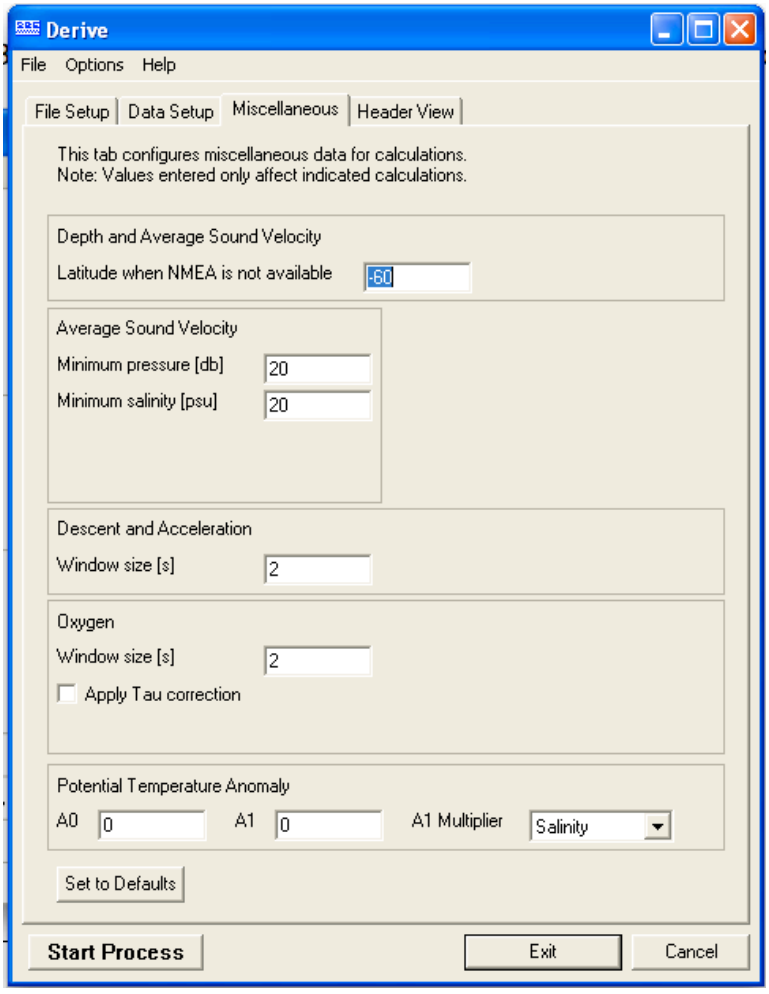

Figure 21: Example of Derive > Miscellaneous screen. Most of these variables are defined while choosing derived variables in the Data Setup tab.

(*I normally stop with the derived procedure*)

Bin Average: "7BIN"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted BinAvg.psa

-Input files: ~/6DEV/*.cnv

-Output directory: ~/7BIN/UPCAST
~/7BIN/DOWNCAST
~/7BIN/UPCAST&DOWNCAST

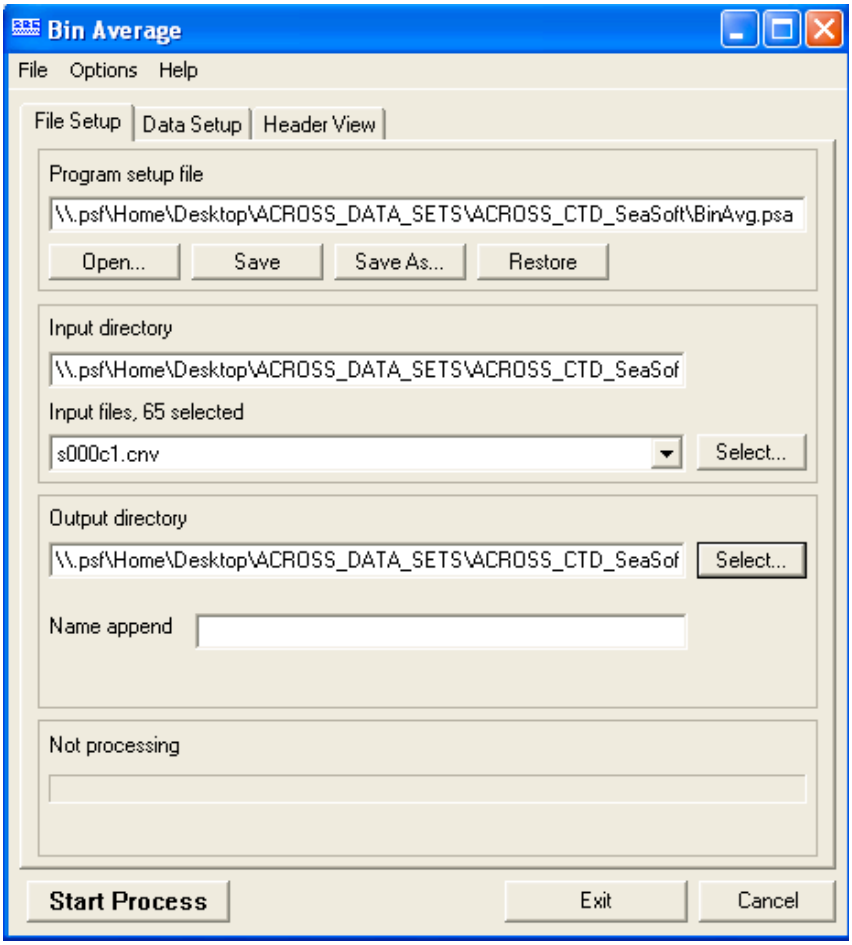

Figure 22: Example of Bin Average > File Setup screen

Data Setup tab:

This step is run 3 different times for each "cast to process." For each run, the File Setup > Output directory and Data Setup > Cast to process must be changed accordingly.

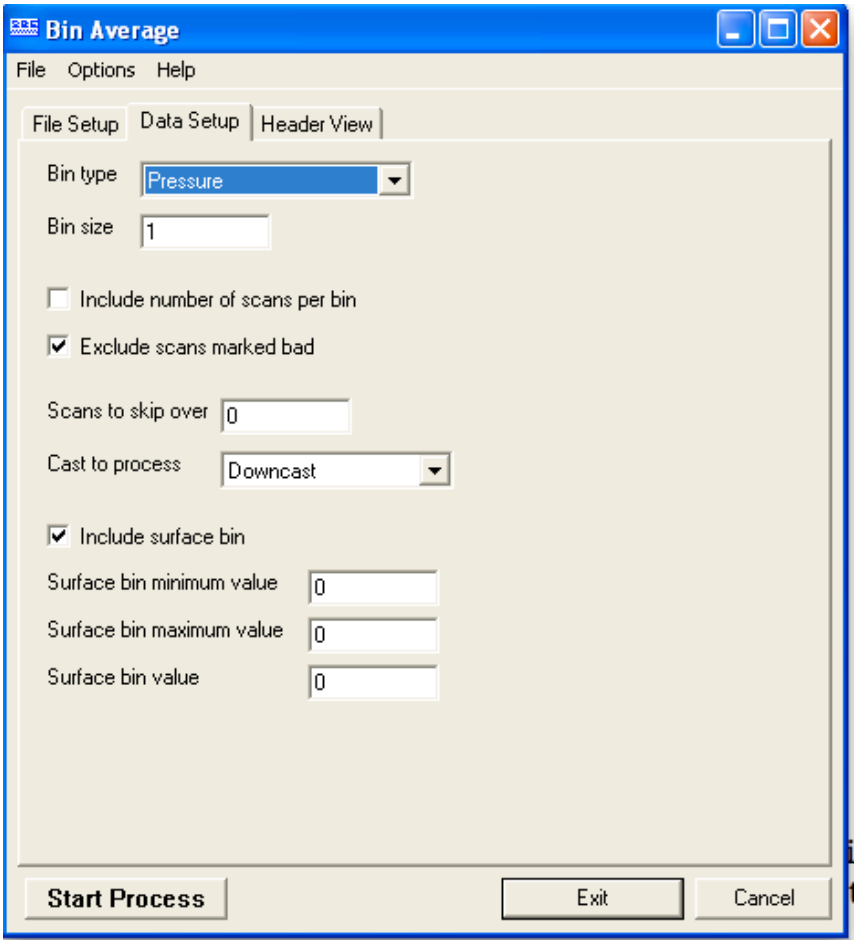

Figure 23: Example of Bin Average > Data Setup screen

Bottle Summary: "8BTL"

File Setup Tab:

-Program setup file: If applicable, select the pre-formatted BinAvg.psa

-Instrument configuration file: ~/1CNV/*.CON

Check "Match instrument configuration to input file"

-Input files: ~/1CNV/*.ros

-Output directory: ~/8BTL

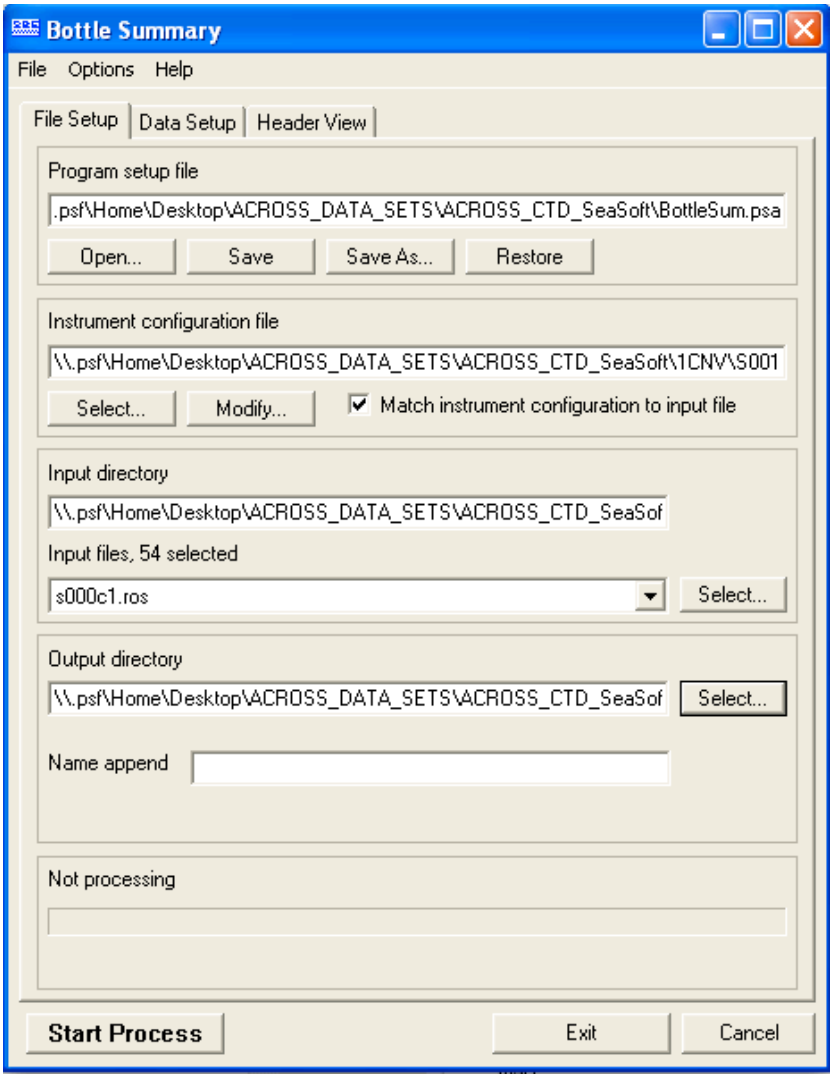

Figure 24: Example of Bottle Summary > File Setup screen

Data Setup tab> Select Averaged Variables… **:**

Select the variables to be averaged in the bottle files.

Note: If using a SBE 43, oxygen saturation [ml/l], and oxygen voltage must be selected.

Data Setup tab> Select Derived Variables… **:**

See Figure 27 for variables to select. If SBE 43 is available select oxygen [ml/l] and oxygen [umol/kg]. The derived oxygen should be used in the final data set.

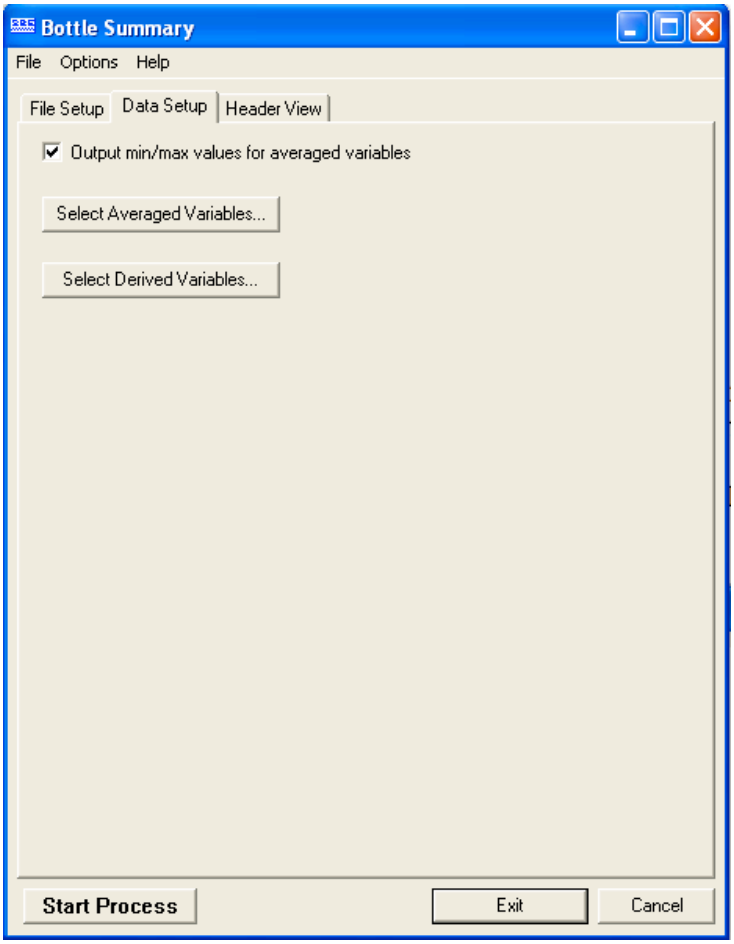

Figure 25: Example of Bottle Summary > Data Setup tab.

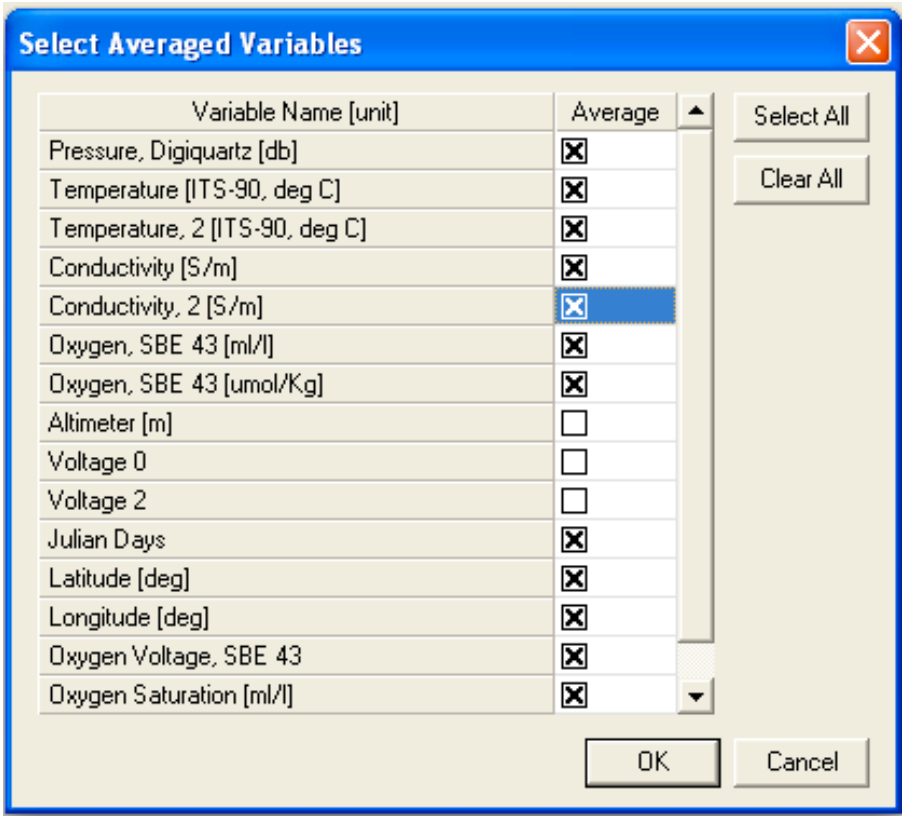

Figure 26: Example of Data Setup > Select Averaged Variables for SBE 9 plus and SBE 43

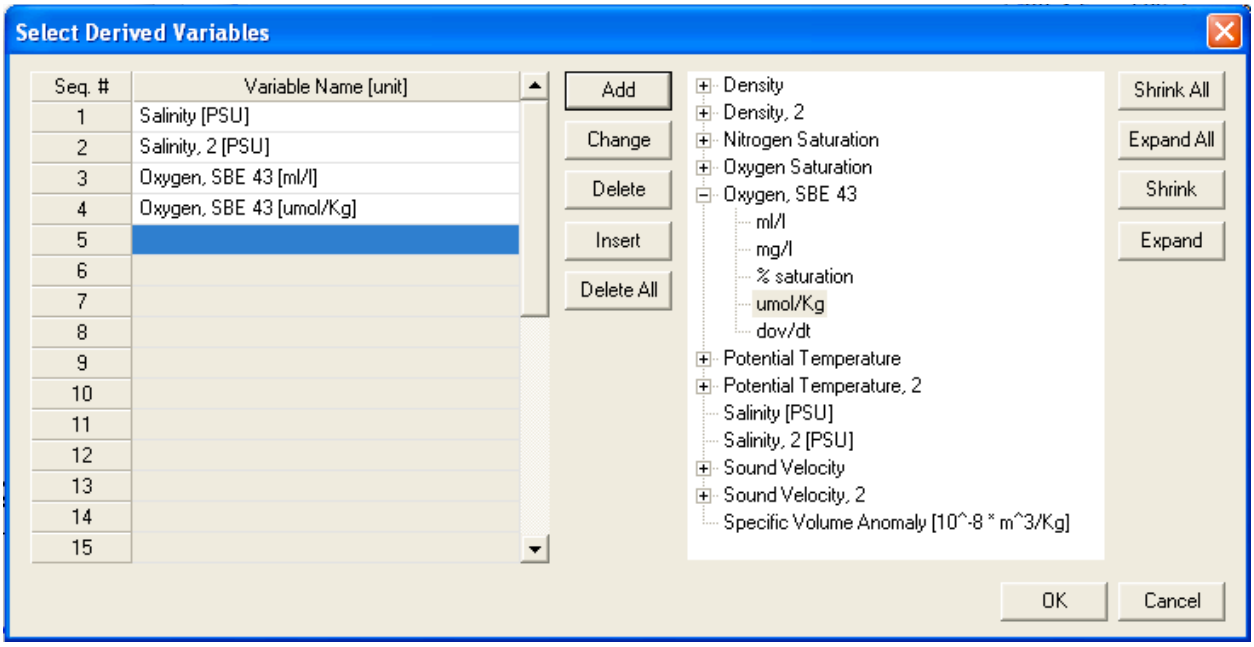

Figure 27: Figure 26: Example of Data Setup > Select Derived Variables for SBE 9 plus and SBE 43