CTD DATA ACQUISITION SOFTWARE

S E A S O F T

VERSION 4.249

May 2002

SEASOFT VERSION 4.249

1.0 INTRODUCTION

SEASOFT consists of modular menu driven routines for acquisition, display, processing, and archiving of oceanographic data acquired with Sea-Bird equipment and is designed to work with an IBM personal computer XT/AT/386/486 or compatible.

In order to enhance data integrity, raw data is acquired from the instruments and stored as raw unmodified data. A conversion program DATCNV uses the instrument configuration and calibration coefficients to create a converted engineering unit data file (.CNV) that is operated on by all SEASOFT post processing modules. Each SEASOFT module that modifies the converted data file adds information to the header of the converted file permitting tracking of how the various oceanographic parameters were obtained.

SEASOFT supports the following Sea-Bird products:

SBE 9/11 CTD System	(24 Hz with cable telemetry)
SBE 911*plus* CTD System	(enhanced SBE 9/11)
SBE 9/17 CTD System with SEARAM	(internally recording SBE 9 with batteries)
SBE 16 SEACAT	(moored time series instrument)
SBE 19 SEACAT PROFILER	(2 Hz internally recording CTD with batteries)
SBE 21 THERMOSALINOGRAPH	(sea surface measurements)
SBE 25 SEALOGGER CTD	(8 Hz internally recording CTD with batteries)
SBE 31 Multi-Channel Counter	(general purpose surface acquisition - previously called the SBE 11/X)
SBE 37 MicroCAT	

2.0 BRIEF DESCRIPTION OF SEASOFT MODULES

Acquisition, Playback, and Conversion of Raw Data to Engineering Units:

CNV37:	Convert data from .ASC files, witten by TERM37, and store the converted data in files with a .CNV extension.
DATCNV:	Convert raw data (.HEX or .DAT files) to engineering units (ascii or binary format). The converted data is stored in files with a .CNV extension.
ROSSUM:	Summarize data in .ROS (Rosette) files.
SEACON:	Configure instruments and enter calibration coefficients.
SEASAVE:	Acquire real-time data and display <u>raw</u> archived data.

Data Editing:

ASCIIIN:	Add header information to a file containing rows and columns of ASCII data.
MARKSCAN:	Create .BSR (bottle scan range) file from .MRK data file
SECTION:	Extract rows of data from .CNV files. Row selection is by scan number or pressure range.
SPLIT:	Split .CNV file into upcast and downcast files.
STRIP:	Extract columns of data from .CNV files.
TRANS:	Change .CNV file format from ASCII to binary or vice versa.

Data Manipulation:

ALIGNCTD:	Align C, T, P, and Oxygen in .CNV files
BUOYANCY:	Compute buoyancy (Brunt-Väisälä) and stability frequency
BINAVG:	Average data in a .CNV file. Bins can be based on pressure, depth, scan number or time.
CELLTM:	Conductivity thermal mass correction
DERIVE:	Read in .CNV and calculate derived variables (salinity, density, sound velocity, oxygen, potential temperature, dynamic height …)
FILTER:	Low pass filter columns of data
LOOPEDIT:	Mark scan with 'badflag' if the scan fails pressure reversal or minimum velocity tests.
WILDEDIT:	Mark 'wild' points in .CNV files by setting their values to 'badflag'.
WFILTER:	Window filters: triangle, cosine, boxcar, gaussian, and median

Data Display:

ASCIIOUT:	Output data portion and/or header portion from .CNV files to an ASCII file.
CONTOUR:	Generate density contours to overlay on TS plots.
SEAPLOT:	Plot data in .CNV files. Plots can be 'screen dumped' to a printer or plotted on a HP pen plotter or HP LaserJet III.

Terminal Programs:

Communicate with recording instruments and upload an unmodified HEX data file preceded by a header.

TERM1621	supports SBE 16 SEACAT and SBE 21 THERMOSALINOGRAPH
TERM17	supports SBE 17 SEARAM
TERM19	supports SBE 19 SEACAT PROFILER (Personal CTD)
TERM25	supports SBE 25 SEALOGGER CTD
TERM37	supports SBE 37 MicroCAT
TERMAFM	supports SBE 90208 Carousel Auto Fire Module
TERM11	displays SBE 11 deck unit configuration, firmware version 2.0 or greater
TMODEM	communicates with SBE 911plus modem channel, can arm and fire bottles

Calibration Programs:

OXSAT	oxygen saturation value as a function of temperature and salinity
OXFIT	compute oxygen coefficients
OXFITW	compute oxygen coefficients using Winkler titration values
PHFIT	compute Ph coefficients

Miscellaneous:

CFGTOCON:	Converts SEASOFT Version 3.* configuration (SEASOFT.CFG) files to SEASOFT V 4.0 format.
SEACALC:	Derived variables calculator.

3.0 SOFTWARE INSTALLATION

SEASOFT requires approximately 4 Mbytes of disk space during installation. Make sure there is room on your disk before proceeding.

1. Make a directory for the SEASOFT executable files and copy all of the SEASOFT disks to this directory.
    for example, type
        cd \
        md seasoft
        cd seasoft
        insert SEASOFT disk 1 in drive a:
        copy a:*.*
        insert SEASOFT disk 2 in drive a:
        copy a:*.*

2. Type sinstall at the DOS prompt to uncompress the SEASOFT files.

3. Make a directory for your configuration and data files.
    for example type
    cd \
    md ctddata

4. Add the seasoft directory to the PATH statement in your autoexec.bat file.

5. In your config.sys file set:
        buffers=20 (or more)
        files=20 (or more)

    If you are using an SBE 11 deck unit with IEEE-488 (GPIB) interface your config.sys file should also contain the line:

        device=gpib.com

    You can copy the GPIB.COM file from the SEASOFT directory to the root directory (the GPIB configuration is shown in the next section) or you can use the IBCONFIG utility that came with your GPIB interface to configure GPIB.COM.

6. If you are using a color graphic adapter with a monochrome display (i.e. most laptop computers) a better display will result if the DOS command MODE BW80 is run before running any of the SEASOFT modules. This command can be inserted in your autoexec.bat. MODE.COM is included in the SEASOFT disks but you may want to run the version that came with the version of DOS that is installed on your computer.

The terminal programs can be run from floppy disk based computers to set up and upload data from internally recording instruments. The data processing programs require a hard disk based system.

3.1 SEASOFT FILES:

EXECUTABLE PROGRAMS: (these files must be in a directory located in the DOS search path)

ALIGNCTD.EXE	ASCIIIN.EXE	ASCIIOUT.EXE
BINAVG.EXE	BUOYANCY.EXE	CELLTM.EXE
CFGTOCON.EXE	CNV37.EXE	CONTOUR.EXE
DATCNV.EXE	DERIVE.EXE	FILTER.EXE
LOOPEDIT.EXE	MARKSCAN.EXE	OXFIT.EXE
OXFITW.EXE	OXSAT.EXE	PHFIT.EXE
ROSSUM.EXE	SEACALC.EXE	SEACON.EXE
SEAPLOT.EXE	SEASAVE.EXE	SECTION.EXE
SPLIT.EXE	STRIP.EXE	TRANS.EXE
TERM11.EXE	TERM1621.EXE	TERM17.EXE
TERM19.EXE	TERM25.EXE	TERM37.EXE
TERMAFM.EXE	TMODEM.EXE	WFILTER.EXE
WILDEDIT.EXE		

PROGRAM DATA and HELP FILES (these files must be in a directory located in the DOS search path)

SBE$ERR.DAT	SBE$HLP.DAT	SBE$MSG.DAT
SEACON.HLP	SEASAVE.HLP	TERM.HLP

RUN TIME LIBRARY FILES (these files must be in a directory located in the DOS search path)

SS.RTL	SSSYS.RTL	TM19.RTL	TMSYS.RTL

CONFIGURATION FILE: (copy this file to your data directory)

SEASOFT.CON or	instrument configuration and calibration coefficients
SERIALNO.CON	SERIALNO is the serial number of the instrument

DEMO DATA FILES:

DEMO.DAT	DEMO.CON	DEMO.DSP	DEMOFEAT.DSP

MISCELLANEOUS:

GPIB.COM	MODE.COM	VERSIONS.DOC

3.2 SOFTWARE DEMO

For a quick look at a demo data set change to the SEASOFT subdirectory and run the program SEASAVE. Example - C:\SEASOFT> seasave

1. From the Main Menu select "Display Archived Data"

2. The menu should contain the following:

Raw Data File =	DEMO.DAT
Configuration file [.CON] =	DEMO.CON
Display File [.DSP] =	DEMO.DSP
Input File [.CON] [.DAT] [.HEX] Path =	C:
Display Type =	Overlaid X-Y Plots

   To change entries, use arrow keys to move highlighted cursor bar to the item you want to change and press the "enter" key. A sub-menu will open to show what other choices are available. Move the cursor bar to the desired item and press "enter" to select it.

3. DEMO.CON contains the configuration and calibration coefficients for the demo data file. If SEASOFT.CON is included on the disk it will contain the configuration and calibration coefficients for your instrument. Do not choose SEASOFT.CON to view the demo data.

4. There are two display files, DEMO.DSP and DEMOFEAT.DSP. For the first demonstration, select DEMO.DSP.

5. For now, do not modify the Variables to Display or Misc. X-Y Plot Parameters.

6. Enter the number of scans to skip over in the data file = 0

7. Enter number of scans to skip between computations = 4 (for maximum graphical resolution choose 0 (but it takes longer to print to the screen).

8. To view the data, press F10. Space Bar halts (and resumes) plotting. CTL-F1 will quit display and return to menu.

9. To look at a portion of the profile in greater detail, select the display file DEMOFEAT.DSP. Set the number of scans to skip over in the data file = 300, and the number of scans to skip between computations = 0.

10. Press F10 to view data.

11. When you press escape to go back to the Main Menu, and then press escape to exit the program, you will be have a choice to do one of the following:

    a) overwrite the .DSP file most recently selected
    b) write to a new file
    c) quit without saving

    To save a display configuration you have created by modifying an existing .DSP file, choose b and enter a new filename.

12. Refer to the manual for instructions on using the other modules.

3.3 IEEE-488 (GPIB) SET UP

The GPIB.COM file included with SEASOFT is configured as follows:

```
┌─────────────────────────┬─────────────────────────┬──────────────────────────┐
│  National Instruments   ║    Board Characteristics ║  PC 2/2A(old) revC.12    │
├─────────────────────────┴──────────────┬──────────╨──────────────────────────┤
│ Board: GPIB0                            │   Primary GPIB Address              │
├─────────────────────────────────────────┼─────────────────────────────────────┤
│  SELECT (use right/left arrow keys)     │  0 to 30                            │
├─────────────────────────────────────────┼─────────────────────────────────────┤
│ Primary GPIB Address          0         │  This address is used to compute the│
│ Secondary GPIB Address ........ NONE    │  talk and listen addresses which    │
│ Timeout setting .............. T30s     │  identify the board or device on the│
│ EOS byte ..................... 00H      │  GPIB. Valid primary addresses range│
│                                         │  from 0 to 30  (00H to 1EH).        │
│ Terminate Read on EOS ........ no       │                                     │
│ Set EOI with EOS on Write ..... no      │  * Adding 32 to the primary address │
│ Type of compare on EOS ........ 7-bit   │    forms the Listen Address (LA).   │
│ Set EOI w/last byte of Write .. no      │  * Adding 64 to the primary address │
│                                         │    forms the Talk Address (TA).     │
│ System Controller ............ yes      │                                     │
│ Assert REN when SC............. no       │  EXAMPLE: Selecting a primary address│
│ Enable Auto Serial Polling .... no      │  of 10 yields the following:        │
│                                         │                                     │
│ Timing ....................... 2usec    │   10 + 32 = 42   (Listen address)   │
│                                         │   10 + 64 = 74   (Talk address)     │
│                                         │                                     │
│                                         │          DMA Jumper Setting         │
│                                         │                                     │
│                                         │        1  1  2  2  3  3             │
│                                         │                                     │
│ CIC Protocol.................. no       │                                     │
│                                         │                                     │
│ Handler type.................. pc2a     │                                     │
│ Interrupt setting ............ 7        │                                     │
│ Base I/O Address ............. 02E1H    │  Place the jumpers as they are shown│
│ DMA channel (Arbitration)     1         │                                     │
├─────────────────────────────────────────┴─────────────────────────────────────┤
│ F1: Help        F6: Reset Value      F9/Esc: Return to Map                     │
└───────────────────────────────────────────────────────────────────────────────┘
```

4.0 FILE FORMATS

File extensions are used by SEASOFT modules to indicate the file type.

4.1 FILE EXTENSION DEFINITIONS:

ASC   The data portion of a .CNV converted data file written in ASCII by ASCIIOUT, or files written by TERM37.

BL   Created by SEASAVE when a bottle fire confirmation is received. Contains bottle sequence number, position, date, time, beginning and ending scan numbers.

BTL   Created by ROSSUM. This is a summary of the data in a .ROS file

BSR   Bottle scan range file, used by DATCNV to create a .ROS file.

CFG   Used by SEASOFT modules to store the input filename, input data path, output data path, and other miscellaneous module specific parameters.

CTR   Density contour file generated by CONTOUR.

CNV   'Converted' engineering unit data file. An ASCII header precedes the data.

CON   Contains instrument configuration and calibration coefficients, used by SEACON, SEASAVE, and DATCNV.

DAT   Raw binary data, optionally with header information (SBE 9/11, 11X, 9/11*plus*, and data files created with previous versions of SEASOFT).

DSP   Used by SEASAVE to store data acquisition and display parameters

HDR   1) Header portion of a .CNV converted data file written by ASCIIOUT.
        2) Header recorded when acquiring real time data or uploading archived data.

HEX   Raw HEX data with header information (SBE 16, 17, 19, 21, and 25).

MRK   Marker file created by SEASAVE during real time data acquisition.

PLT   Used by SEAPLOT to store display parameters.

ROS   Scans marked with the bottle fire confirmation bit, or defined by a .BSR file, written by DATCNV.

SEASOFT modules search the current directory for DSP, PLT, and CFG files.
SEASOFT modules search the 'input data path' for CON, HEX, DAT, and CNV files. One exception is SEACON which searches the current directory for CON files.

4.2 CONVERTED DATA FILE FORMAT:

Converted data files (CNV extension) consist of a descriptive header followed by converted data in engineering units. The header contains header information from the raw input data file followed by entries that describe the number of rows and columns of data, a description of each column, the interval between each row (scan rate or bin size), and a historical record of the processing steps that were used to create or modify the data file. The converted data is stored in either rows and columns of ASCII numbers (11 characters per value) or as a binary data stream with each value stored as a 4 byte binary floating point number. The last data column is a flag field used to mark scans as good or bad.

Header lines beginning with '*' contain header information copied from the raw input data file.
Header lines beginning with '#' contain information describing the converted data file.
The ASCII string "*END*" flags the end of the header information.

The converted data format is:

```
* …
* …
# nquan = < value >
# nvalues = < value >
# units = metric | english
# name 0 = < internal name: descriptive label >
# name 1 = < internal name: descriptive label >
…..
# span 0 = < minimum value, maximum value >
# span 1 = < minimum value, maximum value >
# interval = < pressure, depth or time spacing between rows >
# start_time = < time raw data was acquired >
# bad_flag = -9.99e-029
# file_type = ascii or binary
```

The header is terminated by:

```
*END*< carriage return, line feed >
```

SEASOFT modules process binary data files much faster than ASCII data files. The ASCII files can be examined and modified with any text editor.

The definition of each field is:

nquan = < val >	number of data columns = val
nvalues = < val >	number of rows in the data file = val
name_N = < iname: label >	internal name for the data in column N = i_name (i_name cannot be modified by the user)
	the default label for the data in column N = label (label can be modified by the user
span_N = < min, max >	minimum value for the data in column N = min
	maximum value for the data in column N = max

interval = <type:val>	interval type = decibars, meters, feet, or seconds the interval between rows = val
start_time = <val>	date and time that the raw data was acquired
bad_flag = -9.99e-029	the user can choose to ignore a data point or scan marked equal to the bad_flag while processing or plotting the data
units = <val>	converted data units can be metric or english
file_type = <val>	the converted data file format is ascii or binary

Each SEASOFT module that modifies a .CNV file adds information to the header and updates the nquan, nvalues, name_n, span_n, interval, and file_type entries when appropriate.

5.0 SAMPLE DATA PROCESSING STEPS

The following examples assume that SEACON has been run to create a .CON file containing the instrument configuration and sensor calibration coefficients.

Oxygen values computed by SEASAVE and DATCNV will be somewhat different from oxygen values computed by DERIVE. This is because the oxygen algorithm uses the parameter doc/dt (the derivative of oxygen current with respect to time). SEASAVE and DATCNV compute this parameter looking backwards in time since they share common code and SEASAVE can not use future values of oxygen current while acquiring data in real time. DERIVE uses a centered window (equal number of points before and after the scan) to obtain a better estimate of doc/dt. SEASAVE and DATCNV can be used to obtain a quick look of oxygen values, DERIVE should be used to obtain the most accurate oxygen computations.

5.1 MINIMUM PROCESSING OF CTD DATA

1. Acquire the raw data with SEASAVE or the appropriate terminal program.
2. DATCNV   Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen concentration, and light transmission. Also include derived oceanographic parameters such as salinity, density, and sound velocity. Select ASCII as the data conversion format.

5.2 STANDARD PROCESSING OF PUMPED SBE 19 CTD DATA

WITHOUT OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.
2. DATCNV   Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as light transmission, pH, and fluorescence.
3. FILTER   Force conductivity to have the same response as temperature. Low pass filter conductivity with a time constant of approximately 0.5 seconds. Filter pressure with a time constant of 2 seconds to increase pressure resolution for LOOPEDIT.
4. ALIGNCTD   Advance temperature relative to pressure approximately 0.5 seconds.

5. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
6. BINAVG	Average data into the desired pressure or depth bins.
7. DERIVE	Compute salinity, density, and other oceanographic parameters

WITH OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.

2. DATCNV	Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen current, dissolved oxygen temperature, and light transmission.
3. FILTER	Force conductivity to have the same response as temperature. Low pass filter conductivity with a time constant of approximately 0.5 seconds. Filter pressure with a time constant of 2 seconds to increase pressure resolution for LOOPEDIT.
4. ALIGNCTD	Advance temperature approximately 0.5 seconds and oxygen 3 to 7 seconds relative to pressure.
5. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
6. DERIVE	Compute oxygen from oxygen current, oxygen temperature, temperature and pressure.
7. BINAVG	Average data into the desired pressure or depth bins.
8. DERIVE	Compute salinity, density, and other oceanographic parameters

5.3 STANDARD PROCESSING OF UNPUMPED SBE 19 CTD DATA

WITHOUT OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.

2. DATCNV	Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as light transmission, pH, and fluorescence.
3. FILTER	Force conductivity to have the same response as temperature. Low pass filter conductivity with a time constant of approximately 0.5 seconds. Filter pressure with a time constant of 2 seconds to increase pressure resolution for LOOPEDIT.
4. ALIGNCTD	Advance temperature relative to pressure approximately 0.6 seconds. This value will depend on the lowering rate.
5. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
6. BINAVG	Average data into the desired pressure or depth bins.
7. DERIVE	Compute salinity, density, and other oceanographic parameters

WITH OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.

2. DATCNV	Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen current, dissolved oxygen temperature, and light transmission.

3. FILTER	Force conductivity to have the same response as temperature. Low pass filter conductivity with a time constant of approximately 0.5 seconds. Filter pressure with a time constant of 2 seconds to increase pressure resolution for LOOPEDIT.
4. ALIGNCTD	Advance temperature approximately 0.6 seconds and oxygen 1 to 5 seconds relative to pressure. These values will depend on the lowering rate and the oxygen sensor response time.
5. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
6. DERIVE	Compute oxygen from oxygen current, oxygen temperature, temperature and pressure.
7. BINAVG	Average data into the desired pressure or depth bins.
8. DERIVE	Compute salinity, density, and other oceanographic parameters

5.4 STANDARD PROCESSING OF SBE 25 CTD DATA

WITHOUT OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.	
2. DATCNV	Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen current, dissolved oxygen temperature, and light transmission.
3. FILTER	Low pass filter pressure with a time constant of 0.5 seconds to increase pressure resolution for LOOPEDIT.
4. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
5. BINAVG	Average data into the desired pressure or depth bins.
6. DERIVE	Compute salinity, density, and other oceanographic parameters

WITH OXYGEN:

1. Acquire the raw data with SEASAVE or the appropriate terminal program.	
2. DATCNV	Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen current, dissolved oxygen temperature, and light transmission.
3. ALIGNCTD	Advance oxygen 1 to 5 seconds relative to pressure. These values will depend on the lowering rate and the oxygen sensor response time.
4. FILTER	Low pass filter pressure with a time constant of 0.5 seconds to increase pressure resolution for LOOPEDIT.
5. LOOPEDIT	Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
6. DERIVE	Compute oxygen from oxygen current, oxygen temperature, temperature and pressure.
7. BINAVG	Average data into the desired pressure or depth bins.
8. DERIVE	Compute salinity, density, and other oceanographic parameters

5.5 STANDARD PROCESSING OF SBE 9/11 CTD DATA

The following data processing steps assume that the SBE 11 Deck Unit has been set to correctly advance conductivity relative to pressure (1.75 scans or 0.073 seconds) for SBE 9/11 and SBE 911*plus* systems with a TC duct. The program ALIGNCTD can be used to verify that the deck unit correct by adding positive and negative advances to conductivity and observing the effect salinity and density computed by DERIVE.

WITHOUT OXYGEN:

1. SEASAVE   Acquire the data at 24Hz.
2. DATCNV   Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as light transmission.
3. WILDEDIT   Check for and mark and 'wild' data points.
4. CELLTM   Conductivity cell thermal mass correction. Typical values are alpha = 0.03 and 1/beta = 7.0.
5. FILTER   Low pass filter pressure with a time constant of 0.15 seconds to increase pressure resolution for LOOPEDIT.
6. LOOPEDIT   Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
7. BINAVG   Average data into the desired pressure or depth bins.
8. DERIVE   Compute salinity, density, and other oceanographic parameters

WITH OXYGEN:

1. SEASAVE   Acquire the data at 24Hz.
2. DATCNV   Convert the raw data to pressure, temperature, conductivity and parameters obtained from auxiliary sensors such as dissolved oxygen current, dissolved oxygen temperature, and light transmission.
3. ALIGNCTD   Advance oxygen 1 to 5 seconds relative to pressure.
4. WILDEDIT   Check for and mark and 'wild' data points.
5. CELLTM   Conductivity cell thermal mass correction. Typical values are alpha = 0.03 and 1/beta = 7.0.
6. FILTER   Low pass filter pressure with a time constant of 0.15 seconds to increase pressure resolution for LOOPEDIT.
7. LOOPEDIT   Mark scans where the CTD is moving less than the minimum velocity or travelling backwards due to ship roll.
8. DERIVE   Compute oxygen
9. BINAVG   Average data into the desired pressure or depth bins.
10. DERIVE   Compute salinity, density, and other oceanographic parameters

Notes:

SBE 911plus systems should not have any 'wild' data points. This data processing step may be skipped.

FILTER can be run before CELLTM to remove any residual response time between the temperature and conductivity sensors and to minimize digitization noise. On average, a low pass filter with a time constant of 0.03 sec reduces the noise in computed salinity slightly. A low pass filter with a time constant can be used to smooth the pressure data. This can be useful when examining full rate (24 scans per second) fine structure data on pressure scales of 10 meters or less.

CELLTM needs to be run only if salinity accuracies of better that 0.01 PSU in regions with steep gradients are desired.

SEAPLOT can be used to display the data at any point after DATCNV has been run.
ASCIIOUT is useful for exporting converted data to other computers or other processing software.

5.6 BATCH FILE PROCESSING

The easiest way to process data using a batch file is:

First run each module and enter the desired choices in the set up forms. When the form is complete press Esc to exit the module. The module configuration will be stored in the current directory as MODULENAME.CFG.

Once the module configurations have been written create a batch file to process the data. One example is:

line 1:   datcnv -ihu112
line 2:   alignctd -ihu112
line 3:   loopedit -ihu112
line 4:   binavg -ihu112 -ohu112avg
line 5:   derive -ihu112avg

Line 1 converts HU112.DAT or HU112.HEX and writes the converted file to HU112.CNV.
Line 2 aligns HU112.CNV and writes out the aligned file to HU112.CNV.
Line 3 loopedits HU112.CNV and writes out the edited file to HU112.CNV.
Line 4 averages HU112.CNV and writes out the averaged file to HU112AVG.CNV.
Line 5 computes derived parameters using HU112AVG.CNV and writes out the input data plus the derived data edited file to HU112AVG.CNV.

If you want to be able to interrupt the batch processing modify the batch file as follows:

line 1:   datcnv -ihu112
line 2:   if errorlevel 1 goto abort
line 3:   alignctd -ihu112
line 4:   if errorlevel 1 goto abort
line 5:   loopedit -ihu112
line 6:   if errorlevel 1 goto abort
line 7:   binavg -ihu112 -ohu112avg
line 8:   if errorlevel 1 goto abort
line 9:   derive -ihu112avg

line 10:   if errorlevel 1 goto abort
line 11:   goto end
line 12:   :abort
line 13:   echo batch process interrupted by user
line 14:   :end

6.0 COMMAND LINE INPUT AND OUTPUT FILENAMES

When processing <u>all</u> data files (-a or -ax command line options) the input and output data paths stored in the module configuration file will be added to the filename. With the -a option the setup screen will be displayed and you will have the option of changing the input and output data paths before processing the files.

When specifying the input filenames (-i<filename> command line option):

> If the filename does not contain a path specifier the input data path in the module configuration file is added to the filename.
> If the filename contains a path specifier the input data path in the module configuration file is not used.

When specifying the output filenames (-o<filename> command line option):

> If the filename does not contain a path specifier the output data path in the module configuration file is added to the filename.
> If the filename contains a path specifier the output data path in the module configuration file is not used.

With the exception of SPLIT, the default output filename is the input filename.

If the output filename is the same as the input filename, the output file is first written to a temporary file. When processing is complete the input file is deleted and the temporary file is renamed to the input dat filename.

Examples for SEASOFT module BINAVG:

IF: input data path = c:\ctddata\sta112
      output data path = c:\ctddata\sta112\avg
      (input and output data paths are different)

      binavg -ax

> averages all the .CNV files in c:\ctddata\sta112 and writes out the averaged files (the averaged files will have the same names as the input data files) to c:\ctddata\sta112\avg

      binavg -icast1

> averages c:\ctddata\sta112\cast1.cnv and writes out the averaged data to
> c:\ctddata\sta112\avg\cast1.cnv

binavg -ia:cast1 -ob:test

    averages a:cast1.cnv and writes out the averaged data to b:test.cnv

binavg -i\ctddata\sta100\cast5

    averages c:\ctddata\sta100\cast5.cnv and writes out the averaged data to
    c:\ctddata\sta112\avg\cast5.cnv

binavg -i\ctddata\sta100\cast5 -o\ctddata\sta100\avg\cast5

    averages c:\ctddata\sta100\cast5.cnv and writes out the averaged data to
    c:\ctddata\sta100\avg\cast5.cnv

IF: input data path = c:\ctddata\sta112
     output data path = c:\ctddata\sta112
     (input and output data paths are the same)

binavg -ax

    averages all the .CNV files in c:\ctddata\sta112 and writes out the averaged files (the averaged files
    will have the same names as the input data files) to c:\ctddata\sta112
    The input data files will be overwritten.

binavg -icast1

    averages c:\ctddata\sta112\cast1.cnv and writes out the averaged data to
    c:\ctddata\sta112\cast1.cnv
    The input data file will be overwritten.

binavg -ia:cast1 -ob:test

    averages a:cast1.cnv and writes out the averaged data to b:test.cnv
    The input data file will not be overwritten.

binavg -i\ctddata\sta100\cast5

    averages \ctddata\sta100\cast5.cnv and writes out the averaged data to
    \ctddata\sta112\cast5.cnv
    The input data file will not be overwritten.

binavg -i\ctddata\sta100\cast5 -o\ctddata\sta100\avg\cast5

    averages i:\ctddata\sta100\cast5.cnv and writes out the averaged data to
    i:\ctddata\sta100\avg\cast5.cnv
    The input data file will not be overwritten.

7.0 PROMPTS COMMON TO ALL SEASOFT MODULES

Input Data File =

When the Enter Key is pressed a list of the files in the directory specified by the Input File Path will be displayed. Use the arrow keys or a mouse to highlight the desired file. Pressing the Enter Key will select the file. Pressing the Esc Key will return you to the main menu without selecting the file.

Input File [   ] Path =

Specifies where the module looks for the input file. The extensions inside the square brackets identify the filename extensions that are included in the input file path specification.

Output Data File Path =

Specifies the path and directory where the output data file will be written.

If you wish to read and write from the current directory enter the disk drive letter as the input and output file path.

8.0 DETAILED DESCRIPTION OF SEASOFT MODULES

8.1 ALIGNCTD

Description:

ALIGNCTD aligns temperature, conductivity and oxygen measurements in time relative to pressure. This ensures that calculations of salinity, dissolved oxygen concentration, and other parameters are made using measurements from the same parcel of water. ALIGNCTD can not be run on converted data files that have been averaged into pressure or depth bins.

The measurements can be misaligned for 3 principal reasons:

    a) the sensors are physically misaligned in depth,
    b) the inherent time delay (time constants) of sensor responses, and
    c) the water transit time delay in the pumped plumbing line (or the corresponding flushing
       delay in free-flushing sensors that depends on profiling speed).

When measurements are properly aligned, salinity spiking (and density) errors are minimized, and oxygen data corresponds to the proper pressure (e.g. temperature vs oxygen plots agree between down and up profiles).

8.1.1 ALIGNCTD: EXPLANATION OF PROMPTS

The ALIGNCTD set up form is:

```
ALIGNCTD  4.204                         Sunday  June 26, 1994  1:13 pm

┌──────────────────────────────────────────────────────────────────┐
│                         ALIGNCTD Set Up                            │
├──────────────────────────────────────────────────────────────────┤
│ Input Data File =         6874.CNV                                 │
│                                                                    │
│ Input File [.CNV] Path = J:\SEASOFT\                               │
│                                                                    │
│ Output Data File Path =  J:\SEASOFT\                               │
│                                                                    │
│ Advance Primary Sensors Relative to Pressure (seconds)            │
│    Advance Primary Conductivity =   -0.01000                       │
│    Advance Primary Temperature =    0.000000                       │
│    Advance Primary Oxygen =         3.000000                       │
│                                                                    │
│ Advance Secondary Sensors Relative to Pressure (seconds)          │
│    Advance Secondary Conductivity =  0.073000                      │
│    Advance Secondary Temperature =  0.0000000                      │
│    Advance Secondary Oxygen =        3.0000000                     │
│                                                                    │
│                                                                    │
└──────────────────────────────────────────────────────────────────┘

        <Enter> Modify the Field; <F10> Continue ALIGNCTD; <Esc> Quit.
        <Enter> Modify the Field; <F10> Continue ALIGNCTD; <Esc> Quit.
```

Entries for secondary sensors are ignored if the secondary sensors are not included in the data file.

Number of Seconds to Advance Conductivity Relative to Pressure:
Number of Seconds to Advance Temperature Relative to Pressure:

Temperature (and conductivity) profiles are often systematically separated in depth between the upcast and downcast. The causes are lags in the temperature (and conductivity) sensor response and hysteresis in the pressure measurement. These can be compensated by shifting temperature and conductivity relative to pressure. Because the SBE 19 uses a temperature sensor with a relatively slow time constant a typical correction for the SBE 19 PROFILER is an advance temperature relative to pressure of +0.5 seconds. Because the time response of the SBE 3 temperature is fast (0.06 seconds) it is not necessary to advance temperature relative to pressure for the SBE 9 and SBE 25.

For a given sensor configuration the conductivity measurement may lead or lag that of temperature. This is especially true of SBE 19 PROFILER data where the flushing rate of the conductivity cell depends on drop speed. If the profiler is lowered slowly, conductivity structure will lag temperature structure, while if it is lowered fast it will lead temperature. For an SBE 19 PROFILER the advance of conductivity relative to temperature will range from 0 seconds at a lowering rate of 0.75 meters per second (0.75 decibars per second) to -0.6 seconds for 2 meters per second.

For an SBE 9 CTD with ducted temperature and conductivity sensors and a 3000 rpm pump the typical net advance of conductivity relative to temperature is 0.073 seconds. If the SBE 11 is set to advance the primary conductivity 3 scans (3/24 seconds) the nominal value to advance conductivity relative to temperature with ALIGNCTD is -0.52 seconds (3/24 - 0.052 = 0.073 seconds). If the SBE 11 is set to advance the primary conductivity 1.75 scans (factory setting for the SBE 11plus) the nominal value to advance conductivity relative to temperature with ALIGNCTD is 0.00 seconds (1.75/24 = 0.073 seconds). The SBE 11 and 11plus deck units do not advance the secondary conductivity.

Note that if temperature is advanced relative to pressure and you do not want to change the relative timing of temperature and conductivity you must add the same advance to conductivity.

The best diagnostic of proper alignment is the elimination of salinity spikes that coincide with very sharp temperature steps. To determine the best alignment plot 10 meters of temperature and salinity data at a very sharp temperature step. For the down trace, when the mean gradients are positive (temperature and salinity increasing upward) a negative salinity spike at the temperature step means that conductivity leads temperature (the conductivity sensor "sees" the step before the temperature sensor does) and you will need to advance conductivity relative to temperature a **negative** number of seconds. Conversely if the salinity spikes are positive, advance conductivity relative to temperature a positive number of seconds. The best alignment is obtained when the salinity spikes are minimized.

Some experimentation with different advances will be required to find the best alignment.

When using free flushing conductivity sensors, we recommend that the profiling speed be kept greater than 0.7 meters per second because of thermal contamination of the conductivity measurement at lower speeds.

Example (typical of SBE 19 data):

If we wish to advance conductivity 0.2 seconds relative to temperature and we wish to advance temperature +0.5 seconds relative to pressure. We would enter:

Num seconds to advance conductivity relative to pressure = 0.7
Num seconds to advance temperature relative to pressure = 0.5

Number of Seconds to Advance Oxygen Relative to Pressure:

Oxygen data are also systematically delayed with respect to depth. The two primary reasons are the long time constant of the oxygen sensor (ranging from 2 seconds at 25 C to about 5 seconds at 0 C) and an additional delay from the transit time of water in the pumped plumbing line. As with temperature and conductivity, this delay is compensated by shifting oxygen data relative to pressure. If 0 is entered the relative timing between oxygen and the remaining parameters is not changed. A typical correction for the SBE 19 PROFILER is an advance of +6 seconds, and for the SBE 9 CTD it is an advance of about +3 seconds.

ALIGNCTD: COMMAND LINE PARAMETERS

-a	Align all .CNV files. Display the set up form before processing the data.
-ax	Align all .CNV files. Do not display the set up form.
-e<cname>	Use cname rather than ALIGNCTD.CFG for the configuration.
-cn	Align column N.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-sN	Advance column specified with the -cn option N seconds relative to pressure.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.
-v<colNumber>,<advSeconds>	Advance colNumber advSeconds. This option can be used more than once. For example -v0,-3.5 advances column 0 -3.5 seconds; -v3,0.05 advances column 3 0.05 seconds. No spaces are allowed between the parameters.

Input Files:

ALIGNCTD.CFG	ALIGNCTD configuration file
.CNV	input converted data file

Lines Added to Header:

alignctd_date	system time when ALIGNCTD was run
alignctd_in	input filename
alignctd_cond_adv_secs	number of seconds conductivity advanced relative to pressure
alignctd_temp_adv_secs	number of seconds temperature advanced relative to pressure

alignctd_oxygen_adv_secs	number of seconds oxygen advanced relative to pressure
alignctd_uservar_index_adv_secs	if the -c and -s command line options are specified the first number following this header entry is the column and the second number is the number of seconds that the column was advanced relative to pressure.

8.2 ASCIIIN

Description:

ASCIIIN is a utility that adds a header to a ASCII file that contains rows and columns of ASCII data. ASCIIIN can be used to add a header to data that was generated by a non SEASOFT program.

```
ASCIIIN  4.023                          Tuesday  March 9, 1993  4:57 pm

                        ASCIIIN Set Up Form

Input Data File =                 TEST.ASC

Input Data File Path =            C:\SEASOFT\

Output Data File Path =           C:\SEASOFT\

Input Variables =                 <Press Enter to Modify>

Scan Interval Variable =          time

Scan Interval Value [ seconds] = 0.500000

User Defined Variables Set Up =  <Press Enter to Modify>

        <Enter> Modify the Field; <F10> Continue ASCIIIN; <Esc> Quit.
```

Enter the Input Data File Path and then select the Input Data File.
Select the Input Variables field to label the input data columns. Choose one of the user defined variable names if your input variable is not computed by DATCNV or DERIVE. The User Defined Variables Set Up is used to configure the user defined variables.

8.3 ASCIIOUT

Description:

ASCIIOUT is a utility to output the header portion or the data portion of a converted data file (.CNV extension). The data portion is always written out in ASCII engineering units to a file with a .ASC extension. The header portion is written to a file with a .HDR extension. The flag column and scans with the flag column marked 'bad' can be suppressed from the output. If 'Label Output Columns' is set to YES the top of each column will be labeled. The set up form is shown below:

```
ASCIIOUT  4.023                         Wednesday  March 10, 1993  8:17 am

                           ASCIIOUT Set Up Form
  Input Data File =          6080.CNV

  Input Data File Path =     C:\SEASOFT\

  Output Data File Path =    C:\SEASOFT\

  Output ASCII Header = Yes            Output ASCII Data = Yes

  Variables to be Included = <Press Enter to Modify>

  Output Scans Marked Bad =  No

  Label Data Columns =       Label Columns at the Top of the File

  Number of Lines Per Page = 55

  Add First Column Set Up =  <Press Enter to Modify>

             <Enter> Modify the Field; <F10> Continue ASCIIOUT
```

If columns are labeled at the top of each page a form feed character is inserted after the selected number of lines per page. If add first column is set to yes the first column entry is repeated for each scan in the file. This feature may be used to mark the scans as belonging to a particular cast.

ASCIIOUT: COMMAND LINE PARAMETERS

-a	Process all .CNV files. Display the set up form before processing the data.
-ax	Process all .CNV files. Do not display the set up form.
-b	Output scans marked bad.
-bx	Do not output scans marked bad.
-ca	Output all the data columns including the flag column.
-d	Output the data portion.
-dx	Do not output the data portion.
-e<cname>	Use cname rather than ASCIIOUT.CFG for the configuration.
-f	Output the flag column.
-fx	Do not output the flag column.
-h	Output the header portion.
-hx	Do not output the header portion.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-l	Output data column labels.
-lx	Do not output column label.
-o<filename>	Use <filename> as the output filename.
-px	Do not print progress messages.
-rN	Replace badFlag value with N (defualt badFlag value is -9.99e-29)
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.
-1x	Do not add user defined first column
-1n<name>	Add first column and use name as the first column name (column header).
-1v<value>	Add first column and use value as the first column value string.

Input Files:

ASCIIOUT.CFG ASCIIOUT configuration file
.CNV input converted data file

8.4 BINAVG

Description:

Averages data in converted data (.CNV) files. The averaging interval can be pressure, depth, scan number, or time. Scans marked bad will not be evaluated if "Exclude Scans Marked Bad in BINAVG" is set to "YES". The set up form is shown below:

```
BINAVG  4.005                              Monday  April 27, 1992  10:31 am

                              Bin Average Set Up

Input Data File =                     SBE015.CNV

Input File [.CNV] Path =              C:

Output Data File Path =               C:

Bin Type =                            Pressure Bins

Bin Size =                            2.000000

Include Number of Scans Per Bin =     Yes

Exclude Scans Marked Bad in BINAVG = Yes

Number of Scans to Skip Over =         1

Surface Bin Setup Parameters =        <Press Enter to Modify>
```

```
BINAVG  4.005                              Monday  April 27, 1992  10:31 am

                         Surface Bin Setup Parameters =

 Include Surface Bin =        Yes

 Surface Bin Minimum Value = 0.300000

 Surface Bin Maximum Value = 0.600000
```

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BINAVG: DESCRIPTION OF ALGORITHM

Values set to bad_flag by WILDEDIT are not included in the average. If the number of points included in the average is zero the average value is set to bad_flag.

If Exclude Scans Marked Bad = NO all scans are considered 'good'.

The center value of the first bin is set equal to the bin size.

Scan Number or Time Bins:

   N = scans per bin
   N = bin size; bin type = scans
   N = bin size / interval; bin type = seconds
   N = bin size * 3600 / interval; bin type = hours

   If the bin type is scans N 'good' scans are averaged.

   If the bin type is seconds or hours N scans are read; only the scans marked 'good' are included in the average.

Pressure Bins (No Interpolation):

   For each bin:

   BinMin = center value - binSize / 2
   BinMax = center value + binsize / 2

   Scans with pressure > BinMin and pressure <= BinMax are added to the average. If pressure > BinMax the sums are divided by the number of points and the averages are written to the output file. The center value for the next bin is then computed and the values for the scan are added to the next bin.

   If Exclude Scans Marked Bad = YES, scans with the flag field set to bad_flag (by LOOPEDIT) are skipped over. One exception is the surface bin which will always include these values.

Pressure Bins (with interpolation):

   For each bin:

   BinMin = center value - binSize / 2
   BinMax = center value + binsize / 2

   Scans with pressure > BinMin and pressure <= BinMax are added to the average. If pressure > BinMax the sums are divided by the number of points and the interpolation is done as follows:

P_p =   average pressure of the previous bin
X_p =   average value of the variable in the previous bin
P_c =   average pressure of the current bin
X_c =   average value of the variable in the current bin
P_i =   target or center value for pressure in the bin
X_i =   interpolated value for the variable (value it would have at the center pressure)

$$X_i = ((X_c - X_p) * (P_i - P_p) / (P_c - P_p)) + X_p$$

The interpolated values are computed and stored in the output file.

Interpolated values for the first bin are computed after the averages for the second bin are calculated. In this case the target is first set to the center of the first bin. The interpolated values for the first bin are calculated and stored. The target is then set to the center of the second bin. The interpolated values for the second bin are then calculated and stored.

Depth Bins:

Depth bins are processed the same as pressure bins with interpolation except that the tests to determine whether the scan is in the bin are made on depth rather than pressure.

Include Surface Bin:

The Include Surface Bin flag is ignored when averaging is by scan or time bins.

If Include Surface Bin is set to NO the center of the first bin is set equal to the bin size.

Otherwise all scans with pressure values that are > surface minimum and <= surface maximum are added to the surface bin. As soon as a scan is found with a pressure value > BinMin the surface values are averaged and this value is used as the first bin. The target for the surface bin is set to 0.0.

The first bin is the bin size. Use the -c command line option to change the center value of the first bin for pressure or depth bins. For example if the bin size is 10 decibars:

first bin = 10 decibars, includes data greater than 5 db and less than or equal to 15 db.
second bin = 20 decibars, includes data greater than 15 db and less than or equal to 25 db.
third bin = 30 decibars, includes data greater than 25 db and less than or equal to 35 db.

If binavg -c5 is entered to start BINAVG the center of the first bin is set to 5 decibars:

first bin = 5 decibars, includes data greater than 0 db and less than or equal to 10 db.
second bin = 15 decibars, includes data greater than 10 db and less than or equal to 20 db.
third bin = 25 decibars, includes data greater than 20 db and less than or equal to 30 db.

If binavg -c15 is entered to start BINAVG and Include Surface Bin is set to Yes with surface minimum = 2 db and surface maximum = 8 db, then:

surface bin = 5 decibars, includes data > 2 db and < = 8 db.
first bin = 15 decibars, includes data greater than 10 db and less than or equal to 20 db.
second bin = 25 decibars, includes data greater than 20 db and less than or equal to 30 db.
third bin = 35 decibars, includes data greater than 30 db and less than or equal to 40 db.

BINAVG: COMMAND LINE PARAMETERS

-a	Align all .CNV files. Display the set up form before processing the data.
-ax	Align all .CNV files. Do not display the set up form.
-b	Include values in scans marked bad in the average.
-bx	Do not include values in scans marked bad in the average.
-c < num >	Use num for the first bin's center value
-d	Output downcast only.
-e < cname >	Use cname rather than BINAVG.CFG for the configuration.
-i < filename >	Enter batch mode and use < filename > as the input filename.
-o < filename >	Use < filename > as the output filename.
-px	Do not print out progress messages.
-r	Include surface bin.
-rx	Do not include surface bin.
-s	Flag for including number of scans per bin in last column.
-t < tname >	Use tname rather than TEMP.CNV for the temporary file.
-u	File contains upcast data only
-v[d < binsize >	p < binsize >	s < binsize >	t[s|h] < binsize >	
	bin variable and bin size.
-vd < binsize >	bin var is depth.
-vp < binsize >	bin var is pressure.
-vs < binsize >	bin var is scan number.
-vts < binsize >	bin var is seconds.
-vth < binsize >	bin var is hours.
-x < skipover >	Number of scans to skip over.
-y < surface min >	Surface bin minimum value.
-z < surface max >	Surface bin maximum value.

Input Files:

BINAVG.CFG	BINAVG configuration file
.CNV	input converted data file

Lines Added to Header:

binavg_date   system time when BINAVG was run
binavg_in   input filename
binavg_bintype   bin type (pressure, depth, scans, seconds, or hours)
binavg_binsize   bin size
binavg_excl_bad_scans if yes, values from scans marked bad are not included in the average
binavg_downcast_only   if yes only the downcast data is output
binavg_skipover   number of scans skipped over
binavg_surface_bin   surface bin included ?, min and max values for the surface bin

8.5 BUOYANCY

Description:

Calculates buoyancy (Brunt-Väisälä) frequency (N) and stability (E) using the Fofonoff adiabatic leveling method (Bray N. A. and N. P. Fofonoff (1981) Available potential energy for MODE eddies. *Journal of Physical Oceanography*, **11**, 30-46.). The input .CNV file must have been processed with BINAVG on pressure bins and must contain pressure, temperature, and either salinity or conductivity. The relationship between BUOYANCY (Brunt-Väisälä) frequency N and stability E is:

$$N^2 = gE \quad [rad^2/s^2]$$

where g = gravity [m / s^2]

The algorithm used to compute N^2 for the pressure value centered in the window is:

1. Compute averages:

    p_bar = average pressure in the window [decibars]
    t_bar = average temperature in the window [deg C]
    s_bar = average salinity in the window [PSU]
    rho_bar = density(s_bar, t_bar, p_bar) [Kg / m^3]

2. Compute the vertical gradient:

    theta = potential temperature (s, t, p, p_bar)
    v = 1 / density(s, theta, p_bar)

    Use a least squares fit to compute the linear gradient dv/dp in the window

3. Compute N^2, N, E, and 10^{-8}E:

$$N^2 = -1.0\mathrm{e}^{-4}\, rho\_bar^2\, g^2\, \frac{\delta v}{\delta p} \qquad [rad^2/s^2]$$

$$N = \frac{3600}{2\Pi} \sqrt{N^2} \qquad [cycles/hour]$$

$$E = \frac{N^2}{g} \qquad [rad^2/m]$$

$$E = 10^8 \frac{N^2}{g} \qquad [10^{-8} rad^2/m]$$

The set up form is:

```
Buoyancy  4.020                        Friday  January 22, 1993  8:17 am

                          Buoyancy Set Up

Input Data File =                      TIN.CNV

Input File [.CNV] Path =               C:\SEASOFT\

Output Data File Path =                C:\SEASOFT\

Input Variables =                      <Press Enter to Display>

Variables to be Derived =              <Press Enter to Modify>

Window Size for Buoyancy Computation (decibars) = 50.0000000

Variable Used in Buoyancy Computation =    latitude, 30 degrees


      <Enter> Modify the Field; <F10> Continue Buoyancy; <Esc> Quit.
```

BUOYANCY converts the window size from decibars to scans based on the pressure interval between scans in the input file. If the window size is less than three scans BUOYANCY sets it to three scans. If the window size is an even number of scans BUOYANCY adds one scan to the window size. Example: If the interval between scans in the input file is 10 decibars, window sizes of 5, 10, and 20 decibars will result in a window size of three scans. Window sizes of 30, and 40 decibars will result in a window size of five scans.

The variable used in buoyancy computation can be latitude (BUOYANCY will estimate the local gravity from the latitude using the algorithm in UNESCO Technical Papers in Marine Science No. 44.) or user entered gravity.

The number of variables added to the .CNV file can be 0, 1, 2, 3, or 4. Highlight the Variables to be Derived field and press Enter to select the output variables.

Forms similar to the following will be displayed:

```
┌──────────────────────────────────────────────────────────────────────────────┐
│ Buoyancy  4.020                           Friday  January 22, 1993  8:17 am    │
├──────────────────────────────────────────┬─────────────────────────────────────┤
│     Variables to be Derived and Added int │        Variable Types               │
│                                           │                                     │
│ Variable #  0 = stability, E, rad^2/m     │ stability, E                        │
│ Variable #  1 = stability, E, 10^-8 rad^2/m│ buoyancy frequency                 │
│ Variable #  2 = buoyancy frequency, N^2, rad│ none                             │
│ Variable #  3 = buoyancy frequency, N, cycle│                                  │
│                                           │                                     │
│              ┌────────────────────────────┴──────┐                             │
│              │  Stability, E Units Type          │                             │
│              ├───────────────────────────────────┤                             │
│              │ rad^2/m                           │                             │
│              │ 10^-8 rad^2/m                     │                             │
│              └───────────────────────────────────┘                             │
│                                                                                │
│         <Enter> Modify the Field; <F10> Conti                                  │
└──────────────────────────────────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────────────────────────────────┐
│ Buoyancy  4.020                           Friday  January 22, 1993  8:17 am    │
├──────────────────────────────────────────┬─────────────────────────────────────┤
│     Variables to be Derived and Added int │        Variable Types               │
│                                           │                                     │
│ Variable #  0 = stability, E, rad^2/m     │ stability, E                        │
│ Variable #  1 = stability, E, 10^-8 rad^2/m│ buoyancy frequency                 │
│ Variable #  2 = buoyancy frequency, N^2, rad│ none                             │
│ Variable #  3 = buoyancy frequency, N, cycle│                                  │
│                                           │                                     │
│           ┌───────────────────────────────┴─────┐                             │
│           │ Buoyancy Frequency Units Type       │                             │
│           ├─────────────────────────────────────┤                             │
│           │ N^2, rad^2/s^2                      │                             │
│           │ N, cycles/hour                      │                             │
│           └─────────────────────────────────────┘                             │
│                                                                                │
│         <Enter> Modify the Field; <F10> Conti                                  │
└──────────────────────────────────────────────────────────────────────────────┘
```

BUOYANCY: COMMAND LINE PARAMETERS

-a	Process all .CNV files. Display the set up form before processing the data.
-ax	Process all .CNV files. Do not display the set up form.
-e<cname>	Use cname rather than BUOYANCY.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

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Input Files:

    BUOYANCY.CFG   BUOYANCY configuration file
    .CNV   input converted data file

\# buoyancy_date = Jan 22 1993 08:51:28, 4.020
\# buoyancy_in = TIN.CNV
\# buoyancy_vars: gravity = 9.7988 m/s^2, pres_interval = 50 decibars

Lines Added to Header:

    buoyancy_date   system time when BUOYANCY was run
    buoyancy_in   input data file
    buoyancy_vars   gravity value and window size

8.6 CELLTM

Description:

Uses a recursive filter to remove conductivity cell thermal mass effects from the measured conductivity. In areas with steep temperature gradients the thermal mass correction is on the order of 0.005 PSU. In other areas the correction is negligible. The set up form is:

```
CELLTM  4.0                            Monday  January 13, 1992  1:29 pm

                              CELLTM Set Up

 Input Data File =                      BECK.CNV

 Input File [.CNV] Path =               C:

 Output Data File Path =                C:

 Correct Primary Conductivity Values =      Yes
    Temperature Sensor to Use =             Secondary
    Thermal Anomaly Amplitude (alpha) =     0.035000
    Thermal Anomaly Time Constant (1/beta) = 9.500000

 Correct Secondary Conductivity Values =    Yes
    Temperature Sensor to Use =             Primary
    Thermal Anomaly Amplitude (alpha) =     0.030000
    Thermal Anomaly Time Constant (1/beta) = 9.000000

        <Enter> Modify the Field; <F10> Continue CELLTM; <Esc> Quit.
```

Typical values for an SBE 911*plus* TC ducted conductivity cell (3000 rpm pump) are:

    alpha = 0.03
    1/beta = 7.0

Typical values for an SBE 25 TC ducted conductivity cell (2000 rpm pump) are:

    alpha = 0.04
    1/beta = 8.0

The algorithm used is:

    dt = temperature - previous temperature
    ctm = -1.0 * b * previous ctm + a * dcdt * dt
    corrected conductivity = c + ctm

where:
    a = 2 * alpha / (sample interval * beta + 2)
    b = 1 - (2 * a / alpha)
    dcdt = 0.1 * (1 + 0.006 * (temperature - 20))

A discussion of how to determine the values for alpha and beta can be found in:

Lueck, R. G., 1990: Thermal Inertia of Conductivity Cells: Theory., American Meteorological Society, Oct 1990, 741-755.

CELLTM: COMMAND LINE PARAMETERS

-a	Process all .CNV files. Display the set up form before processing the data.
-ax	Process all .CNV files. Do not display the set up form.
-e<cname>	Use cname rather than CELLTM.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

CELLTM.CFG	CELLTM configuration file
.CNV	input converted data file

Lines Added to Header:

celltm_date	system time when CELLTM was run
celltm_in	input data file
celltm_alpha	value used for alpha
celltm_tau	value used for 1/beta

8.7 CFGTOCON

CFGTOCON is a utility that will convert .CFG files used by previous versions of SEASOFT to store instrument configuration, calibration coefficients, and display parameters to the format used by SEASOFT 4.0. In SEASOFT V 4.0 instrument configuration and calibration coefficients are stored in files with a .CON extension. Display parameters are stored separately.

8.8 CNV37

CNV37 coverts data from .ASC files, written by TERM37, and stores the converted data in .CNV files.

CNV37: COMMAND LINE PARAMETERS

-r   reset julian day when start a new year. Default is not to reset julian day when start a new year so data will plot OK.

8.9 CONTOUR

CONTOUR is used to generate density contours to overlay on TS plots. The set up form is:

```
CONTOUR  4.019                          Tuesday  November 24, 1992  9:37 am

                              CONTOUR Set Up

Output Data File Path =    C:

Output File Name [.CTR] = TS1.CTR

Reference Pressure =       0.000000

Beginning Density =        24.000000

Ending Density =           30.000000

Total Number of Contours = 13

Beginning Temperature =    0.000000

Ending Temperature =       30.00000

Temperature Interval =     0.100000

        <Enter> Modify the Field; <F10> Continue CONTOUR; <Esc> Quit.
```

The density contours are computed using the specified temperature, salinity, and reference pressure. To add density contours to a TS plot:

Run CONTOUR to generate the density contours.
Run SEAPLOT to select the variables and plot format.
    (set X-AXIS #1 variable to none to make room for the density contour labels)
Run SEAPLOT with the -vfilename option to select overlaid plots.
Include the file with the .CTR extension in the list of files in filename.

Example:

if the file tslist contained two lines:

    cast1
    ts1.ctr

then seaplot -vtslist would plot CAST1.CNV and overlay TS1.CTR on the plot

8.10 DATCNV

Description:

Converts raw data from input .DAT or .HEX files to engineering units and stores the converted data in .CNV files. If FILENAME.NAV is found in the Input File Path the contents of this file are added to the header portion of the converted data file. The main set up form is:

8.10.1 DATCNV: EXPLANATION OF PROMPTS

```
DATCNV  4.030                        Friday  September 3, 1993  9:59 am

                              DATCNV Set Up

Raw Data File =                       HU112.DAT

Configuration File [.CON] =           SEASOFTB.CON

Input File [.CON, .DAT, .HEX] Path =  C:\TESTING\SBE911P\

Output Data File Path =               C:\TESTING\SBE911P\

DATCNV Format = Binary          DATCNV Variables = <Press Enter to Modify>

Output Cast Select =            Both Down Cast and Up Cast

Number of Scans to Skip Over =  0

Output Water Bottle Data =      Yes

Water Bottle Data Set Up =      <Press Enter to Modify>

       <Enter> Modify the Field; <F10> Continue DATCNV; <Esc> Quit.
```

Binary converted files are smaller and are processed much faster by the other SEASOFT modules. ASCII converted files can be examined with any text editor. The SEASOFT module TRANS can be used to translate converted data files from binary format to ASCII format or vice versa.

To select the variable to convert move the Arrow keys or mouse to the DATCNV Variables field to highlight <Press Enter to Modify> and then press the Enter Key. The following form will be displayed:

```
DATCNV  4.0                          Monday  January 13, 1992  1:30 pm

          ┌──────────────────────────────────────────────────────┐
          │              Data Conversion Variables =             │
          ├──────────────────────────────────────────────────────┤
          │ Conversion Units  Metric                             │
          │ Column #  0 =    scan number                         │
          │ Column #  1 =    pressure, decibars                  │
          │ Column #  2 =    temperature, primary, deg C         │
          │ Column #  3 =    conductivity, primary, S/m          │
          │ Column #  4 =    oxygen, current, microamps          │
          │ Column #  5 =    oxygen, temperature, deg C          │
          │ Column #  6 =    none                                │
          └──────────────────────────────────────────────────────┘
       <Enter> Modify the Field; <F10> Continue Data Conversion; <Esc> Quit.
```
Conversion Units can be either Metric or English.

To configure the output file use the Arrow Keys or the mouse to highlight the desired column and press enter. A list showing the output variable selections will be shown:

```
DATCNV  4.0                          Monday  January 13, 1992  1:30 pm

  ┌───────────────────────────────────────────┐┌──────────────────────────────┐
  │           Data Conversion Vari            ││         Variable Types        │
  ├───────────────────────────────────────────┤├──────────────────────────────┤
  │ Conversion Units  Metric                  ││ none                          │
  │ Column #  0 =    scan number              ││ number of bottles fired       │
  │ Column #  1 =    pressure, decibars       ││ number of scans averaged      │
  │ Column #  2 =    temperature, primary, deg C││ oxidation reduction potential│
  │ Column #  3 =    conductivity, primary, S/m ││ oxygen                        │
  │ Column #  4 =    oxygen, current, microamps ││ pH                            │
  │ Column #  5 =    oxygen, temperature, deg C ││ potential temperature         │
  │ Column #  6 =    none                      ││ pressure                      │
  │ Column #  7 =    none                      ││ pressure temperature          │
  │ Column #  8 =    none                      ││ salinity                      │
  │ Column #  9 =    none                      ││ scan number                   │
  │ Column # 10 =    none                      ││ sound velocity                │
  │ Column # 11 =    none                      ││ specific conductivity         │
  │ Column # 12 =    none                      ││ specific volume anomaly       │
  │ Column # 13 =    none                      ││ surface irradiance            │
  │ Column # 14 =    none                      ││ temperature                   │
  │ Column # 15 =    none                      ││ thermosteric anomaly          │
  │                                           ││ tilt                          │
  └───────────────────────────────────────────┘└──────────────────────────────┘
      <Enter> Modify the Field; <F10> Continue
```

Highlight the desired variable type and press the Enter Key to make the selection. Press the Esc Key to return to the main menu. Press Function Key 10 to begin the data conversion.

8.10.2 DATCNV: EXTRACTING WATER BOTTLE INFORMATION (CREATING .ROS FILES)

If you do not want to create a .ROS file for subsequent processing by ROSSUM set the 'Output Water Bottle Data' field in the DATCNV set up form to No. In this case the Water Bottle Data Set Up will be ignored.

If you do want to create a .ROS file for subsequent processing by ROSSUM set the 'Output Water Bottle Data' field to Yes. Select the 'Water Bottle Data Set Up' field to select the files to be created and the source of the scan rage for each bottle.

The choices for output file creation are:

```
║ Source of Scan ┌─────────────────────────────────────┐ 0, 3        ║
║                │            File Creation =          │             ║
║ Output Data Fil├─────────────────────────────────────┤             ║
║                │Create Converted Data (.CNV) File Only│             ║
║ DATCNV Format =│Create Water Bottle Data (.ROS) File Only│ Enter to Modify>║
║                │Create Both .CNV and .ROS Files      │             ║
║ Output Cast Sel└─────────────────────────────────────┘Cast         ║
```

The choices for scan range information are:

```
║ Output Data File┌──────────────────────────────────────┐             ║
║                 │        Source of Scan Range =        │             ║
║ DATCNV Format = ├──────────────────────────────────────┤ Enter to Modify>║
║                 │Scans Marked With Bottle Confirm Bit  │             ║
║                 │Bottle Scan Range File [.BSR]         │             ║
║                 │Bottle Log File [.BL]                 │             ║
║ Output Cast Sele│Auto-Fire Module File [.AFM]          │Cast         ║
```

Choose 'Scans Marked with Bottle Confirm Bit' from the menu if you are using an SBE 911plus with a water sampler (rosette) interface. In this case the bottle confirm bit will be set for 1.5 seconds when a confirmation is received from the rosette. You will be prompted for the offset and duration. The offset determines the first scan output to the .ROS file for the bottle. The duration determines the number of scans output to the .ROS file for the bottle. The offset and duration are referenced to the first confirm bit for the bottle. For example if the scan rate is 24 scans per second, 36 scans in a row have the confirm bit set beginning with scan 10,000, offset = -2 seconds and duration = 5 seconds then scans 9,952 through 10,072 will be written to the .ROS file for this bottle.

If you are <u>not</u> using an SBE 911*plus* with a water sampler interface select 'Bottle Scan Range File [.BSR]' or 'Bottle Log File [BL.] as the source of scan range. DATCNV will read the .BSR or .BL file to determine the scans to output to the .ROS file.

If you are using an SBE 90208 Carousel Auto Fire Module select 'Auto-Fire Module File [.AFM]'. DATCNV will merge data from the .HEX file and .AFM file into the .ROS file. You will be prompted for the offset and duration. The offset is relative to the first scan recorded by the Auto-Fire Module (five scans before the bottle is tripped. The duration determines the number of scans output to the .ROS file for the bottle.

If you select Bottle Scan Range File [.BSR] or Bottle Log File[.BL] and bottle confirm bits are set in the raw data file, the data from the .BSR file will be used and the bottle confirm bits will be ignored.

If you have used the Mark Scan feature in SEASAVE during data acquisition to create a .MRK file you can use the module MARKSCAN to create a .BSR file from the .MRK file.

A Bottle Log file is created when bottles are fired and data is stored to disk.

The format for the .BSR file is:

beginning scan number for bottle #1 , ending scan number for bottle # 1
beginning scan number for bottle #2 , ending scan number for bottle # 2
…
beginning scan number for the last bottle , ending scan number for the last bottle

for example the file TEST.BSR could contain:

1000, 1020
2000, 2020
4000, 4020

The .ROS file created using TEST.BSR would contain scans 1000 to 1020 for bottle #1, 2000, 2020 for bottle #2, and 4000 t0 4020 for bottle #3.

8.10.3 DATCNV: NOTES

If you plan to do any post processing of the data select only the primary variables to be converted. Use the SEASOFT module DERIVE to compute derived oceanographic parameters such as salinity, density, sound velocity, oxygen, and dynamic height anomaly.

If you will use BINAVG with depth bins include depth in the output file.

If you will use BINAVG with pressure bins include pressure in the output file.

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.

DATCNV was written to accommodate most if not all of the sensors that have been installed on Sea-Bird products. Consult the configuration page at the beginning of your hardware manual for the sensors that were installed in your system.

If you will use DERIVE to compute oxygen, include oxygen current and oxygen temperature in the output file along with pressure, temperature, and conductivity.

Pressure temperature is computed using a backward looking 30 second running average in order 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 values computed by SEASAVE and DATCNV will be somewhat different from oxygen values computed by DERIVE. This is because the oxygen algorithm uses the parameter doc/dt (the derivative of oxygen current with respect to time). SEASAVE and DATCNV compute this parameter looking backwards in time since they share common code and SEASAVE can not use future values of oxygen current while acquiring data in real time. DERIVE uses a centered window (equal number of points before and after the scan) to obtain a better estimate of doc/dt. SEASAVE and DATCNV can be used to obtain a quick look of oxygen values, DERIVE should be used to obtain the most accurate oxygen computations.

Oxygen sensors normally measure two parameters, oxygen membrane current and oxygen membrane temperature. In previous versions of SEASOFT oxygen was assigned to a data word while other sensors such as transmissometers were assigned to individual voltages. In SEASOFT there are two voltages in a data word. If oxygen were assigned to word 3, oxygen current voltage would appear on voltage 0 and oxygen temperature voltage would appear on voltage 1.

DATCNV: COMMAND LINE PARAMETERS

-a	Process all .DAT and .HEX files. Display the set up form before processing the data.
-ax	Process all .DAT and .HEX files. Do not display the setup form.
-c\<filename\>	Use \<filename\>.con for instrument configuration and calibration constants. Filename can include a path name.
-e\<cname\>	Use cname rather than DATCNV.CFG for the configuration.
-f\<a|b\>	Data conversion format: a(scii) or b(inary).
-h	If a .HDR file with the same name as the data file is found, use the .HDR file as the header for the .CNV file. This allows the user to edit the SBE 911plus ASCII header file and have the edited header replace the header in the binary .DAT file when the file is processed by DATCNV.
-i\<filename\>	Enter batch mode and use \<filename\> as the input filename.
-n\<numscans\>	Number of scans to convert.
-o\<filename\>	Use \<filename\> as the output filename.
-px	Do not print out progress messages.
-r\<degrees\>	Surface PAR = surface PAR * cos(degrees)
-t\<tname\>	Use tname rather than TEMP.CNV for the temporary file.
-s	Use INPUTFILENAME.CON as the .CON file when using the -a to -ax command line options. This option is intended for batch processing of SBE 9 or 9plus data collected with different configurations.
-x\<skipover\>	Number of scans to skip over.

Input Files:

DATCNV.CFG	datcnv configuration
.DAT or .HEX	raw input data file
*.CON	constants file

Lines Added to Header:

datcnv_date = \<date\>	date and time of conversion
datcnv_in = \<F1 F2 ST SC SP\>	F1 = input data filename
	F2 = constants (.CON) filename
	ST = temperature sensor serial number
	SC = conductivity sensor serial number
	SP = pressure sensor serial number

8.11 DERIVE

Description:

DERIVE uses pressure, temperature, and conductivity in the converted data file to compute the following oceanographic parameters:

  density (density, sigma-theta, sigma-t, sigma-1, sigma-2, sigma-4)

  depth (salt water, fresh water)

  dynamic meters

  geopotential anomaly

  potential temperature (reference pressure = 0.0 decibars)

  potential temperature anomaly

  salinity

  sound velocity (Chen-Millero, DelGrosso, Wilson)

  average sound velocity

  specific volume anomaly

  thermosteric anomaly

If the input converted data file has not been averaged into pressure or depth bins DERIVE can compute lowering rate and acceleration.

Oxygen will be added to the variable list if the input file has not been averaged into pressure or depth bins and the input file contains pressure, temperature and either conductivity or salinity.

Definitions:

  Temperature used for derived variables is IPTS-68. Following the recommendation of JPOTS T_{68} is assumed to be $1.00024 * T_{90}$ (-2 to 35 °C)

  Salinity is PSS-78

  Density is calculated based on the equation of state for seawater (EOS80).

The formulas for the computation of salinity, density, potential temperature, specific volume anomaly, and sound velocity were obtained from "Algorithms for computation of fundamental properties of seawater", by N.P. Fofonoff and R.C Millard Jr.; Unesco technical papers in marine science #44, 1983

density $= \rho = \rho \, (s, \, t, \, p) \quad [kg/m^3]$

(density of sea water with salinity s, temperature t, and pressure p)

potential temperature [IPTS-68] $= \theta \, (s, \, t, \, p, \, p_r) \quad [°C]$

potential temperature [ITS-90] $= \theta \, (s, \, t, \, p, \, p_r)/ \, 1.00024 \quad [°C]$

(Potential temperature is the temperature an element of seawater would have if raised adiabatically with no change in salinity to reference pressure p$_r$. DATCNV, DERIVE, and SEACALC use a reference pressure of 0 decibars).

potential temperature anomaly = potential temperature - a0 - a1 x salinity
or
potential temperature anomaly = potential temperature - a0 - a1 x Sigma-θ
The constants a0 and a1 and the salinity/density selection are entered when potential temperature anomaly is selected from the variable to display menu.

Sigma - θ $= \sigma - \theta = \rho \, (s, \, \theta(s, \, t, \, p, \, 0), \, 0) - 1000 \quad [kg/m^3]$

Sigma - 1 $= \sigma - 1 = \rho \, (s, \, \theta(s, \, t, \, p, \, 1000), \, 1000) - 1000 \quad [kg/m^3]$

Sigma - 2 $= \sigma - 2 = \rho \, (s, \, \theta(s, \, t, \, p, \, 2000), \, 2000) - 1000 \quad [kg/m^3]$

Sigma - 4 $= \sigma - 4 = \rho \, (s, \, \theta(s, \, t, \, p, \, 4000), \, 4000) - 1000 \quad [kg/m^3]$

Sigma - t $= \sigma_t = \rho \, (s, \, t, \, 0) - 1000 \quad [kg/m^3]$

thermosteric anomaly $= 10^5 \, ((1000/(1000 + \sigma_t)) - 0.97266) \; [10^{-8} \, m^3/kg]$

specific volume $= V(s, \, t, \, p) = 1/\rho \quad [m^3/kg]$

specific volume anomaly $= \delta = 10^8 \, (V(s, \, t, \, p) - V(35, \, 0, \, p)) \quad [10^{-8} \, m^3/kg]$

geopotential anomaly $= 10^{-4} \sum\limits_{\Delta p, p=0}^{p=p} (\delta \times \Delta p) \quad [J/kg] = [m^2/s^2]$

dynamic meters = geopotential anomaly / 10.0

one dynamic meter = 10 J/kg; (Sverdup, Johnson, Flemming (1946), UNESCO (1991))

oxygen $[\mu moles/kg] = \dfrac{44660}{Sigma - \theta + 1000} \; oxygen \quad [ml/l]$

$$average\ sound\ velocity = \frac{\sum_{\Delta p,p=min}^{p=p} (\Delta p \times avgSV)}{\sum_{\Delta p,p=min}^{p=p} \Delta p} \quad [m/s]$$

Average sound velocity is the average sound velocity from the surface to the current CTD depth. This value is calculated on the downcast only and is not updated on the upcast. The first window begins when pressure is greater than the minimum specified pressure and salinity is greater than the minimum specified salinity. The sums are updated when both pressure and time (referred to the last sum) are greater than the specified window sizes. AvgSV is the average sound velocity in the current window.

8.11.1 DERIVE: EXPLANATION OF PROMPTS

The set up form for DERIVE is:

```
DERIVE  4.025                         Tuesday  January 14, 1992  11:38 am

                             DERIVE Set Up

 Input Data File =                          BECK.CNV

 Configuration File [.CON] for Oxygen Coeffs =  SEASOFT.CON

 Input File [.CNV] Path =                   C:

 Output Data File Path =                    C:

 Input Variables =                          <Press Enter to Modify>

 Variables to be Derived =                  <Press Enter to Modify>

 Variable Coefficients =                    <Press Enter to Modify>

        <Enter> Modify the Field; <F10> Continue DERIVE; <Esc> Quit.
```

Select the variables to be derived as described in DATCNV. The selected variables will be added to the converted data file. The list of variables in the input dat file can be viewed by selecting the Input Variables field.

When you select the Variable Coefficients field the following form will be displayed:

```
DERIVE  4.0                           Tuesday  January 14, 1992  1:35 pm

                        Variable Coefficients =

 Time Window Size for doc/dt (seconds) =  2.000000

 Time Window Size for Descent Rate and Accel (seconds) = 2.000000

        <Enter> Modify the Field; <F10> Continue DERIVE; <Esc> Quit.
```

The derivative terms (doc/dt, lowering rate, and acceleration) are computed by looking at data centered around the current data point with a time span equal to the window size and using a linear regression to determine the slope.

DERIVE: COMMAND LINE PARAMETERS

-a	Process all .DAT and .HEX files. Display the set up form before processing the data.
-ax	Process all .DAT and .HEX files. Do not display the setup form.
-c<filename>	Use <filename>.con for instrument configuration and calibration constants. Filename can include a path name.
-e<cname>	Use cname rather than DERIVE.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-s	Use INPUTFILENAME.CON as the .CON file when using the -a to -ax command line options. This option is intended for batch processing of SBE 9 or 9plus data collected with different configurations.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

DERIVE.CFG	DERIVE configuration file
.CNV	input converted data file

Lines Added to Header:

derive_date	system time when DERIVE was run
derive_in	input filename
derive_oxygen_coeff	Soc, Boc, tcor, pcor, tau, wt
derive_time_window_docdt	window size for doc/dt calculation (seconds)
derive_time_window_dzdt	window size for dz/dt calculation (seconds)

8.12 FILTER

Description:

Filter permits the user to low pass filter one or more columns of data. In order to produce zero phase (no time shift) the filter is first run forward through the file and then run backwards through the file. Two time constants can be specified so that conductivity and pressure can be filtered with different time constants in one invocation of FILTER. The set up form for FILTER is:

```
FILTER  4.0                           Monday  January 13, 1992  1:31 pm

                          Filter Selection Form

 Input Data File =                      BECK.CNV

 Input File [.CNV] Path =               C:

 Output Data File Path =                C:

 Low Pass Filter A, Time Constant (sec) =  0.030000

 Low Pass Filter B, Time Constant (sec) =  0.150000

 Variables to Filter =                  <Press Enter to Modify>

     <Enter> Modify the Field; <F10> Continue FILTER; <Esc> Quit FILTER.
```

For each variable you can select None, Low Pass Filter A, or Low Pass Filter B.

```
FILTER  4.0                           Monday  January 13, 1992  1:31 pm

                          Filter Selection Form

 Filter Type, scan number =                       None
 Filter Type, pressure, decibars =                Low Pass Filter B
 Filter Type, temperature, primary, deg C =       None
 Filter Type, conductivity, primary, S/m =        Low Pass Filter A
 Filter Type, oxygen, current, microamps =        None
 Filter Type, oxygen, temperature, deg C =        None

     <Enter> Modify the Field; <F10> Continue FILTER; <Esc> Quit FILTER.
```

Normally only conductivity and pressure data are filtered. For the SBE 9, the nominal time constants for the filters are 0.03 seconds for conductivity and 0.15 seconds for pressure.

FILTER: COMMAND LINE PARAMETERS

-a	Process all .CNV files. Display the set up form before processing the data.
-ax	Process all .CNV files. Do not display the setup form.
-e<cname>	Use cname rather than FILTER.CFG for the configuration.
-i<filename>	enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

FILTER.CFG	FILTER configuration file
.CNV	input converted data file

Lines Added to Header:

filter_date	system time when FILTER was run
filter_in	input filename
filter_low_pass_tc_A	time constant for filter A
filter_low_pass_tc_B	time constant for filter B
filter_low_pass_A_vars	list of variables filtered with time constant A
filter_low_pass_B_vars	list of variables filtered with time constant B

8.13 LOOPEDIT

Description:

LOOPEDIT marks scans "bad" by setting the flag value associated with the scan to bad_flag in input .CNV files that have pressure slowdowns or reversals. Scans previously marked bad will not be evaluated if "Exclude Scans Marked Bad in Computation" is set to "YES". On the other hand, if "Exclude Scans Marked Bad in LOOPEDIT" is set to "NO", scans previously marked bad will be reevaluated and the scan's flag will be reset accordingly. The set up form is:

```
LOOPEDIT  4.203                        Monday  January 13, 1992  1:32 pm

                            LOOPEDIT Set Up

Input Data File =                      BECK.CNV

Input File [.CNV] Path =               C:

Output Data File Path =                C:

Minimum Velocity Selection = Percent of Mean Speed, 120, 75

Minimum CTD Velocity (m/s) =           0.250000

Exclude Scans Marked Bad in LOOPEDIT =  Yes

        <Enter> Modify the Field; <F10> Continue LOOPEDIT; <Esc> Quit.
```

The minimum velocity selection can be either Fixed Minimum Velocity of Percent of Mean Speed.

Fixed Minimum Velocity:

If the CTD velocity is less than the specified minimum or the pressure is not greater than the previous maximum the scan is marked "bad".

Percent of Mean Speed:

You will be prompted for the Time Window Size and Percent of Mean Speed. For each scan the mean speed over the last Time Window seconds is computed. If the CTD velocity is less than the specified percent of mean speed or the pressure is not greater than the previous maximum the scan is marked "bad". The entry for Fixed Minimum Velocity is used for data points in the first time window.

LOOPEDIT: COMMAND LINE PARAMETERS

-a	Loopedit all .CNV files. Display the set up form before processing the data.
-ax	Loopedit all .CNV files. Do not display the set up form.
-b	Include pressure values in scans marked bad.
-bx	Do not include pressure values in scans marked bad.
-e<cname>	Use cname rather than LOOPEDIT.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-p	Print out progress messages.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.
-y<minvelocity>	Minimum velocity value for loop edit.

Input Files:

LOOPEDIT.CFG	LOOPEDIT configuration file
.CNV	input converted data file

Lines Added to Header:

loopedit_date	system time when LOOPEDIT was run
loopedit_in	input filename
loopedit_minVelocity	minimum CTD velocity (meters per second)
loopedit_excl_bad_scans	if yes, pressure values from scans marked bad are not used to determine the maximum pressure

8.14 MARKSCAN

MARKSCAN is a utility that reads .MRK files (created by pressing Ctrl-F5 while running SEASAVE) to create a .BSR (bottle scan range) file. DATCNV uses the data in the .BSR file to create a .ROS file.

The setup screen is:

```
MARKSCAN  4.030                        Saturday  September 4, 1993  1:17 pm

                           MARKSCAN Set Up

Input Data File =       TEST.MRK

Input Data File Path =  C:\CTDDATA\

Output Data File Path = C:\CTDDATA\

Offset (scans) =        -5

Duration (scans) =      10


      <Enter> Modify the Field; <F10> Continue MARKSCAN; <Esc> Quit.
```

The format for the .BSR file is:

beginning scan number for bottle #1 , ending scan number for bottle # 1
beginning scan number for bottle #2 , ending scan number for bottle # 2
…
beginning scan number for the last bottle , ending scan number for the last bottle

An ASCII text editor can be used to create the .BSR file; the beginning and ending scan numbers must be separated by a comma.

8.15 ROSSUM

ROSSUM is a utility that reads in a .ROS file created by DATCNV and writes out a summary of the bottle data to a file with a .BTL extension. Temperature, pressure, and conductivity or salinity must be contained in the .ROS file. Lines beginning with a '*' or '#' are copied from the .ROS header. Bottle position, optional bottle serial number, and date/time are always output as the first columns. The derived variables are computed from the mean values of temperature, pressure and conductivity.

If a .BL file (same name as the input data file but with a .BL extension) is found in the input file path, ROSSUM will use the bottle position data from the .BL file.

If the file "BOTTLE.SN" is found in the current directory or a bottle serial number file is specified by the -b<bottleSNfilename> command line option, bottle serial numbers are inserted between the bottle position and date/time. The format for the bottle serial number file is:

    bottle position, serial number
    bottle position, serial number
    bottle position, serial number

a comma separates the two fields.

If oxygen current and oxygen temperature are in the .ROS file, oxygen can be calculated. Doc/dt is a least squares fit to all the oxygen current data for each bottle. Oxygen is calculated using the mean values for temperature, pressure, and salinity, doc/dt, and the scan by scan values of oxygen current and oxygen temperature.

The maximum number of scans processed per bottle is 1440.

The setup screen is:

```
ROSSUM  4.030                           Tuesday  March 23, 1993  8:35 am

                            ROSSUM Set Up

 Input Data File =                            30-2.ROS

 Configuration File [.CON] for Oxygen Coeffs =   30-2.CON

 Input File [.ROS, .CON] Path =               C:\SEASOFT\

 Output Data File Path =                      C:\SEASOFT\

 Variables to be Output Automatically =       <Press Enter to Display>

 Variables to be Derived =                    <Press Enter to Modify>

 Additional Variables to be Averaged =        <Press Enter to Modify>

 Output Min/Max Values for Variables to be Averaged = No

        <Enter> Modify the Field; <F10> Continue ROSSUM; <Esc> Quit.
```

Highlight the Variables to be Derived field to select the derived variables to include in the .BTL file.

```
┌────────────────────────────────────────────────────────────────────────┐
│ ROSSUM  4.024                          Tuesday  March 23, 1993  8:35 am │
├────────────────────────────────────────┬───────────────────────────────┤
│                Variables to be Der      │        Variable Types         │
├────────────────────────────────────────┼───────────────────────────────┤
│ Variable #  0 = salinity, PSS-78 [PSU]  │ density                       │
│ Variable #  1 = density, sigma-theta [kg/m^3│ oxygen saturation         │
│ Variable #  2 = density, sigma-1 [kg/m^3]│ oxygen                       │
│ Variable #  3 = oxygen [ml per liter]   │ potential temperature         │
│ Variable #  4 = none                    │ sound velocity                │
│ Variable #  5 = none                    │ specific volume anomaly       │
│ Variable #  6 = none                    │ salinity                      │
│ Variable #  7 = none                    │ thermosteric anomaly          │
│ Variable #  8 = none                    │ none                          │
│ Variable #  9 = none                    │                               │
│ Variable # 16 = none                    │                               │
└───────────────────────────────────────┐│                               │
        <Enter> Modify the Field; <F10> Cont└───────────────────────────────┘
```

The Variables to be Averaged include all the variables in the input .ROS file. The mean and standard deviation for the selected variables will be output.

```
┌────────────────────────────────────────────────────────────────────────┐
│ ROSSUM  4.024                          Tuesday  March 23, 1993  8:35 am │
├────────────────────────────────────────────────────────────────────────┤
│                Additional Variables to be Averaged =                    │
├────────────────────────────────────────────────────────────────────────┤
│ Include pressure [decibars] =                              Yes          │
│ Include temperature [deg C] =                              Yes          │
│ Include conductivity [S/m] =                               Yes          │
│ Include oxygen, current [microamps] =                      No           │
│ Include oxygen, temperature [deg C] =                      No           │
│ Include scan number =                                      No           │
│ Include number of bottles fired =                          No           │
│                                                                         │
└─────────────────────────────────────────────────────────────────────────┘
        <Enter> Modify the Field; <F10> Continue ROSSUM; <Esc> Quit.
```

A sample .BTL file is shown below:

```
* Sea-Bird SBE 9 Raw Data File:
* FileName = D:30-2.DAT
* Software Version 4.0.b.g
* Temperature SN = 1123
* Conductivity SN = 915
* Pressure SN = 43440
* Number of Bytes Per Scan = 15
* System UpLoad Time = January 21, 1992  12:45:52 pm
# interval = seconds: 0.0416667
# start_time = Jan 21 1992 12:45:52
# datcnv_date = Mar 17 1993 16:18:25, 4.023
# datcnv_in = 30-2.DAT 30-2.CON 1123 915 43440
# rossum_date = Mar 23 1993 09:15:45, 4.024
# rossum_in = 30-2.ROS 30-2.CON
```
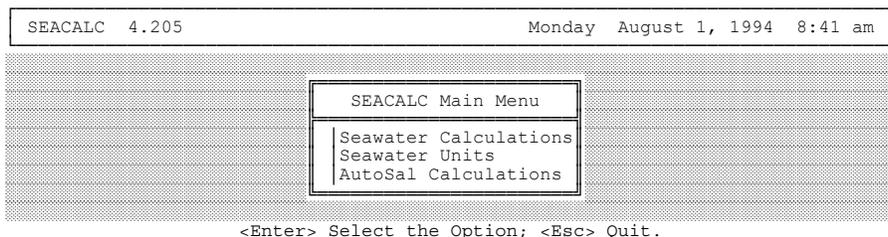
Bottle Position	Date Time	Sal00	Sigma-θ00	OxML/L	Pr	T0	C0
1	Jan 21 1992	34.8987	27.8861	4.966	5259.381	2.5604	3.321875 (avg)
	14:06:30				0.315	0.0003	0.000019 (sdev)
2	Jan 21 1992	34.8985	27.8860	4.931	5262.668	2.5608	3.321997 (avg)
	14:08:55				0.239	0.0002	0.000019 (sdev)
3	Jan 21 1992	34.8997	27.8862	4.894	4998.875	2.5352	3.311516 (avg)
	14:18:24				0.178	0.0002	0.000023 (sdev)
4	Jan 21 1992	34.8998	27.8862	4.895	4999.416	2.5354	3.311557 (avg)
	14:19:21				0.115	0.0003	0.000018 (sdev)
5	Jan 21 1992	34.9124	27.8866	4.878	3999.944	2.5346	3.279282 (avg)
	14:39:02				0.137	0.0002	0.000021 (sdev)
6	Jan 21 1992	34.9125	27.8866	4.875	3998.009	2.5346	3.279227 (avg)
	14:39:27				0.052	0.0002	0.000023 (sdev)
7	Jan 21 1992	34.9502	27.8807	5.001	3000.419	2.8570	3.274832 (avg)
	14:57:48				0.111	0.0002	0.000018 (sdev)
8	Jan 21 1992	34.9502	27.8807	4.999	2999.262	2.8571	3.274794 (avg)
	14:58:08				0.225	0.0002	0.000021 (sdev)
9	Jan 21 1992	35.0257	27.8258	5.150	2002.680	3.9847	3.342746 (avg)
	15:13:23				0.076	0.0008	0.000067 (sdev)
10	Jan 21 1992	35.0255	27.8259	5.190	2002.851	3.9824	3.342530 (avg)
	15:13:45				0.039	0.0003	0.000029 (sdev)
11	Jan 21 1992	35.8694	26.9132	5.148	21.066	13.7509	4.262543 (avg)
	15:51:54				0.036	0.0002	0.000026 (sdev)
12	Jan 21 1992	35.8690	26.9132	5.120	20.814	13.7492	4.262318 (avg)
	15:52:37				0.039	0.0003	0.000030 (sdev)

ROSSUM: COMMAND LINE PARAMETERS

-a	Process all .DAT and .HEX files. Display the set up form before processing the data.
-ax	Process all .DAT and .HEX files. Do not display the setup form.
-b<bottleSNfilename>	Use <bottleSNfilename> to add bottle serial numbers to the .BTL file Filename can include a path name.
-c<filename>	Use <filename>.con for instrument configuration and calibration constants. Filename can include a path name.
-m	Add min/max values to output
-mx	Do not add min/max values to output
-s	Use INPUTFILENAME.CON as the .CON file when using the -a to -ax command line options. This option is intended for batch processing of SBE 9 or 9plus data collected with different configurations.

8.16 SEACALC

SEACALC is a seawater calculator that can be used to compute various derived variables. The first selection screen is:

```
SEACALC  4.205                        Monday  August 1, 1994  8:41 am
```

```
                    ┌──────────────────────┐
                    │   SEACALC Main Menu   │
                    ├──────────────────────┤
                    │ Seawater Calculations │
                    │ Seawater Units        │
                    │ AutoSal Calculations  │
                    └──────────────────────┘
```

```
          <Enter> Select the Option; <Esc> Quit.
```

AutoSal calculations compute:

   salinity as a function of AutoSAl temperature and 2*Conductivity Ratio
   2*Conductivity Ratio as a function of AutoSAl temperature and salinity

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The setup screen for the Seawater calculations is:

Temperature Input: select IPTS-68 or ITS-90, SEACALC will compute the temperature not selected.

Salinity-Conductivity Input: select salinity or conductivity, SEACALC will compute the variable not selected.

Sound Velocity Algorithm: select chen millero, wilson, or delgrosso.

Once the inputs and sound velocity algorithm have been selected, press Function Key 10. The main SEACALC screen will be displayed:

```
┌──────────────────────────────────────────────────────────────────┐
│ SEACALC  4.020                        Friday  December 4, 1992  2:26 pm │
└──────────────────────────────────────────────────────────────────┘
┌──────────────────────────────────────────────────────────────────┐
│                         Input Parameters                           │
├──────────────────────────────────────────────────────────────────┤
│ Pressure =       1000.000000      Reference Pressure = 4000.000000 │
│ Temp [IPTS-68] = 5.000000         Latitude =          45.000000    │
│ Salinity =       35.000000                                         │
├──────────────────────────────────────────────────────────────────┤
│ Conductivity =   3.390090         SpVolAnomaly =      52.501       │
│ Sigma-t =        27.67547         Temp [ITS-90] =     4.998800     │
│ Sigma-theta =    27.68525         OXSAT =             7.089        │
│ Sigma-Ref =      45.37239         Depth (fresh) =     1019.716     │
│ Potential Temp = 4.91587          Depth (salt) =      989.500      │
│ Sound Velocity = 1487.196         Gravity =           9.806190     │
└──────────────────────────────────────────────────────────────────┘
   Copyright (c) 1992 Sea-Bird Electronics, Inc.     <Esc> Quit SEACALC.
```

The derived variables are recalculated whenever any of the input parameters is changed.

Reference pressure is used to compute Sigma-Ref.
$$\textit{Sigma - Ref} = \rho(s, \theta(s, t, p, p_{ref}), p_{ref}) - 1000 \quad [kg/m^3]$$

Latitude is used to compute gravity and salt water depth.
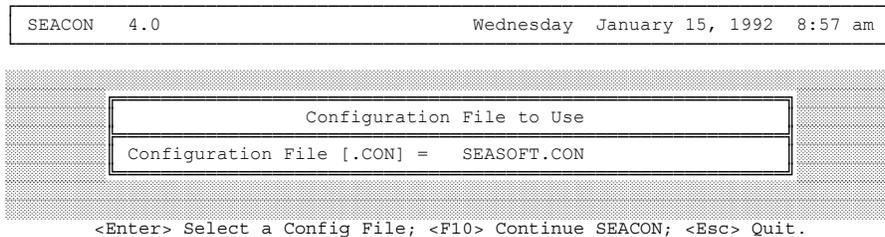
The units for OXSAT are ml/l.

Potential temperature is calculated with reference pressure = 0.0 and output in the same temperature scale as the input temperature.

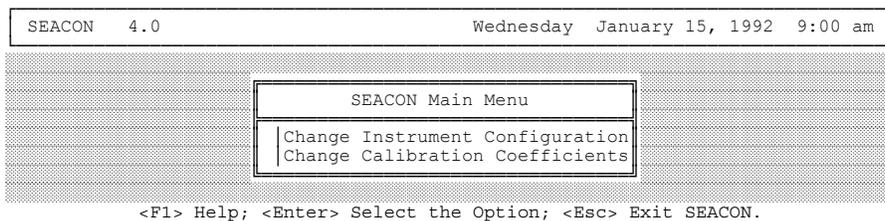SpVolAnomaly is specific volume anomaly.
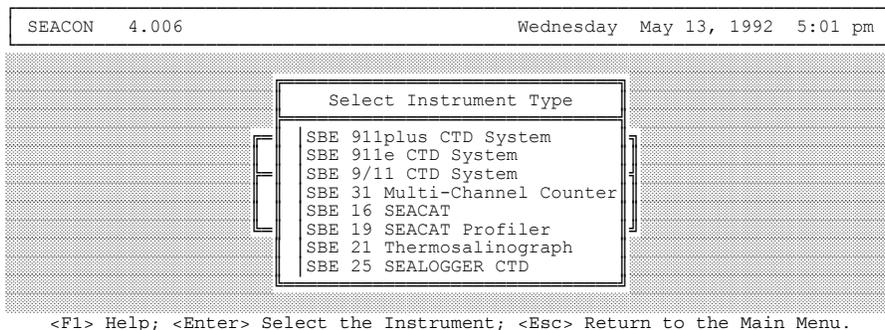
8.17 SEACON

Description:

SEACON reads and optionally modifies a .CON file to define the instrument configuration and calibration coefficients. SEACON searches only the current directory for .CON files. The first SEACON screen is:

```
SEACON    4.0                       Wednesday   January 15, 1992   8:57 am


                   Configuration File to Use

         Configuration File [.CON] =    SEASOFT.CON


           <Enter> Select a Config File; <F10> Continue SEACON; <Esc> Quit.
```

Press Enter to display a list of all the .CON files in the current directory. Press F10 to configure the selected file. The following screen will be displayed:

```
SEACON    4.0                       Wednesday   January 15, 1992   9:00 am


                        SEACON Main Menu
                   Change Instrument Configuration
                   Change Calibration Coefficients

            <F1> Help; <Enter> Select the Option; <Esc> Exit SEACON.
```

Select Change Instrument Configuration. The following will be displayed:

```
SEACON    4.006                     Wednesday   May 13, 1992   5:01 pm


                   Select Instrument Type

                 SBE 911plus CTD System
                 SBE 911e CTD System
                 SBE 9/11 CTD System
                 SBE 31 Multi-Channel Counter
                 SBE 16 SEACAT
                 SBE 19 SEACAT Profiler
                 SBE 21 Thermosalinograph
                 SBE 25 SEALOGGER CTD

      <F1> Help; <Enter> Select the Instrument; <Esc> Return to the Main Menu.
```

Select your instrument type.

8.17.1 SEACON: SBE 9/11, SBE 31

For each of these systems a form similar to the following will be displayed:

```
SEACON   4.0                         Tuesday  January 14, 1992  3:47 pm

┌──────────────────────────────────────────────────────────────────────┐
│                         SBE 9/11 CTD System                            │
├──────────────────────────────────────────────────────────────────────┤
│ Pressure Sensor Type =  High Resolution Digiquartz with Temp Comp      │
│ Number of Data Words =                 8                               │
│ Number of 12 Bit A/D Channels =        8                               │
│ Underwater Unit Scan Rate =            24 scans per second             │
│ Computer Interface =                   IEEE-488 (GPIB)                 │
│ Lat/Lon Data added by NMEA Interface = YES                            │
│ Data Format =                          <Press Enter to Modify>         │
│                                                                        │
│ Frequency  0  temperature             Extrnl Volt  7  spare            │
│ Frequency  1  conductivity                                             │
│ Frequency  2  pressure                                                 │
│ Extrnl Volt  0  oxygen, current                                        │
│ Extrnl Volt  1  oxygen, temperature                                    │
│ Extrnl Volt  2  spare                                                  │
│ Extrnl Volt  3  spare                                                  │
│ Extrnl Volt  4  transmissometer                                        │
│ Extrnl Volt  5  spare                                                  │
│ Extrnl Volt  6  fluorometer, sea tech                                  │
└──────────────────────────────────────────────────────────────────────┘

         <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

Pressure Sensor Type:

Most SBE 9 based CTD systems have a paroscientific digiquartz pressure sensor. If your pressure sensor calibration sheet contains only C, D, and T0 coefficients you do not have temperature compensation. If the pressure sensor calibration sheet contains C1, C2, C3, D1, T1, T2, and T3 coefficients you do have temperature compensation.

CTDs manufactured after December 1988 included a high resolution period counter for the pressure channel. If you have this option the SBE 9 underwater configuration sheet will indicate 'high resolution pressure'.

Number of Data Words:

See the SBE 9 underwater unit configuration sheet

Number of 12 bit A/D channels:

The number of frequency channels is:

    3, no redundant temperature or conductivity channels built in
    4, one redundant temperature or conductivity channel built in
    5, redundant temperature and conductivity channels built in

The number of 12 bit A/D channels is:

(number of data words - number of frequency channels - 1) * 2

Underwater Unit Scan Rate:

See the SBE 9 underwater unit configuration sheet

Computer Interface:

Choose IEEE-488 (GPIB) or RS-232C according to how the SBE 11 Deck unit is connected to the computer.

8.17.2 SEACON: DATA FORMAT SELECTION

Data Format:

After the pressure sensor type, number of data words, and number of 12 bit A/D channels have been specified, highlight the Data Format field and press the Enter Key to specify the data format. A form similar to the following will be displayed:

```
SEACON   4.0                          Tuesday  January 14, 1992  3:47 pm


                         Data Format Definition

Frequency  0   temperature
Frequency  1   conductivity
Frequency  2   pressure
Extrnl Volt  0  oxygen, current
Extrnl Volt  1  oxygen, temperature
Extrnl Volt  2  spare
Extrnl Volt  3  spare
Extrnl Volt  4  transmissometer
Extrnl Volt  5  spare
Extrnl Volt  6  fluorometer, sea tech
Extrnl Volt  7  spare


          <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

To assign sensors to frequency and voltage channels highlight the channel and press the Enter key. A list of sensors will be displayed as shown below:

```
┌─────────────────────────────────────────────────────────────────────────┐
│  SEACON   4.0                          Tuesday  January 14, 1992  3:47 pm │
├─────────────────────────────────────────────────────────────────────────┤
╔══════════════════════════════════════════╗╔══════════════════════════════╗
║                      Data Format Defin    ║║          Data Types          ║
╠══════════════════════════════════════════╣╠══════════════════════════════╣
║ Frequency  0  temperature                 ║║ altimeter                    ║
║ Frequency  1  conductivity                ║║ backscatterance              ║
║ Frequency  2  pressure                    ║║ conductivity                 ║
║ Extrnl Volt  0  oxygen, current           ║║ fluorometer                  ║
║ Extrnl Volt  1  oxygen, temperature       ║║ irradiance (PAR)             ║
║ Extrnl Volt  2  spare                     ║║ ORP                          ║
║ Extrnl Volt  3  spare                     ║║ oxygen                       ║
║ Extrnl Volt  4  transmissometer           ║║ pH                           ║
║ Extrnl Volt  5  spare                     ║║ pressure                     ║
║ Extrnl Volt  6  fluorometer, sea tech     ║║ spare                        ║
║ Extrnl Volt  7  spare                     ║║ surface irradiance (SPAR)    ║
║                                           ║║ temperature                  ║
║                                           ║║ tilt                         ║
║                                           ║║ transmissometer              ║
║                                           ║║                              ║
╚══════════════════════════════════════════╝╚══════════════════════════════╝
```

             <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.

To assign a particular sensor to a data channel highlight the correct data type and press the Enter key. Continue until the data format definition is correct for your CTD system.

8.17.3 SEACON: SBE 911plus CTD SYSTEM

The SBE 911plus CTD system is configured for twelve 24 bit words of data sampled at 24 scans per second. The pressure sensor is a high resolution paroscientific digiquartz with temperature compensation. An optional full duplex modem channel permits independent control of a water sampler or other instruments. Firmware in the SBE 11 deck unit permits the suppression of unused data channels. The SBE 911plus configuration form is:

```
╔══════════════════════════════════════════════════════════════════════╗
║                SBE 911plus CTD System (12 words, 24 Hz)                ║
╠══════════════════════════════════════════════════════════════════════╣
║  Number of Frequency Channels to Suppress =      0                     ║
║  Number of Voltage Words to Suppress =           2                     ║
║  Computer Interface =                            IEEE-488 (GPIB)       ║
║  Surface PAR Voltage Word Added by SBE911plus = No                     ║
║  Lat/Lon Data added by NMEA Interface =          YES                   ║
║  Append System Time to Every Scan =              No                    ║
║  Data Format =                                   <Press Enter to Modify>║
║                                                                        ║
║  Frequency  0  temperature, primary                                    ║
║  Frequency  1  conductivity, primary                                   ║
║  Frequency  2  pressure                                                ║
║  Frequency  3  temperature, secondary                                  ║
║  Frequency  4  conductivity, secondary                                 ║
║  Extrnl Volt  0  oxygen, current                                       ║
║  Extrnl Volt  1  oxygen, temperature                                   ║
║  Extrnl Volt  2  transmissometer                                       ║
║  Extrnl Volt  3  fluorometer, sea tech                                 ║
║                                                                        ║
╚══════════════════════════════════════════════════════════════════════╝
```
```
            <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

Number of Frequency Channels to Suppress:

Suppress 0 if you are using an SBE 3 or SBE 4 plugged into the COND 2 connector on the SBE 9plus bottom end cap (dual redundant sensor configuration).

Suppress 1 if you are using an SBE 3 or SBE 4 plugged into the TEMP 2 connector on the SBE 9plus bottom end cap and you are not using the COND 2 connector (single redundant sensor configuration).

Suppress 2 if you are not using redundant temperature or conductivity sensors.

Number of Voltage Words to Suppress:

The number of voltage words is 4.

The deck unit suppresses words starting with the highest numbered voltage word.

Each voltage word contains data from two 12 bit A/D channels.

Determine the number of voltage words to keep. This will be determined by the highest numbered external voltage input that is not a spare.

```
Extrnal Volt        Connector   voltage words to keep
(not spare)
    0               AUX 1            1
    1               AUX 1            1
    2               AUX 2            2
    3               AUX 2            2
    4               AUX 3            3
    5               AUX 3            3
    6               AUX 4            4
    7               AUX 4            4
```

Number of Voltage Words to Suppress =

    4 - number of voltage words to keep

Surface PAR Voltage Word Added by SBE911plus:

Answer Yes only if the SBE11 has the surface PAR option installed and the SBE11 microprocessor board DIP switch S3 position 8 is set to OFF.

Append System Time to Every Scan

If this entry is Yes, Seasave will append 4 bytes of system time read from the PC to each scan as it is received from the SBE 11plus deck unit. System time is seconds since January 1, 1970.

Lat/Lon Data Added by NMEA Interface

Answer YES only if the optional NMEA interface is installed in the SBE 11plus and it is connected to a NMEA interface. If this selection is set to YES SEASAVE will automatically add the current latitude, longitude, and universal time code to the data header. Select SEASAVE Misc Run Paramters to control how Lat/Lon data is incorporated into the data file.

Data Format:

Refer to section (8.11.2) for instructions on determining the data format.

8.17.4 SEACON: SBE 911e CTD SYSTEM

The SBE 911e CTD system is an upgraded SBE 9/11 CTD system with the new phase-shift keyed telemetry system configured for twelve 24 bit words of data sampled at 24 scans per second. An optional full duplex modem channel permits independent control of a water sampler or other instruments. Firmware in the SBE 11 deck unit permits the suppression of unused data channels. The SBE 911e configuration form is:

```
╔══════════════════════════════════════════════════════════════════════╗
║                  SBE 911e CTD System (12 words, 24 Hz)                 ║
╠══════════════════════════════════════════════════════════════════════╣
║ Pressure Sensor Type = High Resolution Digiquartz with Temp Comp       ║
║ Number of Frequency Channels in the Fish = 3                           ║
║ Number of Frequency Channels to Suppress = 0                           ║
║ Number of Voltage Words in the Fish =       4                          ║
║ Number of Voltage Words to Suppress =       2                          ║
║ A/D Voltage Range = -10 to 10 Volts    Computer Interface = IEEE-488 (GPIB) ║
║ Data Format =                          <Press Enter to Modify>         ║
║ Frequency  0  temperature                                              ║
║ Frequency  1  conductivity                                             ║
║ Frequency  2  pressure                                                 ║
║ Extrnl Volt  0  oxygen, current                                        ║
║ Extrnl Volt  1  oxygen, temperature                                    ║
║ Extrnl Volt  2  pH                                                     ║
║ Extrnl Volt  3  transmissometer                                        ║
║                                                                        ║
╚══════════════════════════════════════════════════════════════════════╝
```

```
         <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

Number of Frequency Channels in the Fish:

- 3,   no redundant temperature or conductivity channels built in
- 4,   one redundant temperature or conductivity channel built in
- 5,   redundant temperature and conductivity channels built in

Number of Frequency Channels to Suppress:

If the number of frequency channels is 3, suppress 0

If the number of frequency channels is 4:
    Suppress 0 if you are using a redundant temperature or conductivity sensor.
    Suppress 1 if you are not using a redundant temperature or conductivity sensor.

If the number of frequency channels is 5:

    Suppress 0 if you are using a redundant temperature or conductivity sensor in the second frequency channel following pressure.

    Suppress 1 if you are using a redundant temperature or conductivity sensor in the first frequency channel following pressure and nothing in the second frequency channel following pressure.

    Suppress 2 if you are not using redundant temperature or conductivity sensors.

Number of Voltage Words in the Fish:

Check the underwater unit configuration sheet.

Number of Voltage Words to Suppress:

The deck unit suppresses words starting with the highest numbered voltage word.
Each voltage word contains data from two 12 bit A/D channels.

Determine the number of voltage words to keep. This will be determined by the highest numbered external voltage input that is not a spare.

Extrnal Volt (not spare)	voltage words to keep
0	1
1	1
2	2
3	2
4	3
5	3
6	4
7	4

Number of Voltage Words to Suppress =

4 - number of voltage words to keep

A/D Input Voltage Range

For CTDs manufactured before February 1992 this will be -10 to +10 volts.
For CTDs manufactured after February 1992 check the underwater unit configuration sheet.

Data Format:

Refer to section (8.11.2) for instructions on determining the data format.

8.17.5 SEACON: SBE 16 SEACAT

The SBE 16 SEACAT set up form is:

```
SEACON   4.0                         Tuesday  January 14, 1992  3:47 pm

╔═══════════════════════════════════════════════════════════════════════╗
║                          SBE 16 SEACAT                                 ║
╠═══════════════════════════════════════════════════════════════════════╣
║ Pressure Sensor Type (standard=none) =     None                        ║
║ Number of Ext Freq Sampled (standard=0) =  0                           ║
║ Number of Ext Volt Sampled (standard=0) =  0                           ║
║ SEACAT Moored Pressure (decibars) =        1000.000000                 ║
║ Sample Interval (seconds) =                15.000000                   ║
║ Firmware Version =                         Greater than or Equal to 4.0║
║ NMEA Interface Installed =                 No                          ║
║ Data Format =                              <Press Enter to Modify>     ║
║ Frequency 0 = temperature                                              ║
║ Frequency 1 = conductivity                                             ║
╚═══════════════════════════════════════════════════════════════════════╝
          <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

The sample interval is used to compute the time between samples.

The SEACAT Moored Pressure is used as the pressure for computation of salinity, density, and other derived variables when the SEACAT does not have an optional pressure sensor.

For SEACATs with external frequencies or voltages refer to section (8.11.2) for instructions on determining the data format.

'Firmware Version' is used to determine the strain gauge pressure sensor data format. Check the instrument configuration or the status reply from the SBE 16 to determine the firmware version.

Set 'NMEA Interface Installed' to Yes only if you are using the optional SBE 90158 NMEA interface box with a GPS or LORAN receiver.

8.17.6 SEACON: SBE 19 SEACAT PROFILER

The SBE 19 SEACAT Profiler set up form is:

```
SEACON   4.0                          Tuesday  January 14, 1992  3:47 pm

╔══════════════════════════════════════════════════════════════════════╗
║                     SBE 19 SEACAT Profiler                             ║
╟──────────────────────────────────────────────────────────────────────╢
║ Pressure Sensor Type =                    Strain Gauge                 ║
║ Number of Ext Volt Sampled (standard=0) = 2                            ║
║ Num of 0.5 Sec Intervals between Samples = 1                           ║
║ Firmware Version =                        Greater than or Equal to 3.0 ║
║ Lat/Lon Data Added by NMEA Interface =    No                           ║
║ Surface PAR Voltage Added by NMEA Interface = No                       ║
║ Data Format =                             <Press Enter to Modify>      ║
║                                                                        ║
║ Frequency 0 = temperature                                              ║
║ Frequency 1 = conductivity                                             ║
║ Extrnl Volt  0  oxygen, current                                        ║
║ Extrnl Volt  1  oxygen, temperature                                    ║
║ Pressure Voltage                                                       ║
╚══════════════════════════════════════════════════════════════════════╝
          <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

The sample interval is used to compute the time between samples.

The number of external voltages sampled must agree with the number programmed into the profiler.

For Profilers with external frequencies or voltages refer to section (8.11.2) for instructions on determining the data format.

Pressure voltage always comes last in the data format.

'Firmware Version' is used to determine the strain gauge pressure sensor data format. Check the instrument configuration or the status reply from the SBE 16 to determine the firmware version.

The SBE 33 Carousel Deck unit or SBE 36 CTD Deck Unit can be set up to add Latitude/Longitude and, or Surface PAR data to the HEX data stream from the SBE 19. Set these fields to correspond to the Deck Unit set up (set the fields to NO if an SBE 33 or SBE 36 Deck Unit is not being used).

8.17.7 SEACON: SBE 21 THERMOSALINOGRAPH

```
SEACON   4.0                              Tuesday  January 14, 1992  3:47 pm


                         SBE 21 Thermosalinograph

Number of Ext Freq Sampled (standard=0) =    1
Number of Ext Volt Sampled (standard=0) =    0
Sample Interval (seconds) =                  15.000000
Append LAT/LON with SBE NMEA Interface Box = YES
Data Format =                                <Press Enter to Modify>

Frequency 0 = temperature
Frequency 1 = conductivity
Frequency 2 = temperature, secondary


          <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

The sample interval is used to compute the time between samples.

The number of external voltages sampled must agree with the number programmed into the thermosalinograph.

For SEACATs with external frequencies or voltages refer to section (8.11.2) for instructions on determining the data format.

The SBE NMEA Interface Box appends latitude and longitude information to each scan received from the SBE 21. Set this selection to NO if you are not using the SBE NMEA interface box.

8.17.8 SEACON: SBE 25 SEALOGGER CTD

```
SEACON   4.0                              Tuesday  January 14, 1992  3:47 pm


                         SBE 25 SEALOGGER CTD

Number of Ext Volt Sampled            = 4
Firmware Version                      = Greater than or Equal to 2.0
Real Time Data Output Rate            = 8
Lat/Lon Data Added by NMEA Interface  = No
Surface PAR Voltage Added by NMEA Interface = No
Data Format                           = <Press Enter to Modify>


Frequency 0 = temperature
Frequency 1 = conductivity
Stored Volt  0  oxygen, current
Stored Volt  1  oxygen, temperature
Stored Volt  2  transmissometer
Stored Volt  3  fluorometer, sea tech


          <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

In order to conserve memory the SBE 25 has the ability to select the number of external voltages that are sampled. Once these external voltages have been selected they are mapped into stored voltages. In the context of this discussion the Stored voltages in the SEACON data format for the SBE 25 are the stored voltage numbers as reported in the SBE 25 display status reply. Consult the configuration page in your SBE 25 manual for additional information.

The number of external voltages and the data format must agree with how the SBE 25 has been programmed. Compare the SEACON setup with the display status reply from the instrument.

The firmware version lets SEASAVE and DATCNV know how to decode the HEX data from the instrument and can be determined from the configuration sheet in the instrument manual or from the display status reply from the instrument.

The real time data output rate is used to calculate elapsed time while acquiring real time data.

The SBE 33 Carousel Deck unit or SBE 36 CTD Deck Unit can be set up to add Latitude/Longitude and, or Surface PAR data to the HEX data stream from the SBE 19. Set these fields to correspond to the Deck Unit set up (set the fields to NO if an SBE 33 or SBE 36 Deck Unit is not being used).

8.17.9 SEACON: CHANGE CALIBRATION COEFFICIENTS

When finished editing the instrument configuration press the Esc key to return to the SEACON main menu and select Change Calibration Coefficients.

8.17.9.1 TEMPERATURE

For the temperature sensor(s) you will be prompted for the sensor serial number, f0, a, b, c, and d. Enter these values from the temperature sensor calibration sheet. The prompt for 'slope' and 'offset' allows you to make small corrections for temperature drift between calibrations. For newly calibrated sensors use slope = 1.0, offset = 0.0. The correction formula is:

   (corrected temperature) = slope * (computed temperature) + offset

where   slope = (true temperature span) / (instrument temperature span)
         offset = (true temperature - instrument reading) * slope; measured at 0.0 Celsius

As an example of computing the correction coefficients, if we had the following calibration data:

   true temperature 0.0 C   25.0 C
   instrument reading   0.0015 C   25.0005 C

   slope = (25.0 - 0.0) / (25.0020 - 0.0015) = 1.000040002
   offset = (0.0 - 0.0015) * (1.000040001) = -0.001500060

If the span error is less than +/- 0.01 then the following approximations are valid: (offset correction) = -(offset error), and (slope correction) = 1.0 / (1.0 + span error).

The Sea-Bird temperature sensors usually drift by changing offset. Changes are typically toward higher temperature with time for sensors with serial numbers <1050 and toward lower temperature with time for serial numbers >1050. Many years of experience with hundreds of sensors indicates that the drift is smooth and uniform with time allowing users to make very accurate corrections based only on pre- and post-cruise laboratory calibrations. Calibration checks at-sea are advisable to insure against sensor malfunction, however, data from reversing thermometers is rarely accurate enough to make calibration corrections that are better than those possible by shore-based laboratory calibrations.

The temperature sensors rarely exhibit span errors larger than 0.005 C over the range -5 to 35 C even after years of drift. A span error that increases by more than +/- 0.0002 [C per C per year] is symptomatic of sensor malfunction. However in the past, some calibrations have been delivered that include span errors up to 0.004 C in 30 C (span error of 0.000133) (approximately zero error at 15 C) because of undetected systematic errors in calibration.

Sea-Bird Application Note 31 discusses how to compute slope and offset correction coefficients from pre- and post-cruise calibrations supplied by Sea-Bird (NRCC).

8.17.9.2 CONDUCTIVITY

For conductivity sensor(s) you will be prompted for the sensor serial number, calibration date, and coefficients m, a, b, c, and d. Enter these values from the conductivity sensor calibration sheet. You can also change the values for 'cpcor', 'slope', and 'offset'. Typical default values are:

    cpcor = -9.57e-08
    slope = 1.0
    offset = 0.0

'cpcor' corrects for the compression of the cell while 'slope' and 'offset' correct for sensor drift between calibrations. An explanation of these coefficients and how to compute alternate values follows.

The 'cpcor' coefficient makes a correction for the highly consistent change in dimensions of the conductivity cell under pressure. For almost all conductivity cells and sensor applications use the default value, cpcor = -9.57e-8. Previous to Seasoft Version 4.209 'cpcor' was "hidden" in software and set to the compressibility coefficient for borosilicate glass (cpcor = -9.57e-8) in accord with the behavior of most cells.

From Version 4.209 forward 'cpcor' is variable to accommodate the discovery that **some** of the conductivity sensors fabricated between 1992 and 1995 exhibit a compression that is slightly less than pure borosilicate glass. For these sensors the (hermetic) epoxy jacket on the glass cell is unintentionally strong and the cell exhibits a composite pressure effect of borosilicate **and** epoxy. For all sensors measured to date the composite pressure coefficient ranges between -9.57e-8 and -6.90e-8. The most extreme composite pressure coefficient produces a correction to deep ocean salinity which is different from pure borosilicate glass by a magnitude of 0.0057 PSU in 5000 dbars pressure.

Before choosing 'cpcor' different from the default value, first confirm that your conductivity sensor has a serial number in the range 1100 to 1500 **and** behaves differently from pure borosilicate glass. A test of your cell can be performed at Sea-Bird where the actual value of 'cpcor' can also be measured. Alternately it is possible to test cells at sea where the computed salinity from a conductivity sensor is checked against the salinity of water samples from a range of depths. With very high precision Autosal work a linear error in salinity of typically less than 0.001 PSU per 1000 dbars can be detected and corrected by changing the coefficient 'cpcor'. For help or more information please contact Sea-Bird.

The coefficients 'slope' and 'offset' allow you to make small corrections for sensor drift between calibrations. For newly calibrated sensors use the default values slope = 1.0 and offset = 0.0. The drift correction formula for conductivity is:

    (corrected conductivity) = ….

    (corrected conductivity) = slope * (computed conductivity) + offset.

where   slope = (true conductivity span) / (instrument conductivity span)
        offset = (true conductivity - instrument reading) * slope; measured at 0.0 S/m

As an example of computing these correction coefficients, if we had the following calibration data:

true conductivity   0.0 S/m   3.5 S/m
instrument reading   -0.00007 S/m   3.49965 S/m

slope = (3.5 - 0.0) / (3.49965 - -0.00007) = +1.000080006
offset = (0.0 - -0.00007) * 1.000080006 = +0.000070006

If the span error is less than +/- 0.01 then the following approximations are valid: (offset correction) =
-(offset error), and (slope correction) = 1.0 / (1.0 + span error).

The conductivity sensor usually drifts by changing span (the slope of the calibration curve). Changes are
typically toward lower conductivity readings with time. Offset error in conductivity (error at 0 S/m) is
usually due to electronics drift which is usually less than +/- 0.0001 S/m per year. If offsets are greater than
+/- 0.0002 S/m it is symptomatic of sensor malfunction. Sea-Bird therefore recommends that drift
corrections to conductivity be made by assuming no offset error, unless there is strong evidence to the
contrary, or a special need.

Sea-Bird Application Note 31 discusses how to compute slope and offset correction coefficients from pre-
and post-cruise calibrations supplied by Sea-Bird (NRCC), or from salinity bottle samples taken at sea during
CTD profiling.

8.17.9.3 PRESSURE

For the pressure sensor you will be prompted for the sensor type (Paroscientific digiquartz or Strain gauge)
and serial number.

For the Digiquartz unit, enter the sets of C, D, and T coefficients listed on the calibration certificate. If the
higher-order coefficients are not listed, enter zero. The slope term will be equal to 1.0 unless the sensor has
been recalibrated by Sea-Bird or NRCC.

12 bit Paros Digiquartz temperature resolution is available for CTDs manufactured after February 1991. The
SBE 9 underwater unit configuration sheet will indicate whether your instrument has 12 bit pressure
temperature resolution installed. If it is present the correct coefficients for AD590M and AD590B will be on
the configuration sheet.

For CTDs with 8 bit Paros temperature resolution:
   AD590M = 0.0125
   AD590B = -10.0

For Sensometrics or Paine strain gauge units, enter A0, A1, and A2 coefficients. For older units with strain
gauge pressure sensors that only have a linear fit for the pressure calibration, enter the M (A1) and B (A0)
coefficients from the pressure calibration sheet. Set A2 to zero.

For either type offset is normally '0' but may be changed to cope with any non-zero sea-surface condition. If
the in-air reading is negative, enter an equal positive value, etc.

8.17.9.4 OXYGEN

You will be prompted for the oxygen sensor serial number, m, b, k, c, Soc, Boc, tcor, wt, pcor, and tau. m, b, k, c, tcor, wt, pcor, and tau are found on the Sea-Bird dissolved oxygen sensor calibration sheet. Use the values of Soc and Boc from the most recent calibration.

8.17.9.5 pH

Enter the serial number, offset, and slope from the calibration sheet or m and b determined from recent calibration. pH is calculated as:

$$pH = 7 + (Vout - offset) / (°K * 1.98416e-4 * slope)$$

°K = temperature in degrees Kelvin.

SEASOFT versions less than 4.008 ignored the temperature compensation of the pH electrode and calculated pH as:

$$pHold = [Vref + ((Vout - B) / M))] (°K * 1.98416e-4)$$

Run pHfit version 2.0 (included with this version of SEASOFT) using the Vout, pH, and temperature values from your original calibration sheet to compute the new values for offset and slope.

The relationship between the two methods is: $pH = pHold + (7 - 2087 / °K)$

8.17.9.6 LIGHT TRANSMISSION

Sea Tech:

Light Transmission (percent) = M * volts + B.

The data sheet supplied by SEA TECH indicates the air calibration voltage (approx 4.7 volts) and the blocked path voltage (approx 0.0 volts). These values along with the current air voltage and blocked path voltage are used derive the M and B coefficients entered in SEACON.

A0 is the AIR CALIBRATION voltage from the SEA TECH calibration sheet
Y0 is the blocked path voltage from the SEA TECH calibration sheet

A1 is the current air voltage
Y1 is the current blocked path voltage

then   M = 20(A0 - Y0)/(A1 - Y1)

and   B = -M Y1

For example, if the SEA TECH calibration gave the following values:

A0 = 4.743 volts
Y0 = 0.002 volts

and the current calibration gave:

A1 = 4.719 volts
Y1 = 0.006 volts

then

M = 20(4.743 - 0.002)/(4.719 - 0.006) = 20.119
B = -0.006 * 20.119 = -0.1207

Chelsea:

Light Transmission (percent) = M * volts + B.

8.17.9.7 FLUORESCENCE

Biospherical Natural Fluorometer:

natural fluorescence $F_n = C_{Fn} * 10^V$ where

C_{Fn} is the natural florescence calibration coefficient and V is the voltage from the natural fluorescence sensor.

production = A1 * F_n / (A2 + PAR)

chlorophyll concentration Chl = F_n / (B * PAR)

Chelsea:

SEASOFT versions less than 4.003:

$$\text{concentration } [\mu g/l] = 10.0^{[(\text{voltage / scale factor}) - 2.0)]} + \text{offset}$$

SEASOFT versions 4.003 to 4.204:

$$\text{concentration } [\mu g/l] = 10.0^{[\text{voltage/scale factor - offset}]}$$
the nominal offset is 2.0.

SEASOFT versions 4.205 and greater:

$$\text{concentration } [\mu g/l] = \text{slope} * ((10.0^{(V / SF)} - 10^{VB}) / (10^{V1\mu g} - 10^{Vacetone})) + \text{offset}$$

VB, V1μg, and Vacetone are obtained from the Chelsea calibration sheet
V is the output voltage measured by the CTD
SF is a scale factor. Set this to 1.0 if the CTD has a gain of 1. SF should be set to 2.0 if the CTD has a gain of 2.0.

Chelsea Minitraka:

concentration = (100 * (V - vacetoneBlank) / (vacetone100 - vacetoneBlank)) + offset

Seapoint Fluorometer:

concentration = (V * 30 / gain) + offset

Slope and offset: Users may wish to "adjust" the fluorometer readings to conform to measured concentrations. For example, from two in-situ samples and with the slope and offset set to 1.0 and 0.0 respectively, a user might observe that SEASOFT indicated a concentration of 0.390 when the concentration determined from a water sample was 0.450, and 0.028 when the concentration determined from a water sample was 0.020. A linear regression to these data would give "slope" = 1.188 and "offset" = -0.013. The introduction of these "fit" coefficients via SEACON would then correct the indicated concentrations. In general, VB, V1µg/l, and Vacetone as listed on the original Chelsea factory calibration sheet can be used throughout the life of the instrument, with subsequent calibrations used to adjust slope and offset alone.

Dr Haardt fluorometer (all channels):

Dr. Haardt instruments may have automatic switching between high and low gains. When entering calibration coefficients select 'Output Voltage Level' if the instrument indicates gain by the output voltage level (less thatn 2.5 volts is low gain; greater than 2.5 volts is high gain). Select 'Modulo Bit' if the Dr. Haardt instrument has control lines custom wired to bits in the SBE 9*plus* modulo word. Select 'None' if the Dr. Haardt instrument does not change gain.

low range output = A0 + A1 * V
high range output = B0 + B1 * V

V = voltage from the sensor

Voltage level switching examples:

Chlorophyll a:
   low range scale is 10 mg/l, gain is 10/2.5 = 4mg/l / volt
       A0 = 0.0, A1 = 4.0
   high range scale is 100 mg/l, gain is 100/2.5 = 40mg/l / volt
       B0 = -100.0, B1 = 40.0
Yellow Substance:
   low range scale is 5 mg/l, gain is 5/2.5 = 2mg/l / volt
       A0 = 0.0, A1 = 2.0
   high range scale is 50 mg/l, gain is 50/2.5 = 20mg/l / volt
       B0 = -50.0, B1 = 20.0

Sea Tech:

concentration = [volts * scale factor / 5] + offset

Sea Tech fluorometers have internal switch-selectable ranges of (nominally) 0 - 3, 0 - 10, and 0 - 30 milligrams per cubic meter (milligrams per cubic meter are equal to micrograms/liter) and are supplied by Sea-Tech set to the middle range.

If the CTD has a gain of 1.0 (default) enter a 'scale factor' of 3 for 3 mg m^{-3}, 10 for 10 mg m^{-3}, or 30 for 30 mg m^{-3}.

If the CTD has a gain of 2.0 (custom) enter a 'scale factor' of 1.5 for 3 mg m^{-3}, 5 for 10 mg m^{-3}, or 15 for 30 mg m^{-3}.

The value for 'offset' may be determined by measuring the fluorometer output when its light sensor is completely blocked from the strobe light. Block the fluorometer light path with a completely opaque substance, (e.g., heavy black rubber) and record the resulting voltage.

Then: 'offset' = - 'scale factor' * voltage/5

Enter the calculated offset into SEACON. Note that the 'offset' and 'scale factor' values may be adjusted as desired to fit a linear regression of fluorometer responses to known chlorophyll *a* concentrations.

Turner 10-005

concentration = [voltage * scale factor / (sf * 5)] + offset

fluorometer voltage is measured on one channel, range voltage is measured on a second voltage channel.

if range < 0.2 volts, sf = 1.0
if range > = 0.2 volts and < 0.55 volts, sf = 3.16
if range > = 0.55 volts and < 0.85 volts, sf = 10.0
if range > = 0.85 volts, sf = 31.0

Turner 10-AU-005

concentration = (1.195 * voltage * (FSC - ZPC)) / FSV + ZPC

voltage = measured output voltage from the fluorometer

FSV = full scale output voltage, typically 5.0 volts.

FSC = full scale concentration

ZPC = zero point concentration

8.17.9.8 NEPHELOMETER

Chelsea nephelometer:

turbidity $= (10.0^V - C)$ / scale factor [F.T.U.]

C = clear water value
V = voltage from the sensor

IFREMER nephelometer:

Diffusion $= (k * (vm - vm0) / (vd - vd0)) - d0$

vm = measured voltage	vm0 = measured voltage offset
vd = direct voltage	vd0 = direct voltage offset
k = scale factor	d0 = diffusion offset

8.17.9.9 IRRADIANCE (PAR)

SEASOFT calculates PAR = multiplier $* (10^9 * 10^{(V - B) / M})$ / calibration constant + offset

When using a light sensor with a built in log amplifier (Biospherical model QSP-200L):

M = 1.0 (or 2.0 if the CTD voltage channel has a gain of 2)

B = 0.0

Otherwise enter the M and B values from the Sea-Bird log amplifier calibration sheet.

The multiplier can be used to scale the output and is typically set to 1.0.

Biospherical PAR Sensors:

calibration constant $= 10^5$ / Biospherical Wet Calibration Factor

offset $= -10^4 *$ wet calibration factor $* 10^{\text{dark voltage}}$

LICOR PAR sensors:

calibration constant = LICOR in water calibration constant

8.17.9.10 LIGHT SCATTERING

Downing & Associates OBS:

output = volts * gain + offset

Seapoint Turbidity:

output = volts * 500 * scale factor / gain

Sea Tech LS6000:

high gain setting: mg/l = volts * 6.6 * slope + offset

low gain setting: mg/l = volts * 20.0 * slope + offset

8.17.9.11 FGP PRESSURE (VOLTAGE OUTPUT)

output [KPa] = volts * scale factor + offset

nominal scale factor = 100 * Pressure sensor range (bar) / Voltage range (volts)

8.17.9.12 GENERAL POLYNOMIAL

Userpoly 0, userpoly 1, userpoly 2 (user defined sensors):

$val = a0 + a1 * V + a2 * V^2 + a3 * V^3$

V = voltage from the sensor

8.17.9.13 ZAPS

ZAPS:

z = M * volts + B   [nmoles]

8.18 SEAPLOT

Description:

SEAPLOT is used to plot converted data files. The plotted data can be screen dumped to a dot matrix or LaserJet II or III printer, or plotted on a HP 7475A/7550A/7440A plotter, HP LaserJet III or 4 printer, or other printers such as the HP DeskJet 1200C that support the HP GL/2 plotting language. Fluorescence and PAR are plotted on a log scale. The command line option -l will force fluorescence to be plotted on a linear scale.

The main set up form for SEAPLOT is:

```
SEAPLOT  4.0                          Wednesday  January 15, 1992  3:03 pm

                              SEAPLOT Set Up

 Input Data File =                        BECKDA.CNV

 Input File [.CNV] Path =                 C:

 Plot Parameters File =                   HU112.PLT

 Plot Format =                            Overlaid X-Y Plots

 Variables to Plot =                      <Press Enter to Modify>

 Misc X-Y Plot Parameters =               <Press Enter to Modify>

 Number of Scans to Skip Over in Data File =   0

 Number of Scans to Skip between Plot Points =  0

 Plot Label =                             processed

       <Enter> Modify the Field; <F10> Continue SEAPLOT; <Esc> Quit.
```

Select the input file path, the input data file and then the plot parameters file. If the input file path is changed the input data file must be reselected.

If you wish to set up new plotting parameters and store them to a new file, make all the selections to the 'Variables to Plot' and 'Misc X-Y Plot Parameters' forms and the press Esc to exit the main set up form. You will then be able to enter the file name for the new display parameters. At this point you may reenter SEAPLOT without exiting to DOS.

Plot Format:

   Select One Monochrome X-Y plot, Two or Three Side-by-Side Plots, or Overlaid Multi-Color X-Y Plots.

Plot Label:

   The Plot Label will be added at the bottom of X-Y plot. Leave this entry blank if you do not wish to label the plot. The input data file name can be automatically inserted in front of the plot label if the 'Add File Name to the Plot Label' filed in the Misc X-Y Plot Parameters form is set to Yes.

Skip:

   Set both these fields to 0 if you wish to plot every data point.

Use the arrow keys or the mouse to highlight the Variables to Plot field and press the Enter key. The following form will be displayed:

8.18.1 SEAPLOT: VARIABLE SELECTION

```
 SEAPLOT  4.0                        Wednesday  January 15, 1992  3:03 pm

 Conversion Units  Metric                   Grid Lines = gray
 Y Axis =  pressure, decibars               Minimum =  0.0000
   Label =   pressure, decibars             Maximum =  3000.0000
   Major Divisions = 3   Minor Divisions = 10 Color =   intense white

 X Axis # 1 =  temperature, primary, deg C  Minimum =  1.0000
   Label =   temperature, primary, deg C    Maximum =  5.0000
   Major Divisions = 4   Minor Divisions = 10 Color =   light blue

 X Axis # 2 =  conductivity, primary, S/m   Minimum =  3.1100
   Label =   conductivity, primary, S/m     Maximum =  3.3000
   Major Divisions = 6   Minor Divisions = 10 Color =   red

 X Axis # 3 =  salinity, PSS-78 [PSU], T0, C0 Minimum =  34.7000
   Label =   salinity, PSS-78 [PSU], T0, C0  Maximum =  35.0000
   Major Divisions = 8   Minor Divisions = 5  Color =   yellow

 X Axis # 4 =  density, sigma-theta, kg/m^... Minimum =  27.5000
   Label =   density, sigma-theta, kg/m^3,... Maximum =  28.0000
   Major Divisions = 6   Minor Divisions = 5  Color =   light magenta
```

To change the display highlight the desired field and press the Enter key.

The delete or backspace keys can be used to get rid of unwanted characters while editing a field in the form.

Axis variables:

   When the axis variable field is selected a list of the variables in the converted data file will be displayed. Highlight the desired variable and press the Enter to select the variable and write the default label into the label field. Press the Esc key if you do not want to select a variable.

Labels:

Highlight the label field and press Enter to change the label. Press the Esc key when you are finished editing the label to return to the form.

Minimum and Maximum:

To change the minimum and maximum values for the axis highlight the field and either press the Enter key or just start typing in the new value. The minimum and maximum values for the variable in the file will be displayed in teh middle of the form. (Note that if the data file contains data collected while the instrument was in the air the minimum and maximum values will reflect these values. The display of minimum and maximum values is most helpful when displaying bin averaged or sectioned files.)

Major and Minor Divisions:

Highlight the field and either press the Enter key or start typing in the new value. Press Enter or Esc to return to the form. If the variable is plotted on a log scale (fluorescence and PAR) the number of major divisions is log10(maximum/minimum).

Color:

Highlight the field and press the Enter key to change the color selection for the axis. Press Esc to return to the form.

8.18.2 SEAPLOT: MISCELLANEOUS PLOTTING PARAMETERS

When the 'Misc X-Y Plot Parameters field is selected from the main SEAPLOT set up form the following form will be displayed:

```
SEAPLOT  4.0                        Wednesday  January 15, 1992  3:03 pm

                      Miscellaneous X-Y Plot Parameters

 Add File Name to the Plot Label =  Yes

 Plot Line Type = Connected

 Automatic Paging of the Display = No

 Output Selection = Plot

 Screen Dump/Plot Selection = Print When CTRL+F9 is Pressed

 Screen Disp/Dump/Plot Parameters = <Press Enter to Modify>

 Lift the Pen Over Values Marked Bad in SEAPLOT = Yes

 Plot Scans Marked Bad Selection =  Plot
```

The plotted line types can be connected, dots, or scalable dots. For salable dots a radius of one will plot a standard size dot, a radius of four will plot a dot that is four times as big as a standard dot. Plotting with scalable dots is much slower than plotting with standard dots and will be useful when plotting averaged files or overlaying a sparse data data set on a plot (such as bottle data on a CTD trace).

If automatic paging is set to yes SEAPLOT will draw a new screen each time the Y axis data is greater than the Y axis maximum. The new Y axis minimum will be the previous maximum. The new Y axis maximum will be two times the old maximum minus the old minimum.

If the output selection is plot the data will be sent to the selected plotting device, otherwise the display will be screen dumped.

The screen dump/plot selections are:

```
            Screen Dump/Plot Selection =
  Print When CTRL+F9 is Pressed
  Print When Reach the End of the Data Set
  Print When Reach Bottom of Plot or End of Data Set
```

You can choose to lift the pen over values marked bad by WILDEDIT or to connect 'good' points.

The choices for Plot Scans marked bad (by LOOPEDIT) are:

```
       Plot Scans Marked Bad Selection =
  Plot
  Lift Pen Over
  Connect Good Scans
```

When the Screen Disp/Dump/Plot Parameters field is selected the following form will be displayed:

8.18.3 SEAPLOT: PRINTER and PLOTTER SELECTION

```
SEAPLOT  4.0                        Wednesday  January 15, 1992  3:03 pm

                  Screen Disp/Dump/Plot Parameters =

  Plot #1 Mark = t   Plot #2 Mark = c   Plot #3 Mark = s   Plot #4 Mark = d

  Display Mark #1 = Yes              Mark Position #1 (%) = 15

  Display Mark #2 = Yes              Mark Position #2 (%) = 95

  Plotter Selection = HP LaserJet III

  Screen Dump Printer Selection = LaserJet+, Series II, or Series III

  Plotter Communication Set Up = <Press Enter to Modify>
```

The printer selections are:

```
┌──────────────────────────────────────────────────────────────┐
│   Screen Dump Printer Selection =                            │
├──────────────────────────────────────────────────────────────┤
│ LaserJet+, Series II, or Series III                          │
│ Epson FX                                                     │
│ Epson LX or MX                                              │
│ Others (DOS GRAPHICS or other memory resident printer drivers│
└──────────────────────────────────────────────────────────────┘
```

The program PIZZAZ 5 by Application Techniques can be used to dump the screen to virtually any dot matrix, inkjet, or Laser printer not supported directly by SEAPLOT. PIZZAZ PLUS can be purchased through Programmers Paradise 1-800-445-7899 (international telephone USA 908 389-8950; FAX 908 389-9227).

WINDOWS 95:

To capture and print a screen dump in Windows 95:

Run SEAPLOT (or SEASAVE) with the command line option -bc5.
This changes the background color from black to white.

When printing to a black and white printer set the plot color of all the variables to blue.

Display the data on the screen.

Press <Alt-Printscreen> to capture the display.

Press the Windows button or <Alt-Tab> to get to the desktop.

Run Word or WordPad, select Edit, Paste.

For multiple plots edit the plot, leave the editor open, and then press teh MS-DOS prompt on the taskbar to resume SEASAVE. Display the next plot, <Alt-Printscreen>, <Alt-Tab>, position the cursor in the editor and paste the new display.

WINDOWS 3.x:

If SEAPLOT (or SEASAVE) is run in a DOS window the screen can be captured to the Windows Clipboard and then pasted into a windows application:

Run SEAPLOT in a DOS window.
Display the plot on the screen.
Press Alt + PrintScrn to copy the screen to the Windows Clipboard.
Press Alt + Tab to pop back into Windows.
Paste the Clipboard into the Windows application (WORD or WORDPERFECT for Windows).

The plotter selections are:

```
┌──────────────────────────────────────────────────┐
│              Plotter Selection =                 │
├──────────────────────────────────────────────────┤
│ HP LaserJet III                                  │
│ HP Pen Plotter (7475A/7550A) with Paper Size A/A4│
│ HP Pen Plotter (7475A/7550A) with Paper Size B/A3│
└──────────────────────────────────────────────────┘
```

Select HP LaserJet III when using any printer that supports the HP GL/2 programming language. SEAPLOT assumes that screen dumps are sent to LPT1. Use the Plotter Communication set up form to configure the plotter for COM1, COM2, LPT1, or LPT2.

If COM1 or COM2 is selected SEAPLOT assumes that the plotter supports XON/XOFF software handshaking. If your plotter does not support software handshaking and you wish to use a serial port use the -o<filename> command line option to send the output to a file rather than the plotter. To output the file:

   1. Use the PC to plotter cable defined in the plotter manual.

   2. Use the DOS mode command to configure the serial port:

        mode com1:96,n,8,1

        will configure COM1 for 9600 baud, no parity, 8 data bits, and one stop bit

   2. copy the file to the comm port

        copy filename com1:

        will copy the file output by SEAPLOT to the comm port

The -o command line option can be used to send the output to a file rather than the plotter.

8.18.4 SEAPLOT: INTERACTIVE MULTI-FILE OVERLAYS

1. Display the first file.
2. Press <Ctrl-F7> to initialize interactive mode and copy the CRT display to a temporary file.
3. Press <Esc> to return to the main setup form and select a new file.
4. Press <F10> and answer yes to the prompt to display the second file.

Repeat steps 3 and 4 to add more overlaid files.

To start over:

1. Select a new file and press <F10> to display it.
2. Answer no to the overlay prompt.
3. Press <Ctrl-F7> to capture the new file.

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8.18.5 SEAPLOT: BATCH MODE MULTI-FILE OVERLAYS

First run SEAPLOT to set up the axis and plotting parameters and then use a flat text editor to create a file that contains the names of the files you want to overlay, one file name per line. The last line must end with a carriage return.

Run SEAPLOT with the -v command line option.

Example:

    if the file castlist contains three lines: cast1
                                               cast2
                                             cast10

    then seaplot -vcastlist will overlay the files CAST1.CNV, CAST2.CNV, and CAST10.CNV

8.18.6 SEAPLOT: DENSITY CONTOURS ON TS PLOTS

Run CONTOUR to generate a density contour file (.CTR extension).

Run SEAPLOT to select the variables and plot format, select none for X-AXIS #1 to leave room for the density contour labels. The usual selections are:

    Y AXIS: temperature or potential temperature
    X-AXIS #1: none
    X-AXIS #2: salinity
    X-AXIS #3: none
    X-AXIS #4: none

Run SEAPLOT with the -vfilename option to select overlaid plots.
Include the file with the .CTR extension in the list of files in filename.

Example:

    if the file tslist contained two lines:
        cast1
        ts1.ctr
    then seaplot -vtslist would plot CAST1.CNV and overlay TS1.CTR on the plot

A screen dump showing density contours on a TS plot is shown below:

Mediterranean Outflow
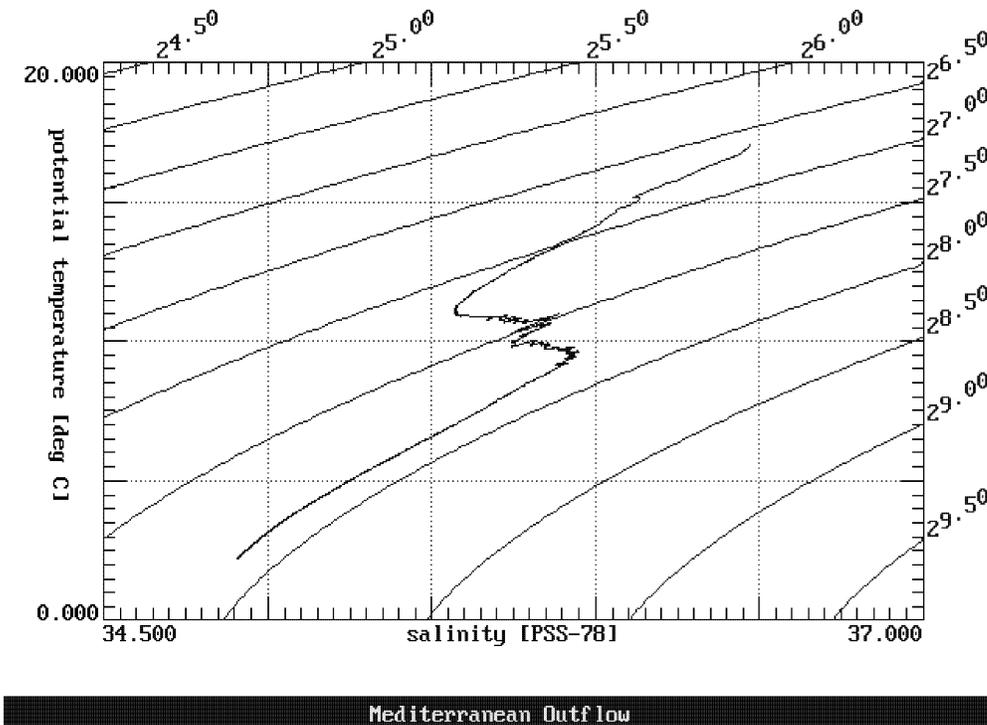
8.18.7 SEAPLOT: BATCH MODE WATERFALL PLOTS

Waterfall plots allow the user to plot several files with an offset added to each file. The procedure for displaying and plotting waterfall plots is similar to overlaid plots except that the command line is

   seaplot -wfilename

and the first line in the file specifying the list of files to be plotted must contain:

   OFFSET: O1 O2 O3 O4

       O1 is the amount to separate the X-AXIS #1 variables
       O2 is the amount to separate the X-AXIS #2 variables
       O3 is the amount to separate the X-AXIS #3 variables
       O4 is the amount to separate the X-AXIS #4 variables

The last line must end with a carriage return.

If labels for each file are desired include the keyword LABEL: on the second line and set X-AXIS #1 variable type to none. (A colon ':' must follow LABEL without any spaces.)
If LABEL: is included on the second line and an optional label follows the filename the label will be used, otherwise the file name will be used as the label.

Examples:

if the file contains 4 lines: OFFSET: 1.0 .5 0 0 0
   cast1
                                              cast2
                                              cast5

CAST1.CNV, CAST2.CNV, and CAST5.CNV will be plotted.
X-AXIS #1 variables will be separated by 1.
X-AXIS #2 variables will be separated by 0.5.
X-AXIS #3 and #4 variables will be overlaid.
None of the files will be labeled.

if the file contains 5 lines: OFFSET: 0 .5 0 0 0
                                              LABEL:
                                              cast1
                                              cast2
                                              cast5

CAST1.CNV, CAST2.CNV, and CAST5.CNV will be plotted.
X-AXIS #1 variables will be overlaid.
X-AXIS #2 variables will be separated by 0.5.
X-AXIS #3 and #4 variables will be overlaid.
The variables will be labeled cast1, cast2, and cast3.

if the file contains 5 lines: OFFSET: 0 .5 0 0 0
                                              LABEL:
                                              cast1 24sep92
                                              cast2 25sep92
                                              cast5 1oct92

CAST1.CNV, CAST2.CNV, and CAST5.CNV will be plotted.
X-AXIS #1 variables will be overlaid.
X-AXIS #2 variables will be separated by 0.5.
X-AXIS #3 and #4 variables will be overlaid.
The variables will be labeled 24sep92, 25sep92, and 1oct92.

A sample waterfall plot with offsets and labels is shown below: This plot was created by running

seaplot -wwlist

the file wlist contains 5 lines:
OFFSET: 0 1 0 0
LABEL:
30-2 cast1
34-8 cast2
39-16 cast3
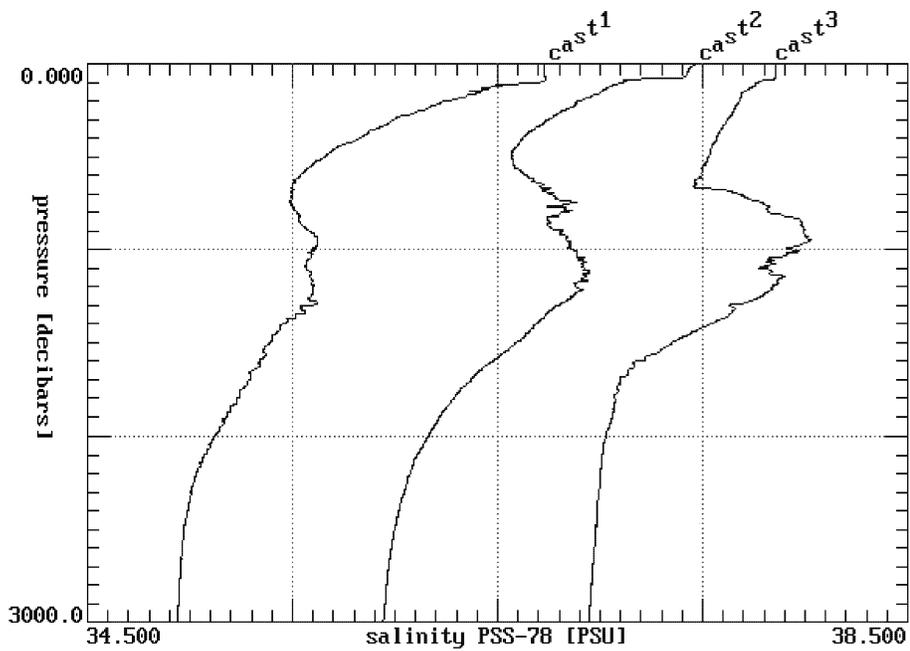
8.18.7 SEAPLOT: BATCH MODE COLOR SELECTION

The parameter -c<variableIndex><colorIndex> can be added after the file name in waterfall or overlay file lists to specify the color for each variable. The variableIndex can be 1, 2, 3, or 4 corresponding to X-Axis variables 1-4. The colorIndex can be 0 through 14. Up to four color selections can be specified for each file name. The mapping is:

0: Blue	1: Brown	2: Cyan	3: Dark Gray
4: Green	5: Intense White	6: Light Blue	7: Light Cyan
8: Light Green	9: Light Magenta	10: Light Red	11: Magenta
12: Red	13: White	14: Yellow	

Example:

    if the file castlist contains two lines:
        cast1 -c10 -c213 -c314
        cast2 -c11 -c27 -c38

    then seaplot -vcastlist
    will overlay the files CAST1.CNV, and CAST2.CNV with the following colors:

	X-AXIS #1	X-AXIS #2	X-AXIS #3
cast1	Light Red	White	Yellow
cast2	Magenta	Light Cyan	Light Green

SEAPLOT: COMMAND LINE PARAMETERS

-bc<colorIndex>	Set the X-Y plot background color (the default is black). See SEAPLOT batch mode color selection for the color map.
-bvc	Connect good values.
-bvl	Lift the pen over bad values.
-bsc	Connect good scans.
-bsl	Lift the pen over bad scans.
-bsp	Plot scans marked bad.
-d<filename>	Use filename for .PLT file.
-e<cname>	Use cname rather than SEAPLOT.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-l	Plot fluorescence on a linear scale.
-ni	Do not send initialize or abort instructions to plotter (use when plotting multiple files in batch mode to prevent the new plot from aborting the unfinished previous plot)
-o<filename>	Send plotter output (HPGL) to <filename>
-p<pausetime>	Wait pausetime seconds after finishing a plot in batch mode. The default value is 60 seconds. This 'pausetime' is used to prevent SEAPLOT from overrunning the printer buffer.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.
-v<filename>	Read a list of files to overlay from filename.
-w<filename>	Read a list of files to overlay with offsets (waterfall) from filename.

Input Files:

    SEAPLOT.CFG SEAPLOT configuration file
    .PLT   plotting configuration
    .CNV   input converted data file to plot

8.19 SEASAVE

Description:

Real Time Acquisition:

Acquires and displays data from SBE 9, SBE 19, SBE 21, or SBE 25 CTD systems. If data is stored to disk a header containing instrument type, start time, and sensor serial numbers followed by a user supplied form will precede the data.

Archived Data:

If the archived data has an imbedded header, SEASAVE will check that the sensor serial numbers in the data file match those in the selected .CON file.

Data Display:

Raw data is converted to engineering units and displayed as a scrolled display, fixed display, side-by-side X-Y plots, or overlaid X-Y plots. The displayed data can be dumped to a printer. The converted data is not stored.

The SEASAVE main menu is:

```
 SEASAVE  4.0                       Wednesday  January 15, 1992  5:28 pm


                    ┌─────────────────────┐
                    │   SEASAVE Main Menu  │
                    ├─────────────────────┤
                    │ Display Archived Data│
                    │ Display Real-Time Data│
                    │ ASCII  Output Set Up │
                    └─────────────────────┘

         <F1> Help; <Enter> Select the Option; <Esc> Exit SEASAVE.
```

8.19.1 SEASAVE: ASCII OUTPUT SET UP

SEASAVE can be configured to output converted ASCII data to COM1, COM2, LPT1, LPT2, LPT3, or to an SBE 14 remote pressure display while displaying either real-time or archived data. The serial output set up form is:

```
 SEASAVE  4.200                         Thursday  January 27, 1994  4:26 pm

                               ASCII Output Set Up
 ┌──────────────────────────────────────────────────────────────────────────┐
 │ Output ASCII Data =  Yes                                                   │
 │ ASCII Data Output Port = LPT1                                              │
 │ Num of Seconds (data time) between ASCII Updates = 60.000000              │
 │ Send Data to SBE 14 Remote Display = No                                    │
 │ Remote Display Data Type = Pressure, 50, 5000 decibars                     │
 │ Remote Display Port = COM1                                                  │
 │ Num of Seconds (data time) between Remote Updates = 1.000000              │
 │ Enable SBE 11 Deck Unit Alarm on Minimum Pressure = Yes                     │
 │ SBE 11 Deck Unit Alarm Parameters = <Press Enter to Modify>                │
 └──────────────────────────────────────────────────────────────────────────┘
             <F1> Help; <Enter> Edit the Field; <Esc> Exit Editing.
```

The format of the ASCII data output is selected in the menu for scrolled or fixed display. The variables listed in the scrolled or fixed display menu are output from the port in the order in which they appear.

If you are not using the ASCII output features be sure to set the Output ASCII Data and Send Data to SBE 14 Remote Pressure Display fields to No. If either field is set to Yes SEASAVE will transmit data to the port even if nothing is attached to it.

To change the ASCII data output serial port configuration:
  select 'ASCII Data output Port', select the desired COMM port, and then press <Enter>. You will then be able to select the baud rate, parity, and number of stop bits.

If you are sending ASCII data to a line printer you can press <Ctrl-P> to suspend/resume the output.

The remote display output data type can be pressure (with minimum and maximum pressure alarms), altimeter height, or altimeter height alternating with either depth or pressure. If altimeter height alternating with depth/pressure is chosen then pressure/depth is displayed with four digits and altimeter height is displayed with three digits. If LPT1, LPT2, or LPT3 is specified for the remote display interface, a parallel to serial adapter must be used to convert the parallel data from the computer to 300 baud serial data for the remote display. The parallel to serial converter must supply 7 to 12 volts on the DB-25 connector pin 20 (Data Terminal Ready) to power the remote display.

When using an altimeter set the 'Min Pressure to Enable ..' to a value greater than 20 meters. This prevents SEASAVE from sending alarm on/off commands to the SBE 11 when the system enters the water. The alarm will be enabled when the pressure is greater than the minimum pressure.

When using the CTD pressure sensor to control the SBE 11 alarm set 'Enable SBE 11 Deck Unit Alarm on Minimum Pressure' to YES and then select the SBE 11 Deck Unit Alarm Parameters' subform.

The alarm will be enabled when the pressure is greater than the value for:

   Pressure to Enable Alarm [db] =

The alarm will sound when the pressure is less than:

   Sound alarm when pressure is less than [db] =

And the alarm has been enabled.

8.19.2 SEASAVE: REAL-TIME DATA SET UP FORM

SEASAVE's main real-time data set up form is:

```
 SEASAVE   4.030                        Friday  September 3, 1993  9:57 am

 ┌──────────────────────────────────────────────────────────────────────┐
 │              Acquire and Display Real-Time Data Set Up                 │
 ├──────────────────────────────────────────────────────────────────────┤
 │ Store Data on Disk = Yes                                               │
 │                                                                        │
 │ Data File Path = C:\CTDDATA\                Data File Name = 1016T4.DAT│
 │                                                                        │
 │ Config File Path = C:\CTDDATA\              Config File [.CON] =SEASAVE.CON│
 │                                                                        │
 │ Display File [.DSP] = TEST.DSP    Display Type = Scrolled Display      │
 │                                                                        │
 │ Variables to Display =               <Press Enter to Modify>          │
 │                                                                        │
 │ Misc X-Y Plot Parameters =           <Press Enter to Modify>          │
 │                                                                        │
 │ Misc Run Parameters =                <Press Enter to Modify>          │
 │                                                                        │
 │ Save Display Parameters to .DSP File = <Press Enter Twice to Save>    │
 │                                                                        │
 └──────────────────────────────────────────────────────────────────────┘

      <Enter> Modify the Field; <F10> Acquire Real-Time Data; <Esc> Quit.
```

The display file, display type, and variables to display are selected as described for SEAPLOT (section 8.18).

8.19.3 SEASAVE: MISC X-Y PLOT PARAMETERS FORM

The Misc X-Y Plot Parameters form is:

```
 SEASAVE  4.0                         Wednesday  January 15, 1992  5:28 pm

                       Miscellaneous X-Y Plot Parameters

  Status Line Variables = <Press Enter to Modify>

  Plot Label =  Station 140

  Plot Line Type = Connected

  Plot Data Selection = Plot All Data

  Plot Status = Yes

  Automatic Paging of the Display = No

  Screen Dump Selection = Print When CTRL+F9 is Pressed

  Printer Control Selection = LaserJet+, Series II, or Series III

  Number of Pts to Compute between Status Line Updates =  9

       <Enter> Modify the Field; <F10> Display Archived Data; <Esc> Quit.
```

Highlight the Status Line Variables field and press the Enter key to select the variables that will be displayed underneath the X-Y plots.

Printer Control Selection is used to select the printer type for screen dumps.

Number of Pts to Compute between Status Line Updates is used to control how often the status line is updated. If this value is 0, the status line will be updated each time a point is plotted. If this value is 9 the status line will be updated every 10th plotted point. If the screen update rate (Miscellaneous Rum Parameters form) is set to 0.5 seconds and the number of points to compute between status line updates is set to 19, data will be displayed two times per second and the status line will be updated every 10 seconds.

If the Output Serial Data field is set to Yes in the Serial Output Set Up form, serial data will be sent to the COMM port when the status line is updated.

8.19.4 SEASAVE: MISC RUN PARAMETERS FORM

```
SEASAVE  4.032                    Wednesday  January 15, 1992  5:28 pm


                       Miscellaneous Run Parameters

 Number of Seconds Between Screen Updates =  0.500000

 Header Choice = Prompt for Header Information

 Header Form = <Press Enter to Modify>

 Mark Variable List =  <Press Enter to Modify>

 Number of Scans to Average in the Deck Unit =  8

 Water Sampler Type = SBE Carousel

 Store Lat/Lon in Raw Data File = Add to Header Only

 COMM Port Configuration =  <Press Enter to Modify>


      <Enter> Modify the Field; <F10> Display Real-Time Data; <Esc> Quit.
```

Number of Seconds Between Screen Updates controls how often data is converted to engineering units and sent to the fixed, scrolled, or X-Y plot displays.

If the Header Choice is Prompt for Header Information, the header form will be displayed at the start of data acquisition for the operator to fill out. The filled out header along with system time, instrument type, and serial numbers will be written to the beginning of the data file and output to a file with a .HDR extension.

If the Header Choice is include default header only the header form, system time, and serial number information will be written to the data file.

If the Header Choice is don't include header, the header form will not be written out.

Highlight the Header Form field and press the Enter key to modify the header prompts. Enter the desired header prompts here. The responses to the prompts will be filled out at the start of data acquisition.

Mark Parameters:

Highlight this field and press the Enter key to select the variables that will be written to the marker file (.MRK) extension. Each time Ctrl-F5 is pressed while acquiring data with SEASAVE one scan with the mark number, system time and the selected variables is written to the .MRK file.

Number of Scans to Average in the Deck Unit:

This field will appear only if the instrument type is SBE 9/11, 911plus, or SBE 31.
For full rate data set this field to 1.

If the CTD scan rate is 24 scans per second and number of scans to average is set to 24 the SBE 11 deck unit will average the data and transmit it to the computer at one scan per second.

Water Sampler Type:

This field will appear only if the instrument type is SBE 911plus. Connect one of the computer COMM ports to the modem port on the SBE 11plus Deck unit to trip water sampler bottles without interrupting the CTD data.

SBE Carousel Water Sampler:

Select sequential, user defined, or table driven firing sequence. If user defined firing sequence is selected you will be prompted for the bottle number to fire each time Ctrl-F3 is pressed. Enter the desired bottle number and press Enter. If sequential firing is chosen the bottles will be fired in order beginning with bottle number one. If table driven firing is chosen the bottles will be fired in the order specified by the table entries. When the SEASAVE receives a valid position code it sets a bit in the modulo word high for 1.5 seconds and increments the number of bottles fired. Support of the SBE Carousel requires SBE 9plus modem firmware 2.0 and SBE 11plus modem firmware version 2.0a (or greater).

GO 1015:

When the SBE 9 underwater unit detects a bottle confirmation from the GO 1015 it sets a bit in the modulo word high for 1.5 seconds and increments the number of bottles fired. This confirmation bit is used by SEASAVE to keep track of the number of bottles fired.

GO 1016:

If user defined firing sequence is selected you will be prompted for the bottle number to fire each time Ctrl-F3 is pressed. Enter the desired bottle number and press Enter. When the SEASAVE receives a valid position code it sets a bit in the modulo word high for 1.5 seconds and increments the number of bottles fired. Support of the GO 1016 requires SBE 9plus and SBE 11plus modem firmware version 2.0 or greater.

All Water Samplers:

Whenever a bottle confirmation is received by SEASAVE a line is written to the output file with a .BL extension containing the bottle firing sequence number, bottle position, date, time, beginning scan number, and ending scan number for the fired bottle. Scans with the bottle confirmation bit set are written to a file with a .ROS extension when the raw data file is converted by DATCNV.

A list containing the bottles fired will be displayed to the right of the overlaid X-Y plot.
A horizontal line will be drawn at the pressure the bottle was fired. The line type, color, and label are selected in the Mark Variable List in the Miscellaneous Run Parameters form.

Store Lat/Lon in Raw Data File:

This prompt will appear only if the NMEA interface option is selected in SEACON. The choices are:

Add to Header Only
Lat/Lon/Time is automatically written to the header when data acquisition is started.

Append to Every Scan
Lat/Lon/Time is automatically written to the header and seven bytes of Lat/Lon data will be appended to every scan.

Append to .NAV File when <Ctrl-N> is Pressed
Lat/Lon/Time is automatically written to the header. Lat/Lon/Time, scan number and pressure are written to FILENAME.NAV. If DATCNV finds FILENAME.NAV it adds the contents of FILENAME.NAV to the converted data file header.

Append to Every Scan and Append to .NAV File when <Ctrl-N> is Pressed
Lat/Lon/Time is automatically written to the header and seven bytes of Lat/Lon data will be appended to every scan. When <Ctrl-N> is pressed Lat/Lon/Time, scan number and pressure are written to FILENAME.NAV. If DATCNV finds FILENAME.NAV it adds the contents of FILENAME.NAV to the converted data file header.

COMM port Configuration:

If the SBE 11 deck unit has been configured (in SEACON) for RS232C the COMM port and its baud rate will be selected. For SBE 911plus systems the COMM port for water sampler control will also be selected.

8.19.5 SEASAVE: ACQUIRE and STORE REAL TIME DATA

Once all of the forms have been completed press function Key 10 to begin data acquisition. If prompt for header information has been selected the header form will be displayed for the operator to fill out. The real-time overlaid X-Y plot display will be similar to the following:
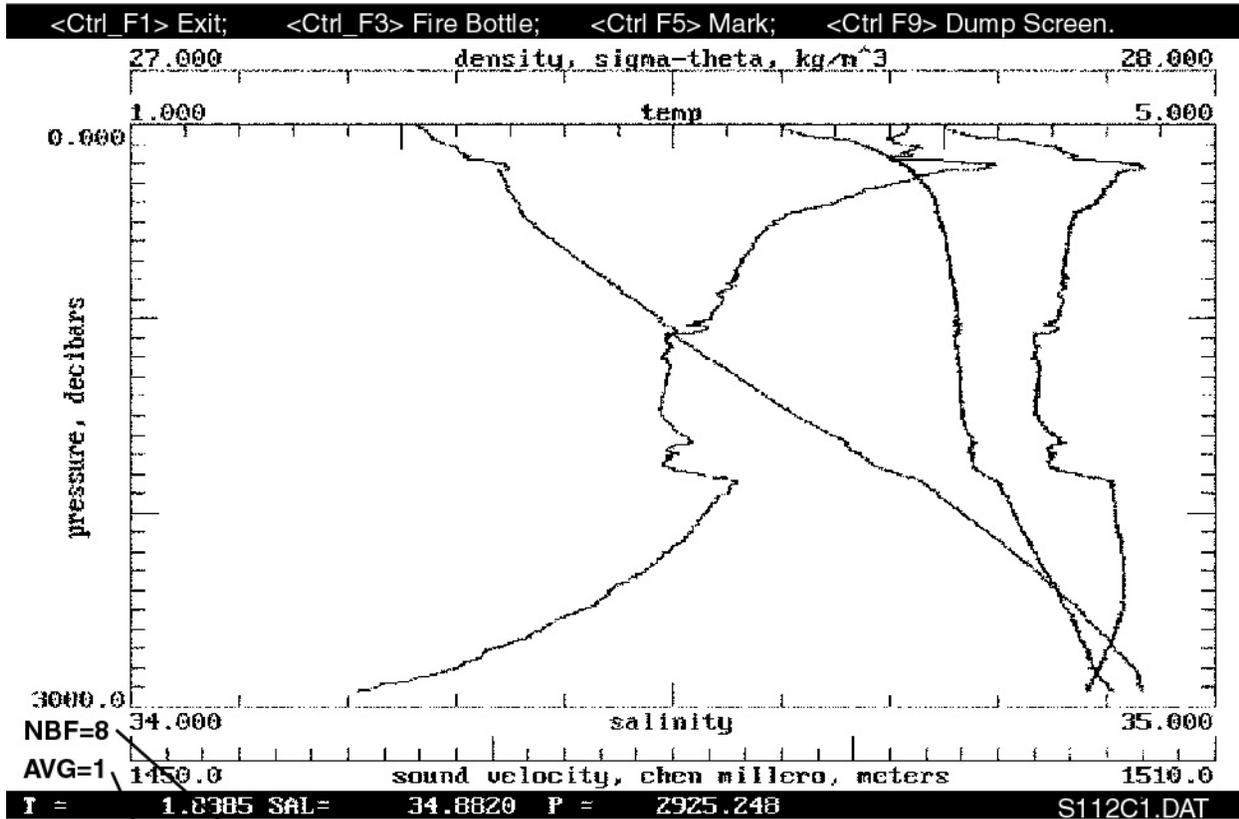
Number of water sampler bottles closed

Data file name

Number of data scans averaged in the deck unit

<Ctrl-F3> Fire Bottle and a list of bottles fired will be displayed if the instrument type is SBE 911plus and Water Sampler Type has been set in the miscellaneous run parameters form. The fire push button on the SBE 11plus deck unit can be used in conjunction with the <Ctrl-F3> key. Pushing the fire button will cause the next sequential bottle to be fired.

<Ctrl-F5> Mark and the data file name will only be displayed if data is being stored to disk. See Section 8.18.4 for a discussion of the marker file

If a NMEA interface is installed, Latitude, Longitude, and Universal Time will be displayed and updated whenever the status line is updated.

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8.19.6 SEASAVE: DISPLAY ARCHIVED DATA

SEASAVE can be used to display archived raw data files. The archived data set up form is:

```
SEASAVE  4.030                       Friday  September 3, 1993  9:57 am

                      Display Archived Data Set Up

Raw Data File =                      5453.DAT

Configuration File [.CON] =          NANCY.CON

Input File [.CON, .DAT, .HEX] Path =  C:\CTDDATA\SBE911P\

Display File [.DSP] = TEST.DSP     Display Type = Scrolled Display

Variables to Display =               <Press Enter to Modify>

Misc X-Y Plot Parameters =           <Press Enter to Modify>

Number of Scans to Skip Over =       0

Number of Scans to Skip between Computations = 0

Save Display Parameters to .DSP File = <Press Enter Twice to Save>

            <Enter> Select the Option; <Esc> Quit.
```

The display file, display type, and variables to display are selected as described for SEAPLOT section 8.12).

To display the entire data file set the number of scans to skip over and the number of scans to skip between computations to 0.

The archived data overlaid X-Y plot display will be similar to the following:
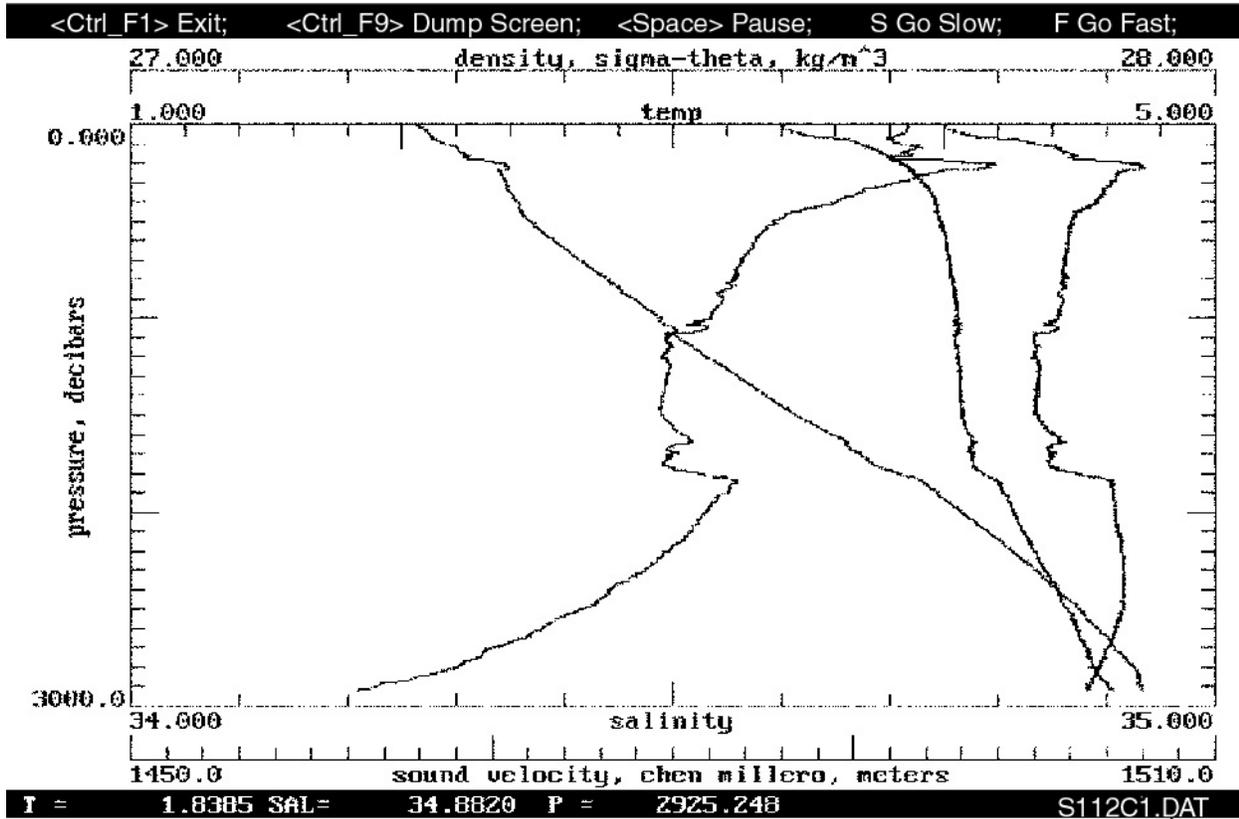
Data file name

SEASAVE: COMMAND LINE PARAMETERS

-bc\<colorIndex\>	Set the X-Y plot background color (the default is black). See linecolor below for the color map.
-b\<linetype\>\<linecolor\>	Use \<linetype\> and \<linecolor\> to determine the bottle firing mark line type and line color where \<linetype\> is 0 for connected and 1 for dotted, and \<linecolor\> is:

0: Blue	1: Brown	2: Cyan	3: Dark Gray
4: Green	5: Intense White	6: Light Blue	7: Light Cyan
8: Light Green	9: Light Magenta	10: Light Red	11: Magenta
12: Red	13: White	14: Yellow	

-c\<filename\>	Use \<filename\>.con for configuration. Filename can include a path name.
-d\<filename\>	Use \<filename\>.dsp for display parameters.
-e\<cname\>	Use cname rather than SEASAVE.CFG for the configuration.
-f	Display GPIB warnings as they occur in real time.
-fb	Enable checking for water bottle confirmation when water sampler type is set to none (GO 1015 only).
-gx	Disable data gap checking.
-gd	Disable GPIB DMA transfers. Use this option with PCMCIA GPIB adapters.
-i\<filename\>	Enter batch mode and use \<filename\> as an archived filename(the file extension defaults to .dat if not entered), use seasoft.con and seasoft.dsp as the defaults.
-l	plot fluorescence on a linear scale.
-m	show red bottle confirm lines on X-Y plots for archived data
-mx	do not show red bottle confirm lines on X-Y plots for archived data
-o\<filename\>	enter batch mode and use \<filename\> as the real time data output filename, use seasoft.con and seasoft.dsp as the defaults.
-p\<plotLabel\>	plot label for screen dump to printer.
-r\<degrees\>	surface PAR = surface PAR * cos(degrees)
-ss	delay saving data to disk. Start saving data when \<Ctrl-D\> is pressed.
-t\<tname\>	Use tname rather than TEMP.CNV for the temporary file.
-y\<val\>	Do not compute or display when pressure is less than \<val\>.
-z\<val\>	Do not compute or display when pressure is greater than \<val\>.
-v6	65536 is added to conductivity numbers from an SBE 16 HEX when the recorded number is less than 10000. This is a work around for SBE 16 conductivity data that 'wraps' in very high conductivity water.

Input files:

SEASAVE.CFG	seasave configuration
.DAT or .HEX	raw input data file
.CON	calibration constants file
.DSP	display parameters file

8.20 SECTION

Description:

Select a range of data based on either scan number or pressure. Write out the selected rows of converted data to a new file. The set up form is:

```
SECTION  4.0                         Thursday  January 16, 1992  2:36 pm

                              SECTION Set Up
Input Data File =              D1.CNV

Input File [.CNV] Path =       C:

Output Data File Path =        C:

SECTION Selection Variable =  Pressure

Pressure Cast Section =        downcast

SECTION Minimum Value =        1040.000000

SECTION Maximum Value =        1048.000000


        <Enter> Modify the Field; <F10> Continue SECTION; <Esc> Quit.
```

The SECTION selection variable can be Pressure or Scan Number.

If the SECTION variable is Scan Number the Pressure Cast Section is ignored.

SECTION: COMMAND LINE PARAMETERS

-e<cname>	Use cname rather than SECTION.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-v[p[d|u] | s]	Section variable selection:
-vpd	Select a section based on pressure, downcast.
-vpu	Select a section based on pressure, upcast.
-vs	Select a section based on scan number.
-y<minval>	MIN value for Section range.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.
-z<maxval>	MAX value for Section range.

Input Files:

SECTION.CFG	SECTION configuration
*.CNV	converted data file

Lines Added to Header:

section_date	system time when SECTION was run
section_in	input filename
section_type	pressure, downcast; pressure, upcast; or scans
section_range	minimum value, maximum value

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8.21 SPLIT

Description:

Splits the data in CNV files into upcast (pressure decreasing) and downcast (pressure increasing) files. The upcast output filename is the input filename prefixed by 'u'. The downcast output filename is the input filename prefixed by 'd'. The command line options -nd, -od, and -ou can be used to override the output filename prefixes. Note that the -d command line option used with BINAVG will produce a downcast only output file, possibly removing the need to run SPLIT.

Pressure values marked bad will not be used to determine the maximum pressure.

Pressure values in scans marked bad will not be used to determine the maximum pressure if "Exclude Scans Marked Bad" is set to YES.

SPLIT: COMMAND LINE PARAMETERS:

-a	Split all .CNV files. Display the set up form before processing the data.
-ax	Split all .CNV files. Do not display the set up form.
-b	Use pressure values in scans marked bad to determine the maximum pressure.
-bx	Do not use pressure values in scans marked bad to determine the maximum pressure.
-d	Output downcast only.
-dx	Output upcast and downcast.
-e<cname>	Use cname rather than SPLIT.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-nd	Do not add 'd' prefix to the downcast output filename.
-od<filename>	Use <filename> as the output downcast filename.
-ou<filename>	Use <filename> as the output upcast filename.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Lines Added to Header

split_date	system time when SPLIT was run
split_in	input filename
split_excl_bad_scans	if yes, pressure values in scans marked bad will not be used to determine the maximum pressure

8.22 STRIP

Description:

Output selected columns of data from the input converted data file. The set up form is:

```
STRIP  4.0                              Thursday  January 16, 1992  2:45 pm

                              STRIP Set Up

Input Data File =                          D1.CNV

Input File [.CNV] Path =                   C:

Output Data File Path =                    C:

Variables to be Included =                 <Press Enter to Modify>
```
        <Enter> Modify the Field; <F10> Continue STRIP; <Esc> Quit.

Highlight the Variables to be included field and press the Enter key to select the columns. A form similar to the following will be displayed:

```
STRIP  4.0                              Thursday  January 16, 1992  2:45 pm

                         Variables to be Included =

Include scan number =                                    Yes
Include pressure, decibars =                             Yes
Include temperature, primary, deg C =                    Yes
Include conductivity, primary, S/m =                     Yes
Include oxygen, current, microamps =                     Yes
Include oxygen, temperature, deg C =                     Yes
Include salinity, PSS-78 [PSU], T0, C0 =                 No
Include density, sigma-theta, kg/m^3, T0, C0 =           No
```
          <Enter> Modify the Field; <F10> Continue STRIP; <Esc> Quit.

Only the variables marked Yes will be included in the output file.

STRIP: COMMAND LINE PARAMETERS:

-a	Strip all .CNV files. Display the set up form before processing the data.
-ax	Strip all .CNV files. Do not display the set up form.
-e<cname>	Use cname rather than STRIP.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename. Columns to include are read from the STRIP.CFG
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

STRIP.CFG	STRIP configuration
.CNV	input converted data

Lines Added to Header:

strip_date	system time when STRIP was run
strip_in	input filename

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8.23 TRANS

Description:

Changes the converted data file format from binary to ascii or vice versa.

TRANS: COMMAND LINE PARAMETERS:

-a	Process all .DAT and .HEX files. Display the set up form before processing the data.
-ax	Process all .DAT and .HEX files. Do not display the setup form.
-e<cname>	Use cname rather than TRANS.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

TRANS.CFG	trans configuration
.CNV	converted data file

Bad flags are not modified.

Lines Added to Header:

8.24 WFILTER

Wfilter provides 4 types of window filters and a median filter for data smoothing of .CNV files. Window filters calculate a weighted average of data values about a center point and substitute this average for the data value at the center point. The median filter calculates a median for data values about a center point and replaces the data value at the center point with the median.

Filter windows are defined by their length and shape. The minimum window size is 1 scan, the maximum is 511 scans. Window length must be an odd number so that the window has a center point. Window lengths that are specified as an even number are implemented by adding 1 to make the length odd. As mentioned above, a filtered data point is a weighted average of those data points within the window calculated by the transfer function below:

$$y(n) = \sum_{k=-L/2}^{L/2} w(k)x(n-k)$$

The following window shapes are available: boxcar, cosine, triangle, and gaussian. The figure below shows the impulse response of each of the 4 filter types for a filter of length 17 scans. The impulse response of a filter is obtained by filtering a data set that has zeros everywhere except one data value that is set to 1.
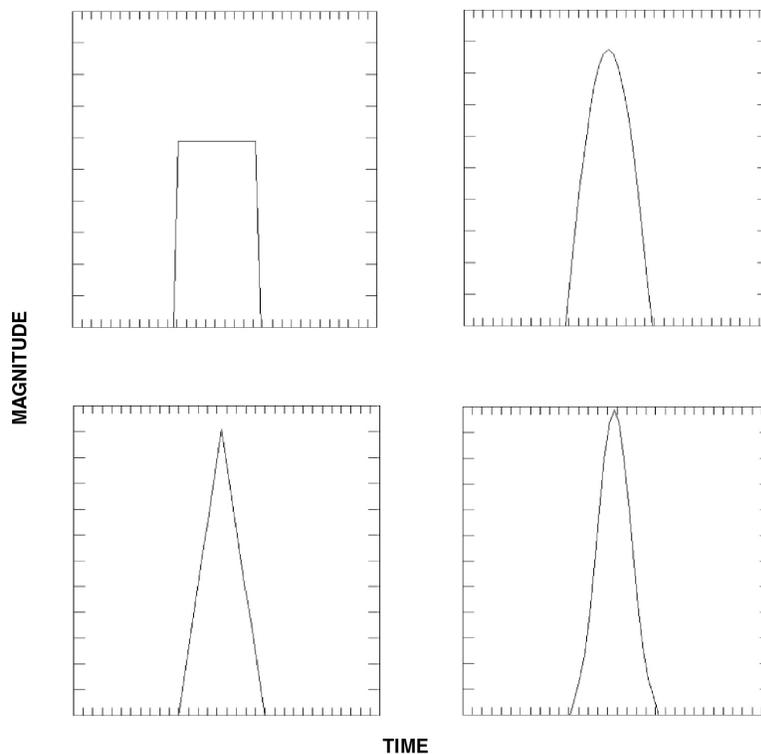
Impulse response of filters. Clockwise from top left: boxcar, cosine, gaussian, triangle. Filter window length is 17 scans.

Filter weights are calculated for each window type with the following equations. After the weights are calculated they are normalized to sum to 1. When a bad data point is encountered the weights are renormalized, excluding the filter element that would operate on the bad data point. In the weight equations below, the following conventions apply:

L is the window length in scans, always an odd number.
n is the window index, running from -L/2 to L/2 with 0 being the center point of the window.
w(n) is the set of window weights.

Boxcar:

$$w(n) = \frac{1}{L} \qquad \text{for } n = -\frac{L-1}{2} \ .. \ \frac{L-1}{2}$$

Cosine:

$$w(n) = 1 \qquad \text{for } n = 0$$

$$w(n) = \cos \frac{n \times \pi}{L+1} \qquad \text{for } n = -\frac{L-1}{2} \ ..-1, 1 .. \ \frac{L-1}{2}$$

Triangle:

$$w(n) = 1 \qquad \text{for } n = 0$$

$$w(n) = \frac{|n|}{K} \qquad \text{for } n = -\frac{L-1}{2} \ ..-1, 1 .. \ \frac{L-1}{2}$$

$$\text{where } K = \frac{L-1}{2} + 1$$

Gaussian:

$$phase = \frac{offset \ (sec)}{sample \ interval \ (sec)}$$

$$scale = log(2) \times \left(2 \times \frac{sample \ rate}{half \ width \ (scans)} \right)^2$$

$$w(n) = e^{\ -phase \times phase \times scale} \qquad \text{for } n = 0$$

$$w(n) = e^{\ -(n - phase)^2 \times scale} \qquad \text{for } n = -\frac{L-1}{2} \ ..-1, 1 .. \ \frac{L-1}{2}$$

GAUSSIAN FILTER

The gaussian window has parameters of halfwidth (in scans) and offset (in time) in addition to window length. These extra parameters allow data to be filtered and shifted in time relative in one operation. Halfwidth, like window length has units of scans. It determines the width of the gaussian curve. A window length of 9 and a halfwidth of 4 would produce a set of filter weights that fill the window. A window length of 17 and a halfwidth of 4 would produce a set of filter weights that fill only half the window. If the filter weights do not fill the window the offset parameter may be used to shift the weights within the window without clipping the edge of the gaussian curve.

The following figure illustrates the interaction of the three parameters. Window length is 33 and halfwidth is 4. Offset is -3 seconds in the left curve, 0 in the middle curve and +3 seconds in the right curve.

The halfwidth parameter determines the width of the gaussian curve, the offset parameter moves the center of the gaussian filter weights relative to the center point of the window.
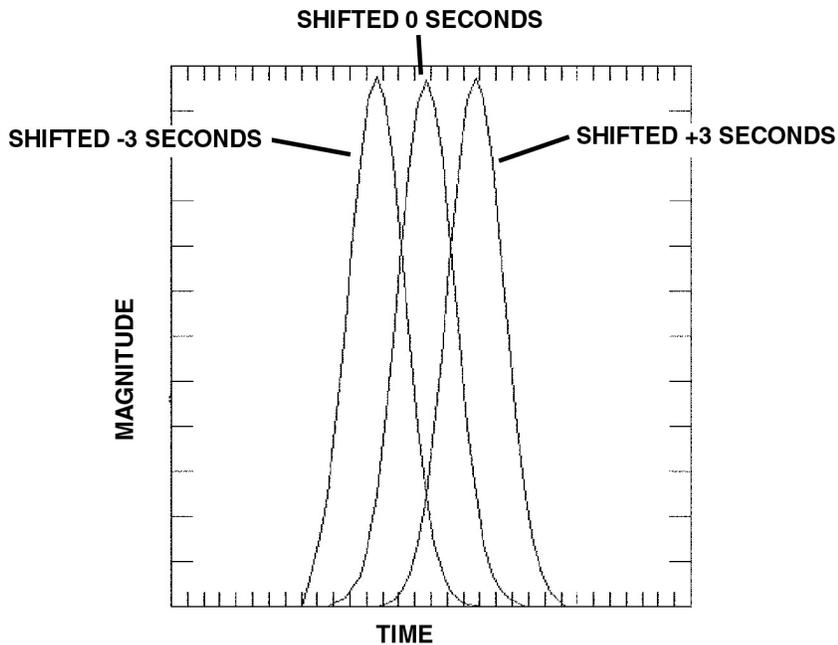
Note that the window length is larger than the halfwidth, this allows the complete gaussian curve to be expressed in the window when the offset parameter shifts the curve forward or backward in time. Were the halfwidth specified to be a larger value the trailing edge of the -3 second offset curve would be truncated, the leading edge of the +3 curve would be truncated. The offset parameter moves the gaussian shape of the window weights forward or backward in time. Since the weighted average is calculated for a data value in the center of the window, this has the effect of shifting the data that the filter is operating on forward or backward in time relative to the other data in the file. This capability allows filtering and time shifting to be done in one step.

MEDIAN FILTER

The median filter is not a smoothing filter in the same sense as the window filters described above. For an arbitrary window size a median value is determined, the data value at the center point of the window is replaced by the median value. Median filtering is most useful in spike removal. The figure below shows a data set before and after median filtering.
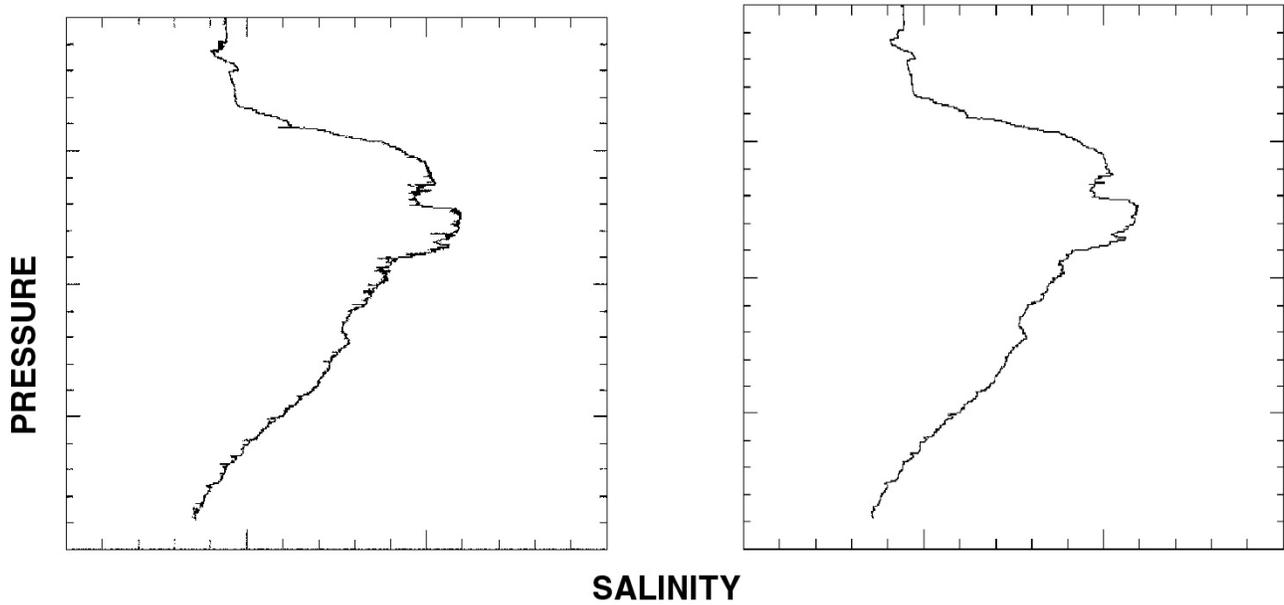
Salinity versus pressure, left is unfiltered data, right is median filtered with window length 17.

WFILTER SETUP

The WFILTER setup menu is shown below. The interval between scans is read off the header of the .CNV file selected as the input file. Select <Press Enter to Modify> to assign filter types and filter parameters to each of the data types in the .CNV file.

```
WFILTER  4.020                     Thursday  January 14, 1993  1:20 pm

                        Wfilter Selection Form

Input Data File =                    FILTEST.CNV

Input File [.CNV] Path =             F:\USERS\DJM\

Output Data File Path =              F:\USERS\DJM\

Variables to Filter =                <Press Enter to Modify>

Exclude Scans Marked Bad in WFILTER =  Yes


Interval Between Scans (seconds) = 0.5

    <Enter> Modify the field; <F10> Continue WFILTER; <Esc> Quit WFILTER.
```

The menu below lists the data types in the .CNV file and the filters assigned to them. Highlight a data type and press enter to change the filter selection.

```
                        Wfilter Selection Form

Filter, pressure, decibars =                none
Filter, temperature, primary, deg C =       cosine, 32
Filter, conductivity, primary, S/m =        triangle, 33
```

Filter types are shown in the menu below, highlight the desired filter type and press enter to assign it to the data type previously selected.

```
        Filter Types

    boxcar
    cosine
    gaussian
    median
    none
    triangle
```

If you select boxcar, cosine, median, or triangle, you will be prompted for window size as shown below. Note that even window lengths will be incremented by WFILTER to provide a center point for the window.

```
┌────────────────────────────────────────────────┐
│              Boxcar Filter Parameters            │
├────────────────────────────────────────────────┤
│  Window Size (scans) = 32                        │
└────────────────────────────────────────────────┘
```

As discussed above, the gaussian filter requires additional parameters. If you desire to offset the filter center with the offset parameter then set the window size and halfwidth as discussed above to allow the window to contain the entire gaussian shape.

```
┌────────────────────────────────────────────────┐
│            Gaussian Filter Parameters            │
├────────────────────────────────────────────────┤
│  Window Size (scans) =  32                       │
│                                                  │
│  Half Width (seconds) = 4.000000                 │
│                                                  │
│  Offset (seconds) =     3.000000                 │
│                                                  │
│                                                  │
│             --Press <Esc> to Exit--              │
└────────────────────────────────────────────────┘
```

WFILTER: COMMAND LINE PARAMETERS

-a	Process all .CNV files. Display the set up form before processing the data.
-ax	Process all .CNV files. Do not display the setup form.
-e<cname>	Use cname rather than WFILTER.CFG for the configuration.
-i<filename>	Enter batch mode and use <filename> as the input filename.
-o<filename>	Use <filename> as the output filename.
-px	Do not print out progress messages.
-t<tname>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

WFILTER.CFG WFILTER configuration file
.CNV   input converted data file

Lines Added to Header:

wfilter_date	system time when WFILTER was run
wfilter_in	input filename
wfilter_excl_bad_scans	exclude bad scan flag
wfilter_action	data channel identifier, filter type, filter parameters

8.25 WILDEDIT

Description:

Marks wild points by setting their values to the bad value specified in the input .CNV header. The first pass obtains an accurate estimate of the data's true standard deviation. The second pass marks values good or bad.

The algorithm is:

- Read in a block of N scans.
- For each column of data, compute the standard deviation of N data points. Flag values that differ from the mean by more than the number of standard deviations specified for pass 1.
- Compute the standard deviation of the same N data points, excluding the flagged values. Mark bad values that differ from the mean by more than the number of standard deviations specified for pass 2.
- Before marking the value bad, check the difference between the value and mean. If this distance is less than the value specified in the form, do not mark the value bad. This is useful when data is from a very slowly changing voltage sensor. Because the voltage channels have limited resolution, the block will have a very small standard deviation, and data that changes by one bit may be incorrectly tagged as wild.
- Repeat until the end of file is reached.
- If the last block of data has less than N scans, use data from the previous scan to fill in the block.

If the data file is particularly corrupted, it may be necessary to run WILDEDIT more than once with different block sizes and number of standard deviations. For example: a 24 scan per second data file obtained from a seven year old reel-to-reel tape contained a large number of dropouts and data errors. Running WILDEDIT three times marked all the "wild" points:

run	pass 1 std dev	pass 2 std dev	points per block
1	2	10	12
2	2	10	100
3	2	5	50

The set up form is:

```
WILDEDIT  4.0                          Thursday  January 16, 1992  2:45 pm

                              WILDEDIT Set Up

Input Data File =                       BECK.CNV

Input File [.CNV] Path =                C:

Output Data File Path =                 C:

No. of Std Deviations for Pass 1 (default=2) =  2.000000

No. of Std Deviations for Pass 2 (default=20) = 20.000000

Keep Data Within this Distance of the Mean: val = 0.01

Number of Points Per Block =            100

Variables to Check for Wild Points =    <Press Enter to Modify>

Exclude Scans Marked Bad in WILDEDIT =  Yes

     <Enter> Modify the Field; <F10> Continue Wild Editing; <Esc> Quit.
```

Scans marked bad will not be evaluated if "Exclude Scans Marked Bad in Computation" is set to "YES".

To select the variables to wildedit highlight the Variables to Check for Wild Points field and press the Enter key. A form similar to the following will be displayed:

```
WILDEDIT  4.0                           Thursday  January 16, 1992  2:45 pm

                    Variables to Check for Wild Points =

Include scan number =                                    No
Include pressure, decibars =                             Yes
Include temperature, primary, deg C =                    Yes
Include conductivity, primary, S/m =                     Yes
Include oxygen, current, microamps =                     Yes
Include oxygen, temperature, deg C =                     Yes
```

        <Enter> Modify the Field; <F10> Continue Wild Editing; <Esc> Quit.

WILDEDIT: COMMAND LINE PARAMETERS:

-a	Edit all .CNV files. Display the set up form before processing the data.
-ax	Edit all .CNV files. Do not display the set up form.
-b	Include values from scans marked bad in the computation of standard deviations.
-bx	Do not include values from scans marked bad in the computation of standard deviations.
-e\<cname\>	Use cname rather than WILDEDIT.CFG for the configuration.
-i\<filename\>	Enter batch mode and use \<filename\> as the input filename. Columns to include are read from the WILDEDIT.CFG
-o\<filename\>	Use \<filename\> as the output filename.
-px	Do not print out progress messages.
-t\<tname\>	Use tname rather than TEMP.CNV for the temporary file.

Input Files:

WILDEDIT.CFG	WILDEDIT configuration
.CNV	input converted data

Lines Added to Header:

wildedit_date	system time when WILDEDIT was run
wildedit_in	input filename
wildedit_pass1_nstd	number of standard deviations for pass 1 test
wildedit_pass2_nstd	number of standard deviations for pass 2 test
wildedit_npoint	number of points to include in each test
wildedit_vars	a list of the variables tested for wild points
wildedit_excl_bad_scans	if yes, values in scans marked bad will not be used to determine the standard deviation

9.0 TERMINAL PROGRAMS

9.1 TERM1621, TERM17, TERM19, TERM25, TERM37, TERMAFM

These programs are used to communicate with Sea-Bird's internally recording instruments. Use

TERM1619	SBE 16 SEACAT or SBE 21 THERMOSALINOGRAPH
TERM17	SBE 17 SEARAM
TERM19	SBE 19 SEACAT PROFILER
TERM25	SBE 25 SEALOGGER CTD
TERM37	SBE 37 MicroCAT
TERMAFM	SBE 90208 Carousel Auto Fire Module

The file TERMXX.CFG (read from the current directory) contains the set up information for each terminal program.

The following discussion of TERM19 applies to all of the terminal programs.

9.1.1 MAIN TERMINAL SCREEN

The main terminal screen is shown below:

```
 SBE 19 Terminal Program  4.0              Thursday  January 16, 1992  4:50 pm

   <F1> Help      <F2> Setup     <F3> Status     <F4> Headers    <F5> Capture
   <F6> Wake Up   <F7> Baud Rate <F8> Init Log   <F9> Upload      <F10> Exit



<F1>Help <Ctrl-C>Halt Instr <Ctrl-F10 or Home>Stop Log Baud = 600  Capt = NO
```

Press F2 and select Communication Set Up to set the COMM port and baud rate. Exit the Set Up form (press Esc) and press F6 to establish communications with the instrument. To abort the attempt to establish communications press the Esc Key.

Once communications have been established characters transmitted by the instrument will be displayed in the center portion of the main screen.

The active function keys are:

F1   Display help screens.

F2   Display the terminal set up form.

F3   Display instrument status.

F4   Display instrument headers. (For TERM37, it displays instrument coefficients).

F5   Capture instrument responses to a file on disk (use F9 for data upload).

F6   Reestablish communications with the instrument. The instrument will 'go to sleep' after two minutes without receiving any commands from the computer.

F7   Change the baud rate.

F8   Initialize logging. Reset the scan and cast pointers in the instrument to 0. Upload any data in the instrument before sending this command.

F9   Upload data from the instrument. The upload parameters are configured in the set up menu (Function Key 2).

F10   Exit to DOS.

Ctrl-C   Sends Ctrl-C to the instrument to halt the display voltages and display frequencies diagnostics.

Ctrl-F10 or Home   Stop Logging (sends a Null character to the instrument). This function is omitted in TERM1621.

On the bottom status line:

Baud =Displays the current baud rate

Capt = Displays the capture to disk status. If YES all replies from the instrument are being written to a file on disk.

The function keys are used to control different features of the terminal programs and to send commands to the instruments for data uploading, initialization, and status information. If communications or instrument problems are encountered the instrument hardware manual should be consulted for the diagnostic and data commands appropriate for that instrument.

In particular if the terminal program is not able to establish communications with the instrument by cycling through the baud rates and comm ports, the baud rate as documented on the configuration page in the hardware manual should be set with the F7 function key and the set up parameters accessed through the F2 function key should be verified. Subsequent attempts at communicating with the instrument can be made by pressing the enter key or via the F6 function key.

9.1.2 TERMINAL SET UP FORM

```
┌─────────────────────────────────────────────────────────────────────┐
│ SBE 19 Terminal Program  4.0           Thursday  January 16, 1992  4:50 pm │
└─────────────────────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────────────────────┐
│╔═══════════════════════════════════════════════════════════════════╗│
│║                    TERM19 Set Up Parameters                       ║│
│╟───────────────────────────────────────────────────────────────────╢│
│║ SBE 19 EPROM (Firmware) Version = 3.0 or Greater                  ║│
│║                                                                   ║│
│║ Communication Set Up =           <Press Enter To Modify>          ║│
│║                                                                   ║│
│║ Data Upload Set Up Parameters =  <Press Enter To Modify>          ║│
│║                                                                   ║│
│║ Header =                         Prompt for Header Information     ║│
│║                                                                   ║│
│║ Header Form =                    <Press Enter To Modify>          ║│
│╚═══════════════════════════════════════════════════════════════════╝│
└─────────────────────────────────────────────────────────────────────┘
        <F1> Help;  <Esc> Exit;  <Enter> Modify the field
```

The EPROM Version is recorded on the configuration sheet of your instrument manual and also displayed in the first line of the reply to the display status (Function Key 3) reply.

The Communication Set Up Form is:

```
┌─────────────────────────────────────────────────────────────────────┐
│ SBE 19 Terminal Program  4.0           Thursday  January 16, 1992  4:51 pm │
└─────────────────────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────────────────────┐
│╔═══════════════════════════════════════════════════════════════════╗│
│║                    TERM19 Set Up Parameters                       ║│
│╟───────────────────────────────────────────────────────────────────╢│
│║ SBE 19 EPROM (Firmware) Version = 3.0 or Greater                  ║│
│║      ┌──────────────────────────────────────────────┐             ║│
│║ Communi│            Communication Set Up =           │             ║│
│║      │                                              │             ║│
│║ Data Up│ Serial Port =           COM1                │             ║│
│║      │                                              │             ║│
│║ Header │ Baud Rate =             300                 │             ║│
│║      │                                              │             ║│
│║ Header │ Data Upload Baud Rate = 9600                │             ║│
│║      │                                              │             ║│
│║      │ Data Bits =             8 Data Bits          │             ║│
│║      │                                              │             ║│
│║      │ Parity =                No Parity            │             ║│
│║      └──────────────────────────────────────────────┘             ║│
│║                                                                   ║│
│╚═══════════════════════════════════════════════════════════════════╝│
└─────────────────────────────────────────────────────────────────────┘
        <F1> Help;  <Esc> Exit;  <Enter> Modify the field
```

SBE 16 and SBE 21:
    Standard instruments are set to 7 data bits, even parity

    Firmware Versions Less than 4.0:
        baud rate = 9600
        upload baud rate = 9600

    Firmware Versions 4.0 or greater:
        baud rate = 600
        upload baud rate is programmable to 600, 1200, 9600, 19200, or 38400

        use slower upload baud rates with slow computers and long cables.
        use 38400 baud with short cables and 386, or 486 based PCs.

Protocol:
select RS-232, full duplex for standard intruments.
select RS-485 if your instrument has been customized with a RS-485 interface. Selecting RS-485 protocol disables XON/XOFF handshaking.

SBE 17:

Firmware Versions Less than 2.0:
7 data bits, even parity
baud rate = 9600
upload baud rate = 9600

Firmware Versions 2.0 or greater:
8 data bits, even parity
baud rate = 9600
upload baud rate is programmable to 600, 1200, 9600, 19200, or 38400

use slower upload baud rates with slow computers and long cables.
use 38400 baud with short cables and 386, or 486 based PCs.

SBE 19 and SBE 25:

Standard instruments are set to 7 data bits, even parity

Firmware Versions Less than 3.0:
baud rate = 9600
upload baud rate = 9600

Firmware Versions 3.0 or greater:
baud rate = 600
upload baud rate is programmable to 600, 1200, 9600, 19200, or 38400

use slower upload baud rates with slow computers and long cables.
use 38400 baud with short cables and 386, or 486 based PCs.

SBE 37:

No choices for Firmware Version.

Standard instruments are set to 9600 baud, 8 data bits, no parity, and RS-232 full duplex.

No choices for Upload Baud Rate.

9.1.3 DATA UPLOAD SET UP FORM

```
SBE 19 Terminal Program  4.0          Thursday  January 16, 1992  4:51 pm

                         TERM19 Set Up Parameters

                     Data Upload Set Up Parameters =

  Upload =                               Upload One Cast

  Echo During Upload =                   Display One '.' Every 16th...

  Output HEX Data File Path =            C:\CTDDATA\

  Upload File Name Choice =              Prompt for File Name

  Default Upload File Name [.HEX] =      upld

  Upload Session Number [0-99] =         3
```

The Upload choices are:

Upload All Data Separated by Casts:
    All data will be uploaded. A separate file will be written for each cast. (Not available in TERM1621)

Upload Data By Cast Number Range:
    The user will be prompted for the beginning and ending cast numbers. A separate file will be written for each cast. (Not available in TERM1621)

Upload One Cast:
    The user will be prompted for the cast number range. One file will be written. (Not available in TERM1621)

Upload All Data as One File:
    The terminal program will send the 'DD' (dump data) command rather than the 'DC' dump cast command to the instrument. Standard upload for SBE 16 and SBE 21. For diagnostic use only with SBE 17, SBE 19, and SBE 25. One file will be written.

Upload Data By Scan Number Range:
    The terminal program will prompt the user for the beginning and ending scan number and then send the 'DD' (dump data) command to the instrument. For diagnostic use only. One file will be written.

The Echo Choices are:

Echo Data During Upload:
    The HEX data from the instrument is displayed on the screen as it is received

Display One '.' Every 16th scan during Upload:
    Will shorten the time required to upload the data.

Output HEX Data File Path =
    Enter the path where you wish the uploaded HEX file to be written.

If one cast is uploaded at a time the upload file name can be up to 8 characters long. TERM19 will add a .HEX extension to the name.

If multiple casts are uploaded ('Upload All Data Separated by Casts' is selected in the set up form) then the filename can be up to 6 characters long. Term 19 will add 2 characters signifying the cast number to the name and add a .HEX extension to the name.

If the upload file name choice is 'Use Default File Name' then the uploaded file name is:

NNNNXXYY.HEX where

NNNN is the default upload file name (one to four characters)
XX is the upload session number
YY is the cast number

Header:
Include Default Header in Upload File:
The default header form is included in the upload file. The user is not prompted to add any information.
Prompt For Header Information:
Each time a cast is uploaded the user will be prompted to fill out the header form
Don't Include Header in Upload File:
Header information is not included in the upload file

Upload File Name Choice =

Use Default File Name:
The user is not prompted for the file name. The upload session number and cast number are added to the default file name to form the actual file name.

Prompt for File Name:
The user is prompted for the file name.

Default Upload File Name [.HEX] =
If the upload file name choice is 'Use Default File Name' then this default file name is used along with the upload session number and the cast number to form the complete upload file. The maximum length for the default file name is 4 characters. The file name extension need not be entered.

Upload Session Number [0 - 99] =
The upload session number is incremented each time data is uploaded (Function Key 9). It is reset by setting this field to 0.

Header Form:

The header form is customized by editing this form. The entries are free form and 0 to 12 lines may be entered. If header = 'Prompt for Header Information' this form will be displayed for the user to fill in. If header = 'Include Default Header', only this form will be included in the upload file.

SBE 37:

Upload choice is always Upload Data By Scan Number Range.

Upload File Name Choice is always Prompt for File Name.

9.1.4 TERMINAL PROGRAM: FIELD OPERATION

The following description for TERM19 applies to the other terminal programs:

Connect the instrument to the computer's serial port. Run TERM19 (the file TERM19.CFG created during setup should be in the current directory). Press F6 to establish communications with the SBE 19 (…communications established… will be displayed when this occurs and the S> will show on the screen indicating that the SBE 19 is ready to accept commands). If communications are not established press F2 and select Communication Set Up. Verify that the serial port, baud rate, data bits, and parity are correct for your configuration.

To upload data, press Function Key F9. The prompts that you see will be determined by the current setup read from TERM19.CFG. TERM19 will automatically obtain status and header information from the SBE 19 and then proceed to transfer the data to the upload file(s). When the upload is complete, the screen will display the message 'Data Upload is Complete, Press <ESC> to continue'. Press <ESC> to continue. If you wish to reset the memory pointers to initialize logging press Function Key 8. In addition to resetting the pointers TERM19 will put the SBE 19 in quiescent mode and then return to DOS.

9.2 TERM11

If your SBE 11 deck unit has firmware version 2.0 or greater (the front panel LED display counts up from 0 on power up), connect the SBE 11 RS232 serial data port to COMM port 1 on your computer. Run TERM11 and press the reset button on the SBE 11. A summary of the deck unit configuration will be displayed. Press Function key 10 to return to DOS.

default baud rate = 9600:   SEASOFT Versions less than 4.005
default baud rate = 19200:   SEASOFT versions 4.005 and greater

TERM11: COMMAND LINE PARAMETERS:

    -bN set the baud rate to N
    -PM set the COMM port to M

Example:

    term11 -b9600 -p2

    starts TERM11 at 9600 baud with COMM port 2

9.3 TMODEM

If you have an SBE 911plus CTD system this program will allow you to test firing water bottles without having to run SEASAVE. Connect the SBE11 RS232 modem serial port to COM port 1 on your computer. Connect the GO 1015 to the top of the SBE 9 underwater unit and connect the SBE 9 to the SBE 11 deck unit. Power on the SBE 11 deck unit and run TMODEM. Press Function Ctrl-F9 to enable the rosette. After 15 seconds you should see the message "#ENABLED" displayed. Press Ctrl-F3 to trip a bottle. The bottle should trip immediately and the message "#CONFIRM" will be displayed. If Function Key Ctrl-F3 is pressed when the rosette is not enabled the control circuit in the SBE 9 underwater unit will enable the rosette and trip the bottle 15 seconds later.

10.0 PROCESSING DATA ACQUIRED WITH PREVIOUS VERSIONS OF SEASOFT

SEASOFT Version 4.0 can read .DAT files created with previous versions of SEASOFT. Run the program CFGTOCON to convert SEASOFT V 3.2 - V 3.5 configuration files to the SEASOFT V 4.0 format. Run SEACON V 4.0 to verify the instrument configuration and calibration coefficients.

11.0 SEASOFT.CON FORMAT

```
Line    Contents

1     conductivity sensor serial number
2     conductivity M, A, B, C, D, PCOR
3     conductivity cell_const, series_r, slope, offset, use GHIJ coefficients?
4     temperature sensor serial number
5     temperature F0, A, B, C, D, slope, offset, use GHIJ coefficients?
6     secondary conductivity sensor serial number
7     secondary conductivity M, A, B, C, D, PCOR
8     secondary conductivity cell_const, series_r, slope, offset, use GHIJ coefficients?
9     secondary temperature sensor serial number
10    secondary temperature F0, A, B, C, D, slope, offset, use GHIJ coefficients?
11    pressure sensor serial number
12    pressure T1, T2, T3, T4, T5
13    pressure C1, C2, C3, C4
14    pressure D1, D2, slope, offset, pressure sensor type, AD590_M, AD590_B
15    oxygen sensor serial number
16    oxygen M, B, K, C, SOC, TCOR
17    oxygen WT, PCOR, TAU, BOC
18    pH sensor serial number
19    pH M, B, VREF
20    PAR light sensor serial number
21    PAR cal const, multiplier, M, B, surface_cc, surface_r, offset
22    transmissometer sensor serial number
23    transmissometer A, B, path length
24    fluorometer sea tech sensor serial number
25    fluorometer sea tech scale factor, offset
26    tilt sensor serial number
27    tilt XM, XB, YM, YB
28    ORP sensor serial number
29    ORP M, B, offset
30    OBS sensor serial number
31    OBS gain, offset
32    ALT scale, alt_set, alt_hyst, alt min pressure, alt hysteresis
33    microstructure temperature sensor serial number
34    microstructure temperature pre_m, pre_b
35    microstructure temperature num, denom, A0, A1, A3
36    microstructure conductivity sensor serial number
37    microstructure conductivity A0, A1, A2
38    microstructure conductivity M, B, R
39    number of external frequencies, number of bytes, number of voltages, instrument type, computer interface, scan
      rate, interval, store system time?
40    data format channels 0 - 9
41    data format channels 10 - 19
42    data format channels 20 - 39
43    sbe16: use water temperature?, fixed pressure, fixed pressure temperature
44    firmware version
45    sbe911plus: number of frequencies from sbe9, number of frequencies to be suppressed, number of voltages to be
      suppressed, voltage range, add surface PAR voltage?, NMEA interface installed?, include IOW sensors?
46    IFREMER nephelometer sensor serial number
47    IFREMER nephelometer VM0, VD0, D0, K
48    Chelsea nephelometer sensor serial number
49    Chelsea nephelometer clear water voltage, scale factor
50    ZAPS sensor serial number
51    ZAPS m, b
52.   calibration date for conductivity sensor
53.   calibration date for temperature sensor
54.   calibration date for secondary conductivity sensor
55.   calibration date for secondary temperature sensor
56.   calibration date for pressure sensor
57.   calibration date for oxygen sensor
58.   calibration date for pH sensor
59.   calibration date for PAR light sensor
60.   calibration date for transmissometer sensor
61.   calibration date for fluorometer sensor
```

62. calibration date for tilt sensor
63. calibration date for ORP sensor
64. calibration date for OBS sensor
65. calibration date for microstructure temperature sensor
66. calibration date for microstructure conductivity sensor
67. calibration date for IFREMER nephelometer sensor
68. calibration date for Chelsea nephelometer sensor
69. calibration date for ZAPS sensor
70. secondary oxygen sensor serial number
71. calibration date for secondary oxygen sensor
72. secondary oxygen M, B, K, C, SOC, TCOR
73. secondary oxygen WT, PCOR, TAU, BOC
74. userpoly1 sensor serial number
75. calibration date for userpoly1 sensor
76. userpoly1 A0, A1, A2, A3
77. userpoly2 sensor serial number
78. calibration date for userpoly2 sensor
79. userpoly2 A0, A1, A2, A3
80. userpoly3 sensor serial number
81. calibration date for userpoly3 sensor
82. userpoly3 A0, A1, A2, A3
83. Dr. Haardt Chlorophyll sensor serial number
84. calibration date for Dr. Haardt Chlorophyll sensor
85. Dr. Haardt Chlorophyll A0, A1, B0, B1, modulo bit, gain range switching
86. Dr. Haardt Phycoerythrin sensor serial number
87. calibration date for Dr. Haardt Phycoerythrin sensor
88. Dr. Haardt Phycoerythrin A0, A1, B0, B1, modulo bit, gain range switching
89. Dr. Haardt Turbidity sensor serial number
90. calibration date for Dr. Haardt Turbidity sensor
91. Dr. Haardt Turbidity A0, A1, B0, B1, modulo bit, gain range switching
92. IOW oxygen sensor serial number
93. calibration date for IOW oxygen sensor
94. IOW oxygen A0, A1, A2, A3, B0, B1
95. IOW sound velocity sensor serial number
96. calibration date for IOW sound velocity sensor
97. IOW sound velocity A0, A1, A2
98. biospherical natural fluorometer sensor serial number
99. calibration date for biospherical natural fluorometer sensor
100. biospherical natural fluorometer Cfn, A1, A2, B
101. sea tech ls6000 sensor serial number
102. calibration date for sea tech ls6000 sensor
103. sea tech ls6000 gain, slope, offset
104. fluorometer chelsea sensor serial number
105. calibration date for fluorometer chelsea sensor
106. fluorometer chelsea scale factor, slope, offset, Vacetone, VB (static), V1ug/l
107. fluorometer turner sensor serial number
108. calibration date for fluorometer turner sensor
109. fluorometer turner scale factor, offset, fluorometer turner-10au full scale concentration, full scale voltage, zero point concentration
110. conductivity G, H, I, J, TC, PC
111. temperature F1, G, H, I, J
112. secondary conductivity G, H, I, J, TC, PC
113. secondary temperature F1, G, H, I, J
114. WET Labs beam transmission sensor serial number.
115. calibration date for WET Labs beam transmission sensor.
116. WET Labs beam transmission Ch2o, Vh2o, Vdark, x, chlorophyll absorption Kv, Vh2o, a*.
117. WET Labs WETStar fluorometer sensor serial number.
118. calibration date for WET Labs WETStar fluorometer sensor.
119. WET Labs WETStar Vblank, scale factor.
120. calibration date for primary conductivity sensor using g, h, i, j coefficients.
121. calibration date for primary temperature sensor using g, h, i, j coefficients.
122. calibration date for secondary conductivity sensor using g, h, i, j coefficients.
123. calibration date for secondary temperature sensor using g, h, i, j coefficients.
124. FGP pressure sensor #0 serial number
125. calibration date for FGP pressure sensor #0
126. FGP pressure sensor #0 scale factor, offset
127. FGP pressure sensor #1 serial number
128. calibration date for FGP pressure sensor #1
129. FGP pressure sensor #1 scale factor, offset

130. FGP pressure sensor #2 serial number
131. calibration date for FGP pressure sensor #2
132. FGP pressure sensor #2 scale factor, offset
133. FGP pressure sensor #3 serial number
134. calibration date for FGP pressure sensor #3
135. FGP pressure sensor #3 scale factor, offset
136. FGP pressure sensor #4 serial number
137. calibration date for FGP pressure sensor #4
138. FGP pressure sensor #4 scale factor, offset
139. FGP pressure sensor #5 serial number
140. calibration date for FGP pressure sensor #5
141. FGP pressure sensor #5 scale factor, offset
142. FGP pressure sensor #6 serial number
143. calibration date for FGP pressure sensor #6
144. FGP pressure sensor #6 scale factor, offset
145. FGP pressure sensor #7 serial number
146. calibration date for FGP pressure sensor #7
147. FGP pressure sensor #7 scale factor, offset
148. seapoint tubidity meter sensor serial number
149. calibration date for seapoint tubidity meter sensor
150. primary seapoint tubidity meter gain, scale
151. secondary seapoint tubidity meter sensor serial number
152. calibration date for secondary seapoint tubidity meter sensor
153. secondary seapoint tubidity meter gain, scale
154. Dr. Haardt Yellow Substance sensor serial number
155. calibration date for Dr. Haardt Yellow Substance sensor
156. Dr. Haardt Yellow Substance A0, A1, B0, B1, modulo bit, gain range switching
157. Chelsea Minitraka serial number
158. Chelsea Minitraka calibration date
159. Chelsea Minitraka vacetoneBlank, vacetone100, offset
160. Seapoint fluorometer serial number
161. Seapoint fluorometer calibration date
162. Seapoint fluorometer gain, offset
163. Sea-Bird Oxygen, primary, serial number
164. Sea-Bird Oxygen, primary, calibration date
165. Sea-Bird Oxygen, primary, Soc, Tcor, offset
166. Sea-Bird Oxygen, primary, Pcor, Tau, Boc
167. Sea-Bird Oxygen, secondary, serial number
168. Sea-Bird Oxygen, secondary, calibration date
169. Sea-Bird Oxygen, secondary, Soc, Tcor, offset
170. Sea-Bird Oxygen, secondary, Pcor, Tau, Boc
171. LS6000, secondary, serial number
172. LS6000, secondary, calibration date
173. LS6000, secondary, gain, slope, offset
174. Transmissometer, secondary, serial number
175. Transmissometer, secondary, calibration date
176. Transmissometer, secondary, A, B, path length
177. Altimeter, serial number
178. Altimeter, calibration date
179. Wet Labs AC3, serial number
180. Wet Labs AC3, calibration date
181. Surface PAR, serial number
182. Surface PAR, calibration date
183. Temperature, SeacatPlus, serial number
184. Temperature, SeacatPlus, calibration date
185. Temperature, SeacatPlus, A0, A1, A2, A3, slope, offset
186. Configuration SeacatPlus, serial sensor type, scans to average, mode
187. Pressure, strain with span TC, serial number
188. Pressure, strain with span TC, calibration date
189. Pressure, strain with span TC, ptempA0, ptempA1, ptempA2, pTCA0, pTCA1, pTCA2
190. Pressure, strain with span TC, pTCB0, pTCB1, pTCB2, pA0, pA1, pA2, offset
191. Temperature, SBE 38, serial number
192. Temperature, SBE 38, calibration date
193. Fluorometer, SCUFA, serial number
194. Fluorometer, SCUFA, calibration date
195. Fluorometer, SCUFA, scale factor, offset, units, mx, my, b
196. OBS, SCUFA, serial number
197. OBS, SCUFA, calibration date
198. OBS, SCUFA, scale factor, offset
199. Fluorometer, WET Labs ECO-AFL, serial number
200. Fluorometer, WET Labs ECO-AFL, calibration date
201. Fluorometer, WET Labs ECO-AFL, vblank, scale factor

12.0 REVISION NOTES

SEASOFT V 4.0 brief revision notes:

A more complete description of SEASOFT revisions can be found in the file VERSIONS.DOC.

<u>Ver</u>   <u>Problems fixed / Features added / Notes</u>

4.002   14 March 1992
       first general release

4.003   23 March 1992
       header serial no. mismatch problem for old SBE 19 HEX data
       batch processing quit after 9 files, and other problems with -a option
       no min/max values for remote display
       add -f option to suppress flag column in ASCIIOUT

4.004   27 March 1992
       Add IFREMER fluorometer
       modify command line options -b, -bx, -px
       change output format for PAR, SPAR, CPAR to exponential

4.005   4 May 1992
       ASCII format badflags were written as 0.00 not -9.99e-29!
       fix English units bug (values were converted twice)
       modify command line options
       change binavg logic: block average time, add surface bin
       set sample interval for SBE 16 correctly
       DATCNV: add salt water depth and number of scans to skip over
       SPLIT: add downcast only, more choices on output filenames
       add -l command line option to plot fluorescence on a linear scale

4.006   13 May 1992
       modify SEAPLOT logic
       add SBE 911e, delete 9/17 from instrument list
       terminal programs send Ctrl-Z when HOME key is pressed
       increase string lengths so programs do not hang with long path names
       modulo value was incorrect when the first two values are connected

4.007   21 May 1992
       add Altimeter to sensor list for all instruments, check for english units
       preserve time block when skipping bad scans with time or seconds bins

4.008   15 June 1992
         fix pH equation
         fix SEASAVE batch mode
         fix ALIGNCTD -2 option (align secondary sensors)
         add support for SBE 17plus
         SEAPLOT: add option to send pen plotter output to file
         DERIVE: add input variable list subform

4.009   18 June 1992
         bug fix: modify all modules to handle 30 output variables

4.010   19 June 1992
         check for minimum velocity = 0 in loopedit
         add -o<outFileName> in SEASAVE for batch mode operation
         add F2/F4 control function in SEASAVE

4.011   9 July 1992
         CELLTM: add support for secondary sensors
         Do not print scan number in 10.2e format when it is > 100,000
         SBE31: support 36 words, add t1-t0, dT/dt to SEASAVE
         fix BINAVG and DERIVE so files are not processed twice when using the -a option

4.012   20 July 1992
         fix error in computing oxygen when units are ENGLISH
         fluorometer data in ASCII .CNV files was 12 characters, SEASOFT modules expect 11 characters.
         negative exponentials in ASCII .CNV files were stored in 12 characters, not 11.
         data in columns following a column with 12 characters is processed incorrectly.
         (the above 12 character column with exponentials bug occurs in SEASOFT V 4.005 - 4.011)

4.013   28 July 1992
         fix minor errors when plotting multiple pages
         terminate plotting correctly when Esc is pressed
         increase the number of significant digits for temperature coefficient f0 to 3

4.014   7 August 1992
         add Chelsea nephelometer and ZAPS sensors
         increase the number of significant digits for computed conductivity
         add a target value for the surface bin in BINAVG

4.015   13 August 1992
         DATCNV: fix bug with -ax option (was not processing all files)
         fig compiler bug: some computers hang when entering floating point numbers

4.016   25 September 1992

switch to Microsoft C/C++ V 7.00 compiler and RTLink linker.

use run time libraries to reduce executable code size.

use overlays in SEASAVE and SEAPLOT to reduce memory requirements.

add OXSAT to variable list.

SEASAVE, DATCNV: correctly initialize arrays for computation of doc/dt and dz/dt.

DATCNV: latitude (used in depth computation) was not stored in datcnv.cfg and was reset to 0.0 degrees each time DATCNV was run.

SEAPLOT: fix -i command line option; did not recognize scans marked bad in binary .CNV files

4.017   8 October 1992

modify deck unit error messages, prevent SEASAVE from hanging if the deck unit is powered off.

display double precision exponents with two digits.

pressing the Enter key will highlight the next field in the form.

add optional grid lines or dots to plotted output.

SEACON in (SEASOFT V 4.016 only) stored the wrong number of bytes per scan in the .CON file.

DERIVE did not compute density if temperature but not conductivity was not in the .CNV file

the system upload time is written in 24 hour format.

SEACON prompts for the no. of frequency channels rather than the no. of voltage channels.

improve obtaining the start time from data files.

4.018   15 October 1992

DATCNV: was setting doc/dt to 0 if oxygen units were ml/l.

SEAPLOT: add command line option to suppress plotter initialization.

SBE17: error reading HEX files from SBE17s with firmware versions >= 2.0

DERIVE: change dynamic height anomaly to geopotential anomaly, add dynamic meters.

4.019   11 December 1992

ASCIIIN: new module.

CONTOUR: new module.

SEACALC: new module.

SEAPLOT: add overlay and waterfall plots, and density contours.

ASCIIOUT: -o command line option did not work properly.

ALIGNCTD: modify so that the input and output files have the same number of scans. Values from beyond the beginning or end of the file are set to badValues.

DATCNV: add scan number to .ROS file if it is not included in the list of selected variables.

add julian days to time options

scans were not skipped over if the instrument type is SBE 19

Paros temperature was calculated incorrectly for SBE 19s with firmware versions < 3.0.

SEASAVE: time derivatives were not correct when skipping scans between computations.

add -v2 variable "plume anomaly" for UW/APL

4.020   25 January 1993
        upgrade linker to RTLinkPlus V 5.2
        BUOYANCY: new module
        WFILTER: new module
        DATCNV, DERIVE: add in-situ density to computed density choices
        ROSSUM: bug fix, first scan in each bin was not included the calculations
        BINAVG: fix -vd<num> command line option bug
        SEASAVE: add number of voltage words to .DAT header
            add altimeter height option to SBE 14 remote display
            improve getting start time from archived files
            only one scan was written to .MRK file (problem started with V 4.016)
        SEAPLOT: PAR was displayed on linear scale (problem started with 4.006)
        SEACALC: gravity computation included density distribution pressure term,
            value was correct for 0 pressure

4.021   4 February 1993
        enclose all units in [] to conform with conventions
        SEACON: add support for surface PAR to SBE 911plus
            add support for SBE 21 NMEA (LAT / LON) input
        BINAVG: add -c command line option to specify first bin's center value
        ASCIIOUT: add option to add labels to the top of each output page

4.022   23 February 1993
        fix bug with SBE 21 and SBE 16 and odd # of external voltages recorded
        SEASAVE: hung while processing old SBE 17 data files
        CELLTM: add -s and -2 command line options
            bug fix: some PCs gave float overflow when CELLTM is run after ALIGNCTD

4.023   17 March 1993
        ALL: fix bug with foreign country codes. A period is now used as the
            decimal separator for all countries.
        ASCIIOUT: let user select which columns to output, let user add optional first column.
        ASCIIIN: add user defined variable types.

4.024   23 March 1993
        bug: bad flag (created by WILEDIT or LOOPEDIT) was set to 0.00 whenever SEASOFT modules
        write .CNV files with ASCII format; this bug is in version 4.023 only
        ROSSUM: Add setup form and choices for output variables.
        fix SBE 16 data upload problem: two lines in the header were concatenated

4.025   5 May 1993
         DATCNV: add option to select downcast only for output.
         SEACON: add secondary oxygen, user defined sensors (userpoly 0, 1, 2).
         SEASAVE: add support for GO 1016 rosette, add bottle firing sequence to X-Y plot.
         DATCNV: add temperature and conductivity serial number match test.
         DERIVE: get oxygen coefficients from .CON file, add Oxygen [micromoles/kg].
         ASCIIOUT: add command line control of optional first column.
         SEAPLOT: direct plotter output to COM1, COM2, LPT1, or LPT2.
         WFILTER: bug fix, was running out of memory after several input files were processed.

4.026   12 May 1993
         DATCNV: detected an incorrect scan length for SBE 19 HEX data files. This bug is in version
         4.025 only.

4.027   18 June 1993
         SEACON: add support for SBE 11plus NMEA GPS interface.
         SEACON: add support for Dr Haardt fluorometer and turbidity sensor.
         SEACON, SEASAVE, DATCNV: add -v3, -v4, and -v5 custom options.
         ASCIIOUT: add -f, -fx, -ca command line flags.
         DATCNV: did not process downcast only files.
         DATCNV: do not output extra scans for SBE 19 with sample intervals greater than 0.5 seconds.
         DERIVE: hung when run in a directory with .CON files but no .CNV files.

4.028   25 June 1993
         SEACON, SEASAVE, DATCNV: remove -v5 custom option.
         SEASAVE: reduce amount of free RAM required.
         SECTION: add prompt for number of scans to skip from the end of the file.
         FILTER: was reporting incorrect number of output lines.

4.029   29 June 1993
         SEASAVE, DATCNV with -v4 option: report pressure with increased resolution.
         SEASAVE: update only Display-Variable, Status-Variable, and Mark-Variable forms. All other
         display parameters are not modified.

4.030   10 September 1993
         Remove trailing blanks in sensor serial numbers.
         Add automatic NMEA GPS Lat/Lon support for SBE 16, SBE 19, SBE 21, and SBE 25.
         Fix daylight savings time conversion bug.
         SEASAVE, SEAPLOT: use Ctrl-F9 for GRAFPLUS controlled screen dump, change direction of
         Y-axis label.
         ASCIIOUT: add julian time output format options.
         MARKSCAN: new module.
         DATCNV: add water bottle sampling options, add option to use .HDR file as header for .CNV file.
         ROSSUM: add minimum and maximum values as output choices.
         SEAPLOT: allow color choices for overlay and waterfall plots.
         SEASAVE: add new field to allow saving of display parameters without exiting the form. Add
         command line option to display bottle confirmation lines on X-Y plots.

4.031   20 September 1993
ROSSUM: Change maximum number of scans processed per bottle from 120 to 1440, do not overwrite arrays if more than 1440 scans per bottle are found.

4.032   18 October 1993
ALL SEASOFT MODULES: Add command line option -e<cname>. This allows cname to replace the default progName.cfg as the module configuration file. Add command line option -t<tfile>. This allows tfile to replace the default TEMP.CNV used when overwriting a .CNV file.
OXYGEN μmoles / Kg was computed with sigma-θ rather than sigma-θ + 1000.
SEASAVE: Add support for SBE Carousel water sampler. Add Depth to remote display. Fix bug in Turner Fluorometer computation. If incoming scans are shorter than expected SEASAVE will display an error message and quit data acquisition.
SEACON: Add coefficient T4 to Paroscientific Digiquartz pressure sensor form.
WFILTER: Fix filter type subform bug.
SBE 21: bug fix, did not correctly calculate external voltages when using a remote temperature sensor.

4.033   9 November 1993
OXYGEN: add doc/dt to variable list.
DATCNV: fix bug when creating .ROS file and .CNV file has 7 or 8 output variables.
SEASAVE: speed up SBE 11plus RS-232 programming, left justify status line variables.
    allow GPS messages that do not have time strings.

4.034   22 November 1993
CFGTOCON: fix conversion error when pressure type is strain gauge and instrument type is not SBE 19.
All modules: update time when not in graphical display.
DATCNV: did not output data when SBE 19 HEX data has only one set of references.
    did not run with -a and -ax command line option when outputting .ROS files.
SEASAVE: SBE11plus did not always start logging when using RS-232 (this problem only occurs in V4.033).
SEAPLOT: add new field in the main form to save the plot parameters while editing the form.

4.035   10 December 1993
DATCNV, DERIVE, ROSSUM: add -s command line option to use FILENAME.CON when using -a or -ax command line options.
ASCIIIN: fix bug that allowed program to occasionally fail after selecting several different files.
ROSSUM: fix bug that allowed out-of-memory error.
ASCIIIN, ASCIIOUT, FILTER, SEAPLOT, STRIP, WFILTER, WILDEDIT: Modify so when the input-path changes the input-variable subform will update accordingly.
SEASAVE: add command line option -b<marklinetype><marklinecolor> for bottle firing.
mark line's type and color.

NOTE: SEASOFT version numbers jump from 4.0 to 4.2. This is to prevent confusion with SEASOFT for WAVES which is at version 4.1.

4.200   28 January 1994
        SEASAVE, DATCNV: Temperature can be computed using IPTS-68 or ITS-90
            add modulo error count to variable list
            add Biospherical natural fluorometer to sensor list
        SEASAVE: Add LPT1 and LPT2 to ASCII output ports. Allow user to specify the number of seconds between status line updates, seconds between remote display updates, and number of seconds between ASCII output updates. Add selection of bottle fire mark line type, color, and label.
        ROSSUM: Modify algorithms so the module does not run out of memory.
        DATCNV, ROSSUM: choices for pri temperature/secondary cond were not displayed correctly on the selection forms for salinity and density.
        DATCNV: Add Bottle Log File [.BL] to Source of Scan Range menu. This will be used when SBE 19s or SBE 25s are used with a Carousel water sampler.

4.201   14 February 1994
        fix sqrt DOMAIN error (message was displayed on screen, calculations were correct)
        SEASAVE: fix display of bottle numbers on X-Y plot when displaying archived data.

4.202   4 April 1994
1. BUG FIXES:

    ROSSUM:
      - Cannot derive oxygen's docdt and mm/kg.

2. MODIFICATIONS:

    ALIGNCTD:
      - Take away command line option -2.
    DATCNV, DERIVE, ROSSUM, SEASAVE:
      - Change ratio of mg/l to ml/l from 1.4276 to 1.4291.
    SEAPLOT:
      - Allow the user to enter blank lines in overlay or waterfall files.
    SEASAVE:
      - Rearrange overlays to reduce seasave.exe's RAM requirements by 30k.
    SEASAVE (real-time):
      - Report all the bottle firings and RESET commands to .BL files.
      - Display all the bottle firings on X-Y plot.
      - For instrument type SBE16, 19, 21 and 25 with Carousel, modify COMM port subform
        to let user enter the baud rate between SBE33 and the computer and the baud rate
        between SBE32 and CTD.
      - Change the output option's default from "Overwrite the File" to "Output to a
     Different File" to avoid the input file to be overwritten accidentally.

3. NEW FEATURES:

    All SEASOFT Programs:
     - Add LPT3 to line printer's selections.
     - Add following units choices for conductivity: Siemens/meter, milliSiemens/centimeter, and microSiemens/centimeter.
     - All the user to use either primary or secondary temperature to compute potential-temperature.
    ALIGNCTD:
     - Add new fields into the main setup form to allow the user to align primary and secondary temperature, conductivity, and oxygen independently.
    DATCNV:
     - Store all the configured sensors' serial numbers in the header part of the output .cnv files.
    SEASAVE:
     - Add a field in "ASCII Output Set Up" form to prompt for Minimum Pressure to Enable Altimeter Alarm. Set the altimeter's alarm only when the pressure is greater or equal to the minimum pressure.
    TRANS:
     - Add command line option -a and -ax for batch process.

4.203   28 April 1994
1. BUG FIXES:

SEASAVE:
 - Could not dump screen while sending ASCII data to LPTx.

2. MODIFICATIONS:

DATCNV:
  - If the input .DAT file has a companion .NAV file, add the .NAV file data to the output .CNV file's header.
DATCNV, DERIVE, ROSSUM:
 - Modify the display messages to align input file names and output file names.
LOOPEDIT:
 - Add options for specifying minimum velocity. The options are:
    1. Fixed minimum velocity or
    2. Percent of mean speed. If this option is selected, prompt for the window size for mean speed's calculation and the percentage of the mean speed to be used in the calculation of the minimum velocity.

SEASAVE (realtime):
   - Change overlay structure to reduce required free RAM by 30K bytes.
   - Add more options for storing Lat/Lon information in files. The options are:
      1. Add to header only.
      2. Add to header and append to every scan or
      3. Add to header and append to .NAV file when <Ctrl-N> is pressed. When <Ctrl-N>
         is pressed and this option is selected, write a line to the specified .NAV file
         in the format of time, lat, lon, pressure, and scan number. The time here is
         the NMEA time if available, otherwise, is the system time.
   - Add <Ctrl-P> to Pause|Unpause the Ascii Output if the output device is LPTx.
TRANS:
   - Indicate the input .CNV file's type (binary or ascii) on the main setup form.

3. NEW FEATURES:

All SEASOFT Programs:
   - Add a new sensor Sea Tech LS6000.

DATCNV, DERIVE, SEASAVE:
   - Add a new variable Average Sound Velocity.

4.204   27 June 1994

1. BUG FIXES:

DATCNV:
   - SBE19: the first two converted scans contain incorrect temperature and conductivity values if the first
   two scans in the input data file are reference scans.

ROSSUM:
   - Incorrect time strings in the output .btl files. This was caused by a
   local value declared as an integer rather than a long. Also ROSSUM
   did not skip over "RESET ...." lines in the .btl file.

SEASAVE (realtime):
   - SBE 31: occasionally hung when starting to acquire data. SEASAVE was sending
   XOFF at the wrong time.

2. MODIFICATIONS:

ALIGNCTD:
   - Regroup the form fields in the setup form.

DATCNV:
   - Display error messages for SBE19 when DATCNV cannot find reference scan pairs
   in input data files.

DATCNV, SEASAVE:
   - Allow pressure frequency for "paros without TC" (in addition to "paros with TC") to
   have four bytes for instrument SBE16 when a command line option -v4 is specified.

LOOPEDIT:
   - Add "Total Number of Bad Scans So Far = " to the display messages.

TERMINAL Programs:
   - Change drives to directory paths for all the input and output files.

3. NEW FEATURES:

SEASOFT All Programs:
   - SBE31: Add support for NMEA interface.

SEACON:
   - Add sensor types IFREMER and NEPHELOMETER to SBE19 and SBE25.

SEASAVE:
   - Add "table driven" to the bottle firing choices.

4.205   1 August 1994

1. BUG FIXES:

SEASOFT Modules:
   - dz/dt and acceleration were computed incorrectly when English units were chosen.

SEASAVE:
   - SBE 31s with old microprocessor boards were being programmed to transmit four bytes per word.

TERMINAL programs:
   - fix directory path bug. Bug is in V4204 only.

2. MODIFICATIONS:

SEASOFT Modules:
   - modify display of units (all modules display values with consistent SI units).

SEASAVE:
   - improve reporting of GPIB error messages.

3. NEW FEATURES:

ROSSUM:
   - Allow bottle serial numbers to be added to .BTL files.

SEACALC:
   - Add AutoSal calculations
   - Add screen to display units

SEASAVE:
   - Add 19200 and 38400 baud rate choices to serial data ASCII output.

TERMAFM:
   - New module to support SBE 90208 Carousel Auto Fire Module.

4.206   21 September 1994

1. BUG FIXES:

TERMAFM:
   - The Min-Pressure and Pressure-Window-Size etc. were not set correctly when the AFM if the AFM is set to Stationary Mode.

TERM25:
   - Hung when uploading all data as one file or by scan number range when the upload baud rate differed from the communication baud rate.

2. MODIFICATIONS:

SEASAVE:
   - Change one of the choices for the Printer Control Selection from "Others (GRAFPLUS Control)" to "Others (DOS GRAPHICS or other memory resident printer drivers)".

SEAPLOT:
   - Change overlay structure to reduce the memory requirements by about 40k.

3. NEW FEATURES:

SEACON, SEASAVE:
   - Add an new type of sensor - Bottom Contact Switch for instrument types SBE19 and SBE25.

4.207   2 November 1994

1. BUG FIXES:

BUOYANCY:
   - A floating point error occured sometimes when <Esc> was pressed before starting the main process.

DATCNV:
   - If a .BL file is selected to get scan range information for bottle firing, and the .BL file contains "RESET" lines, the Number of Bottle Fired in both output .CNV and .ROS files is incorrect.

SEAPLOT:
   - SEAPLOT may get confused when plotting several one-page plots in a batch mode and "Print When Reach Bottom of Plot or End of Data Set" is selected.
   - When plotting more than 7 plots in a batch job on some plotters, a data overflow on the plotter might occur. Use the new option -p<pauseTime> (see details in the following NEW FEATURES section).

SEASAVE:
   - The input file name was not displayed correctly on the screen when processing in batch mode with the file name specified on the command line.

TERMAFM:
   - The pressure offset was computed as psia rather than decibars.

TRANS:
   - Input file type was not updated when a different path was selected.

WFILTER:
   - Scan interval was not updated when a different path was selected.

2. MODIFICATIONS:

All TERMINAL Programs:
   - Terminal programs no longer automatically wake the instrument when the program is run. Press <F6> to wake the instrument up and establish communications. This permits the user to go to the Set Up form before communication with the instrument. This change was made when support for COM3 and COM4 was added since some computers hang when the selected COMM port I/O address is used by another device (such as a network adapter card).
   - When <F6> is pressed, the program uses COMM port selected in the set up form to establish the serial connections, it does not try other COMM ports.

All SEASOFT Programs:
   - Programs will allow the user to go to the setup-form even if the selected input file or .con file do not exist or are invalid.

SEASAVE:
   - Add the data file name (input file name for ARCHIVED display and output file name for REALTIME display) and time to the ASCII optput.
   - Erase DOS error message on XY display after <Esc> is pressed.

3. NEW FEATURES:

All SEASOFT, TERM Programs:
   - Add COM3 and COM4 to the serial port choices.
   - Exit module with error level set to 1 if batch processing is interrupted.

SEAPLOT:
   - Map screen display's colors to plot's colors on HP color printer as close as possible. The color mapping will work on all types of HP printers as long as the printer supports HP-GL/2.

SEAPLOT:
   - Add an new command line option -p<pauseTime>. This indicates to pause pauseTime seconds after sending data to a plotter in a batch mode. If you use -p without specifying the pauseTime, the default 60 seconds pause will be used. This option is useful especially when you have to plot a lot of plots in a batch job.

1. BUG FIXES:

DATCNV, SEASAVE:
  - For SBE17 or SBE17plus if the input file's path in the .hex file's header
    contains the word "SEARAM", the output pressure and pressure-temperature
    values are computed incorrectly. This bug originated in version 4.020.

SEASAVE:
  - In X-Y plots a large positive number was sometimes displayed as
    a large negative number.

TERMAFM:
  - When pressing <F8> to switch from SBE19/25 to AFM or vice versa, the instrument
    would not wake up correctly.

2. MODIFICATIONS:

All SEASOFT Programs:
  - Improve the error handling for when there are no input files in
    the specified directory.

SEACON:
  - SBE 25: Add a field to specify real time data output rate.

SEAPLOT:
  - Eliminate subforms for variables' min and max values. A variable's min and
    max values will be shown above the variable's min or max value field when
    the min or max value field is being edited. This change enables SEAPLOT's
    forms to have the similar look and feel as SEASAVE's.

SEASAVE:
  - Remove the command line option -s since it is no longer useful.

SEASAVE (realtime):
  - Enable the user to go back to the main menu after editing the user-header form.
  - Modify the Auto-Bottle-Fire logic.

3. NEW FEATURES:

ALIGNCTD:
  - Add an new command line option -v<colNumber>,<advSeconds> for more advanced users.
    The option lets the user specify the column number and the number of seconds to
    advance. For example, -v0,-3.5 means to advance the variable values at column #0
    by -3.5 seconds. Note that no spaces are allowed between these parameters. These
    values override the ones originally specified in alignctd.cfg. This option can be
    used more than once.

DATCNV:
   - For each frequency, voltage, pressure channel add a line of descriptions to
     the output .cnv file's header. The line contains channel name, sensor type,
     sensor serial number and calibration date.

DATCNV, SEACON, SEASAVE:
   - Add choices to temperature computation: using a, b, c, d, f0 or using g, h,
     i, j, f0 coefficients. For temperature sensors calibrated before 1/1/95 use
     a, b, c, d, f0 coefficients, and for temperature sensors calibrated during
     and after 1/1/95 use g, h, i, j, f0 coefficients.

   - Add choices to conductivity computation: using a, b, c, d, m or using g, h,
     i, j, tc, pc coefficients. For temperature sensors calibrated before 1/1/95 use
     a, b, c, d, m coefficients, and for temperature sensors calibrated during
     and after 1/1/95 use g, h, i, j, tc, pc coefficients.

Most SEASOFT Programs:
   - Add an new feature: press <Ctrl_F10> to view the input data file's header.
     The input data files, which contain headers, are files with extensions such
     as .dat, .hex, .ros and .cnv.

All SEASOFT Programs:
   - Add support for WET Labs AC-3, A-3, and WET star. Add three new voltage
     channels - chlorophyll absorption, beam transmission, and WET star chlorophyll
     absorption, and add two new variables - WET Labs chlorophyll concentration and beam
     attenuation. Normally the values of chlorophyll absorption, chlorophyll
     concentration are plotted with logarithm axis, but if -l option is used
     (in SEASAVE or SEAPLOT), these values are plotted with linear axis.

4.209   2 February 1995

1. BUG FIXES:

FILTER:
   - fix -t<tempfile> command line option. Temp file was always named TEMP.CNV.

2. MODIFICATIONS:

SEACON:
   - Add field for conductivity pressure coefficient.

TERMINAL PROGRAMS:
   - Add 19200 and 38400 baud rate choices to set up menu.

<u>4.210</u>   <u>23 February 1995</u>

1. BUG FIXES:

TERMAFM:
   - Did read pressure coefficients correctly from .CON files generated with SEASOFT V 4.208 or
   4.209. The use g,h,i,j, coefficients flag caused the line length to exceed the length specified
   in TERMAFM). This bug is in V 4.208 and 4.209 only. Pressure values were not correctly
   converted to pressure numbers when the pressure coefficient A2 was 0.0.

2. MODIFICATIONS:

SEACON:
   - SBE 16 and SBE 19: Do not prompt for AD590M and AD590B when digiquartz with temperature
   compensation is selected as the pressure sensor type.

<u>4.211</u>   <u>14 April 1995</u>

1. BUG FIXES:

ALIGNCTD:
   - An advance time of zero specified on the command line does not override the
   value in the Set-Up Form.

TERMAFM:
   - When uploading data to .afm files, "Receiving Error…" is reported
   when no error is detected.

WFILTER:
   - When running Median filter on some .cnv files which were processed by WildEdit
   and/or AlignCTD and/or LoopEdit, the program sometimes hung.

2. MODIFICATIONS:

All TERM Programs:
   - Enable them to upload cast numbers from 0 to 999 instead of 0 to 99.
   (only 100 casts can be uploaded at one time).

DATCNV, SEASAVE:
   - Add command line option -r<degrees> to specify the suns angle in degrees from vertical
   for surface par or corrected par's computation.
   PAR = PAR * cosine(degrees)

<u>4.212</u>   <u>17 May 1995</u>

1. BUG FIXES:

SEACON:
   When the pressure type is changed from NONE or Strain Gauge to Digiquartz w/ or w/o TC
   or vice versa for SBE16, the number of frequencies in the DataFormat subform was not
   updated accordingly.

2. NEW FEATURES:

SEASAVE, DATCNV, DERIVE, ASCIIIN:
   - Add an new variable - Potential Temperature Anomaly.

SEASAVE, SEAPLOT:
   - Add a new command line option -bc<colorIndex> to let the user select the background
     color for MultiXY plot. The color index range is [0, 14] and the color map is the same
     SEAPLOT batch mode color selection. The default background color is black. If a
     variable has the same color as the background color, the variable's color is changed
     to black. This option was added to support screen dumps to color printers via Windows.

SEASAVE (realtime):
   - Add an new choice to the Store Lat/Lon in Raw Data File menu: "Append to Every Scan and
     Append to .NAV File when <Ctrl_N> is Pressed".

<u>4.213</u>   <u>13 June 1995</u>

1. BUG FIXES:

SEASAVE:
   - When displaying archived data, if the screen is dumped after reaching the
     end of the data set status line values other than pressure, temperature,
     and salinity are incorrect.

   - When acquiring data from an SBE 9/11 with a RS-232 interface if the
     computer was not keeping up with the incoming data SEASAVE was not sending
     XOFF commands correctly to the deck unit causing some characters
     to be dropped. This occurs only if SEASAVE is configured for use with
     a water sampler. One side effect is that non-existing bottle confirmations
     were displayed.

   - If bottles were fired rapidly (less than 3 seconds between bottles) some
     bottle confirmations were not detected by SEASAVE. When firing sequentially,
     if one confirmation was missed subsequent confirmations were not detected.

2. MODIFICATIONS:

SEACON, SEASAVE:
  - Move the "Min Pressure to Enable Altimeter Alarm [db] = " field from
    SEASAVE's ASCII Output Set Up form to SEACON's Altimeter Constants Set Up form.

SEASAVE:

  - Keep Set-Altimeter-Alarm-On commands to the deck unit at least two
    seconds apart.

  - Set Column #0 in the Marked Variable List in the Misc Run Parameters
    form to Scan Number, and make this field fixed (users cannot modify it).
    This insures that scan numbers are always included in .mark files.

4.214   2 August 1995

1. BUG FIXES:

ALIGNCTD:
  - If the total number of scans in the input was less than the window size,
    extra scans with incorrect values were added to the file.

SEASAVE:
  - When the units were changed from Metric to English or vice versa, some of
    variables descriptions for X-Y overlay display were garbled.
  - If Lat/Lon data is added by the NMEA interface, and the display mode is
    not set to X-Y overlay display, the Lat/Lon data stored in .NAV file was
    not updated when <Ctrl-N> was pressed.

SEASOFT:
  - When using the -a command line option to process all files, if one of the
    modules aborts with a partially processed TEMP.CNV file, the partially
    processed TEMP.CNV file caused errors for subsequent processing.

2. MODIFICATIONS:

SEASOFT:
  - Modify the batch processing so that if one of the modules encounters an error
    it will display the error message and wait for the user to press a key to continue.
    Processing resumes with the next file in the file list. Prior to this version
    processing would resume with the next module in the batch file (the remaining files
    in the list were not processed).

3. NEW FEATURES:

DERIVE, SEASAVE:
  - Add DTDT (delta temperature delta time) to DERIVE and add an optional DTDT's
    window size in seconds to the existing command line option -v1,<windowSize>.
    If the window size is not specified, the default window size of 300 seconds
    will be used.

SEACON:
  - Add support for surface PAR data to be appended by the SBE 33 or SBE 36 deck
    unit with NEMA interface (for SBE 19 and SBE 25).

4.215   5 October 1995

1. BUG FIXES:

BINAVG:
  - If the command line option -c is used to set the first bin's center value and
    surface bin is set to yes and the first bin minimum is greater than the surface
    bin maximum then the surface bin maximum was incorrectly reset to the binsize / 2.

DATCNV:
  - For SBE25, if the user chose to obtain Bottle Firing data from .AFM file and
    if the SBE25 internal recording rate and AFM real time rate were not the same,
    DATCNV did not extract correct scans from the .HEX file into the .ROS file.
  - If the AFM real time data rate is 4 or 8 scans per second, DATCNV incorrectly
    displayed a "Scans Don't Match" error, and the scan ranges stored in the .BL file
    were incorrect.

TERM1621, TERM17, TERM19, TERM25:
  - The command line option -f<upldFileName> used to run the batch process for
    uploading data did not work.

2. NEW FEATURES:

SEAPLOT:
  - Add a choice of Scalable Dots to Plot Line Type's choices.

SEASAVE:
  - Add Altimeter Height + Depth and Altimeter Height + Pressure to Remote Display
    Data Type's choices. If either of these choices is chosen, display Altimeter
    Height and Depth or Pressure alternately.

<u>4.216</u>   <u>30 October 1995</u>

1. BUG FIXES:

All SEASOFT Programs:
   - When the input and output filenames are the same and the output
     file is on a different drive than where the SEASOFT module is executing then
     the output file is not created and the TEMP.CNV file is not removed.

2. MODIFICATIONS:

DATCNV:
   - Modify the program so that the selected variable list is retained
     when the input path is changed or a different .con file is selected.

3. NEW FEATURES:

SEACON, SEASAVE:
   - Add "Lat/Lon Data Added by NMEA Interface" option to sbe911's
     setup form.

TERM1621:
   - Add an option in the communication set up form to select either full duplex RS232
     or half duplex RS485.

<u>4.217</u>   <u>26 February 1996</u>

1. BUG FIXES:

DATCNV:
   - A divide by zero runtime math error occures with instrument type SBE19
     when get water bottle data from .afm file is selected.

SEASAVE (realtime):
   - The SBE 11 Deck Unit was programmed to transmit 4 bytes per output word.
     Since SEASAVE expects 3 bytes per word the displayed data is garbage.
     This bug applies only to SBE 11 deck units with firmware versions less than 2.0
     with SEASOFT V 4.202 through 4.216.
     This bug does not affect any SBE 11plus deck units.

2. NEW FEATURES:

All SEASOFT Programs:
   - Add a new voltage output sensor: FGP pressure. Up to eight FGP sensors
     can be used on the CTD at once.
   - Add a new voltage output sensor: Seapoint Turbidity Meter.

SEASAVE (realtime):
  - Add a command line option -u3 to enable control of storing realtime data
    to disk. When -u3 is specified, if bit3 of the middle byte of the modulo
    word is 0 store data, otherwise do not.
  - Add a new variable "Storing Data" to indicate if the current scan is stored
    on to the disk or not.

4.218   26 April 1996

1. BUG FIXES:

DATCNV, SEASAVE:
  - Conductivity and salinity values from wide-range conductivity sensors using
    ghij coefficients were incorrect.

DATCNV, SEASAVE, Terminal Programs:
  - When the user enters words such as "cast" and "hdr" into the user-entered header
    information, the program would get incorrect information from the header part
    of the data file. For instance, the start time for the data set would be wrong.

SEAPLOT:
  - Overlay plots on printer are not using the correct line types (connected
    line or dots).
  - The whole set of data for the overlay display was plotted even when the screen
    display contains partial data set.

2. MODIFICATIONS:

All SEASOFT Programs:
  - Add choices for primary and secondary sensors to Seapoint Turbidity Meter sensor.

4.218A 9 May 1996

1. MODIFICATIONS:

SEASAVE:
  - Add a command line option -fb to enable bottle firing detection for GO 1015 when the
    Firing Bottle Type is set to NONE. This is useful when both serial ports are used
    for other functions and the bottles are fired with the deckunit.

  - Add choices for primary and secondary sensors to Seapoint Turbidity Meter sensor.

<u>4.219</u>   <u>12 July 1996</u>

1. MODIFICATIONS:

DATCNV:
  - When .HEX files have extra blanks at the end of a scan DATCNV would report a
    scan length error and quit processing the file.

DATCNV, SEASAVE:
  - Do not match sensor serial numbers for archived data display for SBE 31.

SEASAVE:
  - If the GPS NMEA message (such as GGA or GLL message) contains only the time
    (hhmmss) but not the month-date information, the time information will still
    be saved in the output file's header as the NMEA UTC time.
   - Retain the user entered header information in the setup form.

2. NEW FEATURES:

SEASAVE:
  - Add a command line option -ss to enable the user to delay saving data to the
    output file. Initially, the realtime data will be displayed on the screen but
    not saved. When the <Ctrl-D> key is pressed data is saved to the output
    file. If X-Y display is selected, the display will be cleared when <Ctrl-D>
    is pressed.
   - Save the entire command line to output file's header.

<u>4.220</u>   <u>3 October 1996</u>

1. BUG FIXES:

CELLTM:
   - The corrected conductivity values were incorrect when the conductivity unit
     were either milli Siemens/cm or micro Siemens/cm.

SEASAVE:
   - Altimeter's alarm did not work for SEASOFT versions 4.213 to 4.219 when using
     the IEEE-488 interface.

2. MODIFICATIONS:

DATCNV:
   - Modify DATCNV's batch process so that it uses the same base file name as the .CNV
     file when getting bottle firing information from .BL files.

SEACON:
  - Modify setup form for temperature and conductivity calibration constants to make it obvious which set of
    calibration coefficients is selected.

3. NEW FEATURES:

ALIGNCTD:
  - Add a new feature to allow user to align WETStar Fluorometer values relative to pressure values.

All SEASOFT Programs:
  - Add a new type of sensor, Dr. Haardt Yellow Substance, and add a new field -
    Gain Range Switch to the Dr. Haardt sensor's setup form. Users can select gain based on Output Voltage
    Level, Modulo Bit, or NONE.

4.221   8 October 1996

1. Bug Fixes:

SEACON, SEASAVE, SEACON:
  - When reading old .CON files, SEASOFT assumed that temperature and conductivity coefficients were
    G,H,I,J instead of A,B,C,D. G,H,I,J coefficients are undefined in old versions of .CON files. This bug is
    only in 4.220.

4.222   21 November 1996

1. Bug Fixes:

BUOYANCY:
  - When processing several files in the same session, the output .CNV file from the first file was correct.
    The subsequent .CNV files were incorrect.

2. MODIFICATIONS:

CELLTM:
  - Remove command line options -s and -2 and reorganize the setup form.

TERMAFM:
  - Bottle positions can be selected in the range of 1 and 36 rather than being limited
    to the total number of bottles.

<u>4.223</u>   <u>20 December 1996</u>

1. MODIFICATIONS:
SEACON:
   - Increase the number of 12 bit A/D channels from 10 to 16 for SBE31.
   - Add voltage range choices into SBE31's setup form.

<u>4.224</u>   <u>10 January 1997</u>

1. NEW FEATURES:

CNV37:
   - New release.

TERM37:
   - New release.

<u>4.225</u>   <u>15 April 1997</u>

1. NEW FEATURES:
   - Add command line option -v6. When this command line option is used, 65536 is added to conductivity
     numbers from an SBE 16 HEX when the recorded number is less than 10000. This is a work around for
     SBE 16 conductivity data that 'wraps' in very high conductivity water.

2. MODIFICATIONS

SEASAVE:
   - Change RS-232 default baud rate to 19200 and default Modem COMM port to COMM 2.

<u>4.226</u>   <u>14 July 1997</u>

1. NEW FEATURES:
   - Add capability for the SBE 11 deck unit to sound an alarm when the CTD pressure is less than a user
supplied limit. This feature is controlled in the ASCII Output Set Up form.

<u>4.227</u>   <u>28 September 1997</u>

1. NEW FEATURES:

DERIVE:
  - Add Specific Conductance to derived variable list.

2. MODIFICATIONS:

TERM37:
  - Improve support for RS-485 and Inductive Modem MicroCats

<u>4.228</u>   <u>8 October 1997</u>

1. NEW FEATURES:

SEASAVE:
  - Add NMEA support to SBE 911E.

2. MODIFICATIONS:

TERM19/TERM25:
  - Remove 'Data Upload is Completed' message between casts when uploading all casts.

<u>4.229</u>   <u>17 November 1997</u>

1. BUG FIX:

TERM26:
  - Was not sending XON/XOFF commands during data upload. This caused slower PCs to have data upload errors when uploading at baud rates of 9600 baud or above. This bug is in versions 4.216 through 4.228.

<u>4.230</u>   <u>8 December 1997</u>

1. MODIFICATIONS:

TERM37:
  - Improve support for inductive modems.

<u>4.231</u>   <u>12 February 1998</u>

1. BUG FIX:

SEASAVE:
  - SBE 19 or SBE 25 with SBE 36 deckunit:
  If configuration was set to add surface PAR without NMEA, SEASAVE would not start data acquisition.
  Corrected surface PAR was not computed correctly for SBE 19 and SBE 25.

<u>4.232</u>   <u>23 February 1998</u>

1. BUG FIX:

SEACON:
  - Sometimes would hang or give invalid help context values. This bug was introdced in version 4.228.

<u>4.233</u>   <u>12 May 1998</u>

1. MODIFICATION:
  - SEASAVE:
  Add command line option -gd to disable DMA transfers with IEEE-488.

2. NEW FEATURES
  - Add support for SBE 39 (TERM39.EXE and CNV39.EXE).

<u>4.234</u>   <u>2 October 1998</u>

1. BUG FIX
  - CNV37 and CNV39:
   Was not computing Julian day correctly

2. MODIFICATION:
  - SEASAVE:
  Add scan length checking to SBE 911plus to catch differences between SPAR settings in deck unit and
  .CON file

3. NEW FEATURES
  - Add PROG11V2.EXE to support Version 2 11plus.
  - Add TERM35.EXE to support Version 2 SBE 35

<u>4.235</u>   <u>24 February 1999</u>

1. BUG FIX
   - SEAPLOT:
   Fix plotting list of files bug

2. MODIFICATION:
   - ALIGNCTD:
   Align Sea-Tech, WetLabs, or Turner Fluorometer

<u>4.236</u>   <u>8 March 1999</u>

1. BUG FIX
   - DATCNV:
   Was not reading start time correctly from SBE 19 header in year 2000.

<u>4.237</u>   <u>8 October 1999</u>

1. NEW FEATURES
   - ASCIIOUT
   Add -rN option to replace badFlag value with N

   - DATCNV
   Increase number of significant digits for OBS, LS6000, Transmission, and voltage

   - SEACON:
   Add option to add system time to stored data for SBE 911plus systems
   Add Chelsea Minitraka and Seapoint fluorometers

   - SEASAVE, DATCNV, DERIVE
   Add density option to potential temperature anomaly calculation

<u>4.238</u>   <u>14 October 1999</u>

1. BUG FIX
   - SEACON
   Entering Data Format selection for SBE 9/11 caused screen to go blank (does not apply for SBE 9/11plus
   or SBE 9/11E).

<u>4.239</u>   <u>2 December 1999</u>

1. BUG FIX

   - DATCNV
   DATCNV displayed #start_time year as 100 for HEX files uploaded with a terminal
   program when the year is 2000.

2. NEW FEATURES

   - SEACON
   Add coefficient T5 to Paroscientific pressure sensor

   - DATCNV
   Add pump status and bottom contact to output variable choices

<u>4.240</u>   <u>14 December 1999</u>

1. MODIFICATIONS
   - Change compiler optimization options. Celltm was hanging on some PCs.

<u>4.241</u>   <u>3 January 2000</u>

1. Bug Fix
   - Seasave
   Linker incompatibility with WIN98 caused Seasave to crash

<u>4.242</u>   <u>1 February 2000</u>

1. Bug Fix
   - Rossum
   Year 2000 was output in the .BTL file as 1969

<u>4.243</u>   <u>15 February 2000</u>

1. BUG FIX
   - SEASAVE Y2K
   Unstable in Real-Time with NMEA and the NMEA string contained 00 for the year
   Unstable in Archived with NMEA and the NMEA string did not contain a date field
   SBE 19, 21, and 25 reported year as 1900 when collecting real-time data with the NMEA opto-box and
   the NMEA data had a year of 00.

   - SBE37 and CNV39
   Julian day was computed as a large negative number if the year rolled over in the .ASC file

<u>4.244</u>   <u>20 March 2000</u>

1. MODIFICATION
   - DATCNV
   Use year from system upload time as start time. Datcnv was using the current PC system time.

1. MODIFICATION
   - .CON file
   Remove trailing blanks from serial numbers.
   - BINAVG
   Save configuration even if no files have been processed.
   - DATCNV
   -s command line option now sets .BSR file name to data file name.
    Datcnv bottle scan range source is not left blank in header.
   -i command line option truncated last 4 characters of output filename if extension was not specified.
   - WILDEDIT
   Add Keep points within distance of mean field.
   -CNV37, CNV39
   Julian days were 1 too many.
   - SEASAVE and DATCNV
   Add support for custom SBE 19 for job 22659.

4.246   29 June 2000

1. BUG FIX
   - SEASAVE, DATCNV
   SBE 21 with remove temperature, remote temperature was not computed correctly. Bug was only in version 4.245.

4.246a   10 July 2000

1. BUG FIX
   - SEASAVE, DATCNV
   Fix time computatin bug with custom SBE 19, job 22659.

4.247   14 December 2000

1. MODIFICATION
   - DATCNV
   Improve .AFM file compare SBE 25 Hex data files.
   - SEASAVE, DATCNV
   Change altimeter from 4 to 2 significant digits.
   Add offset term to PAR calculation.

4.248   13 February 2001

   Add support for Sea-Bird SBE 43 oxygen sensor.
   Modify .CON file format so new sensors supported with WIN32 software are not overwritten.

4.249   23 March 2001

SEASAVE, DATCNV
   SBE 16, start time was read from last header line, not first.
   Julian day on Jan 1 is now 1, it was 0.

13.0 SOFTWARE UPDATES

The current version of SEASOFT is available for downloading in Sea-Bird's anonymous FTP account.

If you are using a WWW browser Open:

   ftp://ftp.seabird.com/pub/seabird

and then select OUT. Set your browser to load files to disk before selecting .DOC, .EXE, or .BAT files.

If you are using the UNIX command line:

action   description

login to internet

ftp ftp.seabird.com	start ftp session
Name: anonymous	login as anonymous
Password: your e-mail address	
ftp > cd /pub/seabird/OUT	go to the SEASOFT area
ftp > dir	you should see 7 (or more) files:
	manual.txt, manual.wp, readme.1st
	sinstall.bat, ss42nnd1.exe
	ss42nnd2.exe, versions.doc
ftp > binary	set to image transfer!
ftp > get sinstall.bat	this gets one file
ftp > mget *.exe	this gets SEASOFT
ftp > mget *.*	this will get all the files
ftp > bye	end ftp session

files in /pub/seabird/OUT:

readme.1st	a description of the files
versions.doc	description of the changes for each version of SEASOFT you may want to read this first before deciding to download a new version
manual.txt	SEASOFT manual DOS text format
manual.wp	SEASOFT manual WordPerfect V 5.1 format
ss42nnd1.exe	first half of SEASOFT
ss42nnd2.exe	second half of SEASOFT
sinstall.bat	SEASOFT installation batch file

SEASOFT installation:

make a directory on your hard disk containing ss42nnd1.exe, ss42nnd2.exe, and sinstall.bat.

run sinstall.bat

14.0 SOFTWARE PROBLEMS

Considerable effort has been made to test and check this software before its release. However because of the wide range of products that Sea-Bird Electronics produces and the many different applications that these products are being used in, there will be software problems that have not been discovered and corrected. If in the use of this software a problem occurs in the configuration of the software for a particular instrument or in the analysis of data please contact the factory with the following information:

1. Your instrument serial number
2. The version of the software that was originally shipped with the unit
3. The version of the software that you are attempting to run
4. A complete description of the problem that you are having

If the problem involves the configuration or set up of the software, in most cases a phone call to the factory will be sufficient to solve the problem. If you phone Sea-Bird we would appreciate it if you would be ready to run the software on a computer during the phone conversation.

For problems that involve the processing of data you may be asked to send a sample of the data to Sea-Bird for evaluation.

If this software was received with a new unit, the instrument configuration was checked at the factory and the software should be set up correctly. If this software is being used with an existing product consult the configuration sheet in the original manual for the instrument type and configuration.

It is intended that Version 4.0 and subsequent versions of the software be run on IBM PC or compatible computer with a HARD DISK.

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