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software ver 4.249, manual ver ss4.249, March 2001
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 911plus 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, written 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 raw 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  ASCIOUT.EXE
BINAVG.EXE  BUOYANCY.EXE  CELDTM.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 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:

<table>
<thead>
<tr>
<th>National Instruments</th>
<th>Board Characteristics</th>
<th>PC 2/2A(old) revC.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board: GPIB0</td>
<td>Primary GPIB Address</td>
<td></td>
</tr>
<tr>
<td>SELECT (use right/left arrow keys)</td>
<td>0 to 30</td>
<td></td>
</tr>
<tr>
<td>Primary GPIB Address</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Secondary GPIB Address</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>Timeout setting</td>
<td>T30s</td>
<td></td>
</tr>
<tr>
<td>EOS byte</td>
<td>00H</td>
<td></td>
</tr>
<tr>
<td>Terminate Read on EOS</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Set EOI with EOS on Write</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Type of compare on EOS</td>
<td>7-bit</td>
<td></td>
</tr>
<tr>
<td>Set EOI w/last byte of Write</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>System Controller</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Enable Auto Serial Polling</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td>2usec</td>
<td></td>
</tr>
</tbody>
</table>

This address is used to compute the talk and listen addresses which identify the board or device on the GPIB. Valid primary addresses range from 0 to 30 (00H to 1EH).

* Adding 32 to the primary address forms the Listen Address (LA).
* Adding 64 to the primary address forms the Talk Address (TA).

EXAMPLE: Selecting a primary address of 10 yields the following:

10 + 32 = 42 (Listen address)
10 + 64 = 74 (Talk address)

Example: CIC Protocol, Handler type, Interrupt setting, Base I/O Address, DMA channel (Arbitration)

<table>
<thead>
<tr>
<th>DMA Jumper Setting</th>
<th>CIC Protocol</th>
<th>Handler type</th>
<th>Interrupt setting</th>
<th>Base I/O Address</th>
<th>DMA channel (Arbitration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 2 2 3 3</td>
<td>no</td>
<td>pc2a</td>
<td>7</td>
<td>0281H</td>
<td>1</td>
</tr>
</tbody>
</table>

Place the jumpers as they are shown

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)
- `span_N = <min, max>` 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
- `span_N = <min, max>` 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 911plus 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 CELLM 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.

CELLM 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 edited 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
6.0 COMMAND LINE INPUT AND OUTPUT FILENAMES

When processing all 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 data 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:

<table>
<thead>
<tr>
<th>ALIGNCTD Set Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data File = 6874.CNV</td>
</tr>
<tr>
<td>Input File [.CNV] Path = J:\SEASOFT\</td>
</tr>
<tr>
<td>Output Data File Path = J:\SEASOFT\</td>
</tr>
<tr>
<td>Advance Primary Sensors Relative to Pressure (seconds)</td>
</tr>
<tr>
<td>Advance Primary Conductivity = -0.01000</td>
</tr>
<tr>
<td>Advance Primary Temperature = 0.000000</td>
</tr>
<tr>
<td>Advance Primary Oxygen = 3.000000</td>
</tr>
<tr>
<td>Advance Secondary Sensors Relative to Pressure (seconds)</td>
</tr>
<tr>
<td>Advance Secondary Conductivity = 0.073000</td>
</tr>
<tr>
<td>Advance Secondary Temperature = 0.0000000</td>
</tr>
<tr>
<td>Advance Secondary Oxygen = 3.0000000</td>
</tr>
</tbody>
</table>

<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.
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
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.

<table>
<thead>
<tr>
<th>ASCIIIN Set Up Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data File = TEST.ASC</td>
</tr>
<tr>
<td>Input Data File Path = C:\SEASOFT\</td>
</tr>
<tr>
<td>Output Data File Path = C:\SEASOFT\</td>
</tr>
<tr>
<td>Input Variables = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Scan Interval Variable = time</td>
</tr>
<tr>
<td>Scan Interval Value [ seconds] = 0.500000</td>
</tr>
<tr>
<td>User Defined Variables Set Up = &lt;Press Enter to Modify&gt;</td>
</tr>
</tbody>
</table>

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:
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 (default badFlag value is -9.99e-29)
- **-t <tname>** Use tname rather than TEMP.CNV for the temporary file.
- **-lx** 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:

#### Bin Average Set Up

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data File</td>
<td>SBE015.CNV</td>
</tr>
<tr>
<td>Input File [.CNV] Path</td>
<td>C:</td>
</tr>
<tr>
<td>Output Data File Path</td>
<td>C:</td>
</tr>
<tr>
<td>Bin Type</td>
<td>Pressure Bins</td>
</tr>
<tr>
<td>Bin Size</td>
<td>2.000000</td>
</tr>
<tr>
<td>Include Number of Scans Per Bin</td>
<td>Yes</td>
</tr>
<tr>
<td>Exclude Scans Marked Bad in BINAVG</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Scans to Skip Over</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Surface Bin Setup Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include Surface Bin</td>
<td>Yes</td>
</tr>
<tr>
<td>Surface Bin Minimum Value</td>
<td>0.300000</td>
</tr>
<tr>
<td>Surface Bin Maximum Value</td>
<td>0.600000</td>
</tr>
</tbody>
</table>
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:

\[ N = \text{scans per bin} \]
\[ N = \text{bin size}; \text{bin type} = \text{scans} \]
\[ N = \text{bin size} / \text{interval}; \text{bin type} = \text{seconds} \]
\[ N = \text{bin size} * 3600 / \text{interval}; \text{bin type} = \text{hours} \]

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:

\[ \text{BinMin} = \text{center value} - \text{binSize} / 2 \]
\[ \text{BinMax} = \text{center value} + \text{binsize} / 2 \]

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:

\[ \text{BinMin} = \text{center value} - \text{binSize} / 2 \]
\[ \text{BinMax} = \text{center value} + \text{binsize} / 2 \]

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:
$P_p = \text{average pressure of the previous bin}$

$X_p = \text{average value of the variable in the previous bin}$

$P_c = \text{average pressure of the current bin}$

$X_c = \text{average value of the variable in the current bin}$

$P_i = \text{target or center value for pressure in the bin}$

$X_i = \text{interpolated value for the variable (value it would have at the center pressure)}$

$$X_i = \left( \frac{(X_c - X_p) \times (P_i - P_p)}{P_c - P_p} \right) + X_p$$

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 $> \text{surface minimum}$ and $\leq \text{surface maximum}$ are added to the surface bin. As soon as a scan is found with a pressure value $> \text{BinMin}$ 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:

$\text{first bin} = 10 \text{ decibars, includes data greater than 5 db and less than or equal to 15 db.}$

$\text{second bin} = 20 \text{ decibars, includes data greater than 15 db and less than or equal to 25 db.}$

$\text{third bin} = 30 \text{ decibars, includes data greater than 25 db and less than or equal to 35 db.}$

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

$\text{first bin} = 5 \text{ decibars, includes data greater than 0 db and less than or equal to 10 db.}$

$\text{second bin} = 15 \text{ decibars, includes data greater than 10 db and less than or equal to 20 db.}$

$\text{third bin} = 25 \text{ decibars, includes data greater than 20 db and less than or equal to 30 db.}$
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

- Align all .CNV files. Display the set up form before processing the data.
-a

-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 # # 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:

\[ N^2 = gE \quad [\text{rad}^2/\text{s}^2] \]

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:
   - \( p_{\text{bar}} \) = average pressure in the window [decibars]
   - \( t_{\text{bar}} \) = average temperature in the window [deg C]
   - \( s_{\text{bar}} \) = average salinity in the window [PSU]
   - \( \rho_{\text{bar}} \) = density\((s_{\text{bar}}, t_{\text{bar}}, p_{\text{bar}})\) [Kg / m\(^3\)]

2. Compute the vertical gradient:
   - \( \theta \) = potential temperature \((s, t, p, p_{\text{bar}})\)
   - \( v = 1 / \text{density}(s, \theta, p_{\text{bar}}) \)

   Use a least squares fit to compute the linear gradient \( dv/dp \) in the window
3. Compute $N^2$, $N$, $E$, and $10^8 E$:

$$N^2 = - 1.0e^4 \rho_{bar}^2 g^2 \frac{\delta v}{\delta p} \quad [rad^2/s^2]$$

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

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

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

The set up form is:

<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

<table>
<thead>
<tr>
<th>Variables to be Derived and Added int</th>
<th>Variable Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable # 0 = stability, E, rad^2/m</td>
<td>stability, E</td>
</tr>
<tr>
<td>Variable # 1 = stability, E, 10^-8 rad^2/m</td>
<td>buoyancy frequency</td>
</tr>
<tr>
<td>Variable # 2 = buoyancy frequency, N^2, rad</td>
<td>none</td>
</tr>
<tr>
<td>Variable # 3 = buoyancy frequency, N, cycle</td>
<td>none</td>
</tr>
</tbody>
</table>

Stability, E Units Type

<table>
<thead>
<tr>
<th>rad^2/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>10^-8 rad^2/m</td>
</tr>
</tbody>
</table>
```

<Enter> Modify the Field; <F10> Conti

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

<table>
<thead>
<tr>
<th>Variables to be Derived and Added int</th>
<th>Variable Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable # 0 = stability, E, rad^2/m</td>
<td>stability, E</td>
</tr>
<tr>
<td>Variable # 1 = stability, E, 10^-8 rad^2/m</td>
<td>buoyancy frequency</td>
</tr>
<tr>
<td>Variable # 2 = buoyancy frequency, N^2, rad</td>
<td>none</td>
</tr>
<tr>
<td>Variable # 3 = buoyancy frequency, N, cycle</td>
<td>none</td>
</tr>
</tbody>
</table>

Buoyancy Frequency Units Type

<table>
<thead>
<tr>
<th>N^2, rad^2/s^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N, cycles/hour</td>
</tr>
</tbody>
</table>
```

<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.
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:

```
CELTM 4.0

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 911plus 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:

\[
\text{alpha} = 0.04 \\
1/\text{beta} = 8.0
\]

The algorithm used is:

\[
\begin{align*}
\text{dt} &= \text{temperature} - \text{previous temperature} \\
\text{ctm} &= -1.0 * \text{b} * \text{previous ctm} + \text{a} * \text{dcdt} * \text{dt} \\
\text{corrected conductivity} &= \text{c} + \text{ctm}
\end{align*}
\]

where:

\[
\begin{align*}
\text{a} &= 2 * \text{alpha} / (\text{sample interval} * \text{beta} + 2) \\
\text{b} &= 1 - (2 * \text{a} / \text{alpha}) \\
\text{dcdt} &= 0.1 * (1 + 0.006 * (\text{temperature} - 20))
\end{align*}
\]

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


CELLTM: COMMAND LINE PARAMETERS

- \text{-a} \hspace{1cm} \text{Process all .CNV files. Display the set up form before processing the data.}
- \text{-ax} \hspace{1cm} \text{Process all .CNV files. Do not display the set up form.}
- \text{-e <cname>} \hspace{1cm} \text{Use cname rather than CELLTM.CFG for the configuration.}
- \text{-i <filename>} \hspace{1cm} \text{Enter batch mode and use <filename> as the input filename.}
- \text{-o <filename>} \hspace{1cm} \text{Use <filename> as the output filename.}
- \text{-px} \hspace{1cm} \text{Do not print progress messages.}
- \text{-t <tname>} \hspace{1cm} \text{Use tname rather than TEMP.CNV for the temporary file.}

Input Files:

CELLTM.CFG \hspace{1cm} \text{CELLTM configuration file}
\text{.CNV} \hspace{1cm} \text{input converted data file}

Lines Added to Header:

\[
\begin{align*}
\text{celltm\_date} & \hspace{1cm} \text{system time when CELLTM was run} \\
\text{celltm\_in} & \hspace{1cm} \text{input data file} \\
\text{celltm\_alpha} & \hspace{1cm} \text{value used for alpha} \\
\text{celltm\_tau} & \hspace{1cm} \text{value used for 1/beta}
\end{align*}
\]
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 converts 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:

<table>
<thead>
<tr>
<th>CONTOUR Set Up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Data File Path = C:</td>
<td></td>
</tr>
<tr>
<td>Output File Name [.CTR] = TS1.CTR</td>
<td></td>
</tr>
<tr>
<td>Reference Pressure = 0.000000</td>
<td></td>
</tr>
<tr>
<td>Beginning Density = 24.000000</td>
<td></td>
</tr>
<tr>
<td>Ending Density = 30.000000</td>
<td></td>
</tr>
<tr>
<td>Total Number of Contours = 13</td>
<td></td>
</tr>
<tr>
<td>Beginning Temperature = 0.000000</td>
<td></td>
</tr>
<tr>
<td>Ending Temperature = 30.000000</td>
<td></td>
</tr>
<tr>
<td>Temperature Interval = 0.100000</td>
<td></td>
</tr>
</tbody>
</table>

<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

<table>
<thead>
<tr>
<th>DATCNV 4.030</th>
<th>Friday September 3, 1993 9:59 am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Data File =</td>
<td>HU112.DAT</td>
</tr>
<tr>
<td>Configuration File [.CON] =</td>
<td>SEASOFTB.CON</td>
</tr>
<tr>
<td>Input File [.CON, .DAT, .HEX] Path =</td>
<td>C:\TESTING\SBE911P\</td>
</tr>
<tr>
<td>Output Data File Path =</td>
<td>C:\TESTING\SBE911P\</td>
</tr>
<tr>
<td>DATCNV Format = Binary</td>
<td>DATCNV Variables = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Output Cast Select =</td>
<td>Both Down Cast and Up Cast</td>
</tr>
<tr>
<td>Number of Scans to Skip Over =</td>
<td>0</td>
</tr>
<tr>
<td>Output Water Bottle Data =</td>
<td>Yes</td>
</tr>
<tr>
<td>Water Bottle Data Set Up =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
</tbody>
</table>

<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:
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:

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 range for each bottle.
The choices for output file creation are:

<table>
<thead>
<tr>
<th>Source of Scan</th>
<th>File Creation =</th>
<th>0, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Data File</td>
<td>Create Converted Data (.CNV) File Only</td>
<td>Enter to Modify&gt;</td>
</tr>
<tr>
<td>DATCNV Format</td>
<td>Create Water Bottle Data (.ROS) File Only</td>
<td></td>
</tr>
<tr>
<td>Output Cast Selection</td>
<td>Create Both .CNV and .ROS Files</td>
<td></td>
</tr>
</tbody>
</table>

The choices for scan range information are:

<table>
<thead>
<tr>
<th>Source of Scan Range =</th>
<th>0, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Data File</td>
<td>Enter to Modify&gt;</td>
</tr>
<tr>
<td>DATCNV Format</td>
<td>Scans Marked With Bottle Confirm Bit</td>
</tr>
<tr>
<td></td>
<td>Bottle Scan Range File [.BSR]</td>
</tr>
<tr>
<td></td>
<td>Bottle Log File [.BL]</td>
</tr>
<tr>
<td></td>
<td>Auto-Fire Module File [.AFM]</td>
</tr>
<tr>
<td>Output Cast Selection</td>
<td></td>
</tr>
</tbody>
</table>

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 not using an SBE 911plus 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 to 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 * \(\cos(\text{degrees})\)
- **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 T₉₈ is assumed to be 1.00024 * T₀ (-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 \(= \rho(s, t, p)\) \([\text{kg/m}^3]\)
(density of sea water with salinity s, temperature t, and pressure p)

**potential temperature** \([\text{IPTS-68}] = \theta(s, t, p)\) \([\text{°C}]\)

**potential temperature** \([\text{ITS-90}] = \theta(s, t, p) / 1.00024\) \([\text{°C}]\)

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

**potential temperature anomaly** = potential temperature - \(a_0 - a_1 x \text{salinity}\)
or
**potential temperature anomaly** = potential temperature - \(a_0 - a_1 x \Sigma \theta\)
The constants \(a_0\) and \(a_1\) and the salinity/density selection are entered when potential temperature anomaly is selected from the variable to display menu.

\[\text{Sigma} - \theta = \sigma - \theta = \rho(s, \theta(s, t, p, 0), 0) - 1000\] \([\text{kg/m}^3]\)

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

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

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

\[\text{Sigma} - t = \sigma - t = \rho(s, t, 0) - 1000\] \([\text{kg/m}^3]\)

thermosteric anomaly = \(10^{-5} ((1000/(1000 + \sigma t)) - 0.97266) \times 10^{-8} \text{m}^3/\text{kg}\)

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

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

**geopotential anomaly** = \(10^{-4} \sum_{j=0}^{p=p} (\delta x \Delta p)\) \([\text{J/kg}] = [\text{m}^2/\text{s}^2]\)

dynamic meters = geopotential anomaly / 10.0

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

**oxygen** \([\mu \text{moles/kg}] = \frac{44660}{\text{Sigma} - \theta + 1000}\) oxygen \([\text{ml/l}]\)
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:

<table>
<thead>
<tr>
<th>DERIVE 4.025</th>
<th>Tuesday January 14, 1992 11:38 am</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DERIVE Set Up</strong></td>
<td></td>
</tr>
<tr>
<td>Input Data File =</td>
<td>BECK.CNV</td>
</tr>
<tr>
<td>Configuration File [.CON] for Oxygen Coeffs =</td>
<td>SEASOFT.CON</td>
</tr>
<tr>
<td>Input File [.CNV] Path =</td>
<td>C:</td>
</tr>
<tr>
<td>Output Data File Path =</td>
<td>C:</td>
</tr>
<tr>
<td>Input Variables =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Variables to be Derived =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Variable Coefficients =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
</tbody>
</table>

<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:

<table>
<thead>
<tr>
<th>DERIVE 4.0</th>
<th>Tuesday January 14, 1992 1:35 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable Coefficients</strong></td>
<td></td>
</tr>
<tr>
<td>Time Window Size for doc/dt (seconds) =</td>
<td>2.000000</td>
</tr>
<tr>
<td>Time Window Size for Descent Rate and Accel (seconds) =</td>
<td>2.000000</td>
</tr>
</tbody>
</table>

<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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-a</td>
<td>Process all .DAT and .HEX files. Display the set up form before processing the data.</td>
</tr>
<tr>
<td>-ax</td>
<td>Process all .DAT and .HEX files. Do not display the setup form.</td>
</tr>
<tr>
<td>-c &lt; filename &gt;</td>
<td>Use &lt;filename&gt;.con for instrument configuration and calibration constants.</td>
</tr>
<tr>
<td></td>
<td>Filename can include a path name.</td>
</tr>
<tr>
<td>-e &lt; cname &gt;</td>
<td>Use cname rather than DERIVE.CFG for the configuration.</td>
</tr>
<tr>
<td>-i &lt; filename &gt;</td>
<td>Enter batch mode and use &lt;filename&gt; as the input filename.</td>
</tr>
<tr>
<td>-o &lt; filename &gt;</td>
<td>Use &lt;filename&gt; as the output filename.</td>
</tr>
<tr>
<td>-px</td>
<td>Do not print out progress messages.</td>
</tr>
<tr>
<td>-s</td>
<td>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.</td>
</tr>
<tr>
<td>-t &lt; tname &gt;</td>
<td>Use tname rather than TEMP.CNV for the temporary file.</td>
</tr>
</tbody>
</table>

**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, tc0r, pcmr, 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:

<table>
<thead>
<tr>
<th>Input Data File = BECK.CNV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input File [.CNV] Path = C:</td>
</tr>
<tr>
<td>Output Data File Path = C:</td>
</tr>
<tr>
<td>Minimum Velocity Selection = Percent of Mean Speed, 120, 75</td>
</tr>
<tr>
<td>Minimum CTD Velocity (m/s) = 0.250000</td>
</tr>
<tr>
<td>Exclude Scans Marked Bad in LOOPEDIT = Yes</td>
</tr>
</tbody>
</table>

<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 │
│                                                                  │
└──────────────────────────────────────────────────────────────────────────────┘

╔══════════════════════════════════════════════════════════════════════════════╗
║                                                                  │
║ 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:

<table>
<thead>
<tr>
<th>ROSSUM 4.030</th>
<th>Tuesday March 23, 1993 8:35 am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data File =</td>
<td>30-2.ROS</td>
</tr>
<tr>
<td>Configuration File [.CON] for Oxygen Coeffs =</td>
<td>30-2.CON</td>
</tr>
<tr>
<td>Input File [.ROS, .CON] Path =</td>
<td>C:\SEASOFT\</td>
</tr>
<tr>
<td>Output Data File Path =</td>
<td>C:\SEASOFT\</td>
</tr>
<tr>
<td>Variables to be Output Automatically =</td>
<td>&lt;Press Enter to Display&gt;</td>
</tr>
<tr>
<td>Variables to be Derived =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Additional Variables to be Averaged =</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Output Min/Max Values for Variables to be Averaged =</td>
<td>No</td>
</tr>
</tbody>
</table>

<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.

<table>
<thead>
<tr>
<th>Variables to be Der</th>
<th>Variable Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable # 0 = salinity, PSS-78 [PSU]</td>
<td>density</td>
</tr>
<tr>
<td>Variable # 1 = density, sigma-theta [kg/m^3]</td>
<td>oxygen saturation</td>
</tr>
<tr>
<td>Variable # 2 = density, sigma-1 [kg/m^3]</td>
<td>oxygen</td>
</tr>
<tr>
<td>Variable # 3 = oxygen [ml per liter]</td>
<td>potential temperature</td>
</tr>
<tr>
<td>Variable # 4 = none</td>
<td>sound velocity</td>
</tr>
<tr>
<td>Variable # 5 = none</td>
<td>specific volume anomaly</td>
</tr>
<tr>
<td>Variable # 6 = none</td>
<td>salinity</td>
</tr>
<tr>
<td>Variable # 7 = none</td>
<td>thermosteric anomaly</td>
</tr>
<tr>
<td>Variable # 8 = none</td>
<td>none</td>
</tr>
<tr>
<td>Variable # 9 = none</td>
<td>none</td>
</tr>
<tr>
<td>Variable # 10 = none</td>
<td>none</td>
</tr>
</tbody>
</table>

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.

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
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:

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
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:

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

Reference pressure is used to compute Sigma-Ref.

\[
\text{Sigma - Ref} = \rho(s, \theta(s, t, p, \rho_v), p_{ref}) - 1000 \quad [\text{kg/m}^3]
\]

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
```

<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

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

<Enter> Select the Instrument; <Esc> Exit SEACON.

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    |                                 |

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:

\[(\text{number of data words} - \text{number of frequency channels} - 1) \times 2\]

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

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency 0</td>
<td>temperature</td>
</tr>
<tr>
<td>Frequency 1</td>
<td>conductivity</td>
</tr>
<tr>
<td>Frequency 2</td>
<td>pressure</td>
</tr>
<tr>
<td>Extrnl Volt 0</td>
<td>oxygen, current</td>
</tr>
<tr>
<td>Extrnl Volt 1</td>
<td>oxygen, temperature</td>
</tr>
<tr>
<td>Extrnl Volt 2</td>
<td>spare</td>
</tr>
<tr>
<td>Extrnl Volt 3</td>
<td>spare</td>
</tr>
<tr>
<td>Extrnl Volt 4</td>
<td>transmissometer</td>
</tr>
<tr>
<td>Extrnl Volt 5</td>
<td>spare</td>
</tr>
<tr>
<td>Extrnl Volt 6</td>
<td>fluorometer, sea tech</td>
</tr>
<tr>
<td>Extrnl Volt 7</td>
<td>spare</td>
</tr>
</tbody>
</table>
```

<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:

<table>
<thead>
<tr>
<th>Data Format Definition</th>
<th>Data Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency 0</td>
<td>temperature</td>
</tr>
<tr>
<td>Frequency 1</td>
<td>conductivity</td>
</tr>
<tr>
<td>Frequency 2</td>
<td>conductivity</td>
</tr>
<tr>
<td>Extranl Volt 0</td>
<td>oxygen, current</td>
</tr>
<tr>
<td>Extranl Volt 1</td>
<td>oxygen, temperature</td>
</tr>
<tr>
<td>Extranl Volt 2</td>
<td>ORP</td>
</tr>
<tr>
<td>Extranl Volt 3</td>
<td>spare</td>
</tr>
<tr>
<td>Extranl Volt 4</td>
<td>transmissometer</td>
</tr>
<tr>
<td>Extranl Volt 5</td>
<td>pressure</td>
</tr>
<tr>
<td>Extranl Volt 6</td>
<td>fluorometer, sea tech</td>
</tr>
<tr>
<td>Extranl Volt 7</td>
<td>spare</td>
</tr>
</tbody>
</table>

<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:
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)

<table>
<thead>
<tr>
<th>External Volt</th>
<th>Connector</th>
<th>Voltage Words to Keep</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>AUX 1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>AUX 1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>AUX 2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>AUX 2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>AUX 3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AUX 3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AUX 4</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>AUX 4</td>
<td>4</td>
</tr>
</tbody>
</table>

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:
### SHES 911e CTD System

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Sensor Type</td>
<td>High Resolution Digiquartz with Temp Comp</td>
</tr>
<tr>
<td>Number of Frequency Channels in the Fish</td>
<td>3</td>
</tr>
<tr>
<td>Number of Frequency Channels to Suppress</td>
<td>0</td>
</tr>
<tr>
<td>Number of Voltage Words in the Fish</td>
<td>4</td>
</tr>
<tr>
<td>Number of Voltage Words to Suppress</td>
<td>2</td>
</tr>
<tr>
<td>A/D Voltage Range</td>
<td>-10 to 10 Volts</td>
</tr>
<tr>
<td>Computer Interface</td>
<td>IEEE-488 (GPIB)</td>
</tr>
<tr>
<td>Data Format</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Frequency 0</td>
<td>temperature</td>
</tr>
<tr>
<td>Frequency 1</td>
<td>conductivity</td>
</tr>
<tr>
<td>Frequency 2</td>
<td>pressure</td>
</tr>
<tr>
<td>Extrnl Volt 0</td>
<td>oxygen, current</td>
</tr>
<tr>
<td>Extrnl Volt 1</td>
<td>oxygen, temperature</td>
</tr>
<tr>
<td>Extrnl Volt 2</td>
<td>pH</td>
</tr>
<tr>
<td>Extrnl Volt 3</td>
<td>transmissometer</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>External Volt (not spare)</th>
<th>voltage words to keep</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>SEACON</th>
<th>Tuesday January 14, 1992 3:47 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBE 16 SEACAT</td>
<td></td>
</tr>
<tr>
<td>Pressure Sensor Type (standard=none)</td>
<td>None</td>
</tr>
<tr>
<td>Number of Ext Freq Sampled (standard=0)</td>
<td>0</td>
</tr>
<tr>
<td>Number of Ext Volt Sampled (standard=0)</td>
<td>0</td>
</tr>
<tr>
<td>SEACAT Moored Pressure (decibars)</td>
<td>1000.000000</td>
</tr>
<tr>
<td>Sample Interval (seconds)</td>
<td>15.000000</td>
</tr>
<tr>
<td>Firmware Version</td>
<td>Greater than or Equal to 4.0</td>
</tr>
<tr>
<td>NMEA Interface Installed</td>
<td>No</td>
</tr>
<tr>
<td>Data Format</td>
<td>&lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Frequency 0</td>
<td>temperature</td>
</tr>
<tr>
<td>Frequency 1</td>
<td>conductivity</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>SEACON 4.0</th>
<th>Tuesday January 14, 1992 3:47 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEACON 19 SEACAT Profiler</strong></td>
<td></td>
</tr>
<tr>
<td>Pressure Sensor Type = Strain Gauge</td>
<td></td>
</tr>
<tr>
<td>Number of Ext Volt Sampled (standard=0) = 2</td>
<td></td>
</tr>
<tr>
<td>Num of 0.5 Sec Intervals between Samples = 1</td>
<td></td>
</tr>
<tr>
<td>Firmware Version = Greater than or Equal to 3.0</td>
<td></td>
</tr>
<tr>
<td>Lat/Lon Data Added by NMEA Interface = No</td>
<td></td>
</tr>
<tr>
<td>Surface PAR Voltage Added by NMEA Interface = No</td>
<td></td>
</tr>
<tr>
<td>Data Format = &lt;Press Enter to Modify&gt;</td>
<td></td>
</tr>
<tr>
<td>Frequency 0 = temperature</td>
<td></td>
</tr>
<tr>
<td>Frequency 1 = conductivity</td>
<td></td>
</tr>
<tr>
<td>Extrl Volt 0 oxygen, current</td>
<td></td>
</tr>
<tr>
<td>Extrl Volt 1 oxygen, temperature</td>
<td></td>
</tr>
<tr>
<td>Pressure Voltage</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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.
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:

\[(\text{corrected temperature}) = \text{slope} \times (\text{computed temperature}) + \text{offset}\]

where \(\text{slope} = (\text{true temperature span}) / (\text{instrument temperature span})\)
\(\text{offset} = (\text{true temperature} - \text{instrument reading}) \times \text{slope}; \text{measured at 0.0 Celsius}\)

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

<table>
<thead>
<tr>
<th>true temperature</th>
<th>0.0 C</th>
<th>25.0 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>instrument reading</td>
<td>0.0015 C</td>
<td>25.0005 C</td>
</tr>
</tbody>
</table>

\[
\text{slope} = (25.0 - 0.0) / (25.0020 - 0.0015) = 1.000040002 \\
\text{offset} = (0.0 - 0.0015) \times (1.000040001) = -0.001500060
\]

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:

\[ \begin{align*}
\text{cpcor} &= -9.57\times10^{-8} \\
\text{slope} &= 1.0 \\
\text{offset} &= 0.0
\end{align*} \]

'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:

\[ \begin{align*}
\text{(corrected conductivity)} &= \ldots \\
\text{(corrected conductivity)} &= \text{slope} \times (\text{computed conductivity}) + \text{offset}
\end{align*} \]

where \( \text{slope} = (\text{true conductivity span}) / (\text{instrument conductivity span}) \)
\( \text{offset} = (\text{true conductivity} - \text{instrument reading}) \times \text{slope}; \text{measured at 0.0 S/m} \)
As an example of computing these correction coefficients, if we had the following calibration data:

<table>
<thead>
<tr>
<th>true conductivity</th>
<th>0.0 S/m</th>
<th>3.5 S/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>instrument reading</td>
<td>-0.00007 S/m</td>
<td>3.49965 S/m</td>
</tr>
</tbody>
</table>

\[
\text{slope} = \frac{(3.5 - 0.0)}{(3.49965 - -0.00007)} = +1.000080006 \\
\text{offset} = (0.0 - -0.00007) \times 1.000080006 = +0.000070006
\]

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:

\[ pH = 7 + \frac{(V_{out} - \text{offset})}{(°K \times 1.98416e^{-4} \times \text{slope})} \]

°K = temperature in degrees Kelvin.

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

\[ pHold = \left[ V_{ref} + \frac{(V_{out} - B)}{M} \right] (°K \times 1.98416e^{-4}) \]

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: \( pH = pHold + \frac{(7 - 2087)}{°K} \)

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

\[ M = 20(A0 - Y0)/(A1 - Y1) \]

and \( B = -M \times Y1 \)
For example, if the SEA TECH calibration gave the following values:

\[
\begin{align*}
A_0 &= 4.743 \text{ volts} \\
Y_0 &= 0.002 \text{ volts}
\end{align*}
\]

and the current calibration gave:

\[
\begin{align*}
A_1 &= 4.719 \text{ volts} \\
Y_1 &= 0.006 \text{ volts}
\end{align*}
\]

then

\[
\begin{align*}
M &= 20(4.743 - 0.002)/(4.719 - 0.006) = 20.119 \\
B &= -0.006 \times 20.119 = -0.1207
\end{align*}
\]

\textbf{Chelsea:}

Light Transmission (percent) = \(M \times \text{volts} + B\).

\textbf{8.17.9.7 FLUORESCENCE}

\textbf{Biospherical Natural Fluorometer:}

natural fluorescence \(F_n = C_{Fn} \times 10^V\) where

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

production = \(A_1 \times F_n / (A_2 + \text{PAR})\)

chlorophyll concentration \(\text{Chl} = F_n / (B \times \text{PAR})\)

\textbf{Chelsea:}

\textbf{SEASOFT versions less than 4.003:}

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

\textbf{SEASOFT versions 4.003 to 4.204:}

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

the nominal offset is 2.0.

\textbf{SEASOFT versions 4.205 and greater:}

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

\(V_B, V_{\mu g},\) and \(V_{\text{Vacetone}}\) 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:**

\[
\text{concentration} = \left(100 \times \frac{V - \text{vacetoneBlank}}{\text{vacetone100} - \text{vacetoneBlank}}\right) + \text{offset}
\]

**Seapoint Fluorometer:**

\[
\text{concentration} = \left(V \times \frac{30}{\text{gain}}\right) + \text{offset}
\]

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, V1\(\mu\)g/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 than 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 9plus modulo word. Select 'None' if the Dr. Haardt instrument does not change gain.

\[
\begin{align*}
\text{low range output} &= A_0 + A_1 \times V \\
\text{high range output} &= B_0 + B_1 \times V
\end{align*}
\]

\[V = \text{voltage from the sensor}\]

Voltage level switching examples:

**Chlorophyll a:**
- low range scale is 10 mg/l, gain is 10/2.5 = 4mg/l / volt
  - \(A_0 = 0.0, A_1 = 4.0\)
- high range scale is 100 mg/l, gain is 100/2.5 = 40mg/l / volt
  - \(B_0 = -100.0, B_1 = 40.0\)

**Yellow Substance:**
- low range scale is 5 mg/l, gain is 5/2.5 = 2mg/l / volt
  - \(A_0 = 0.0, A_1 = 2.0\)
- high range scale is 50 mg/l, gain is 50/2.5 = 20mg/l / volt
  - \(B_0 = -50.0, B_1 = 20.0\)
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:

\[ \text{turbidity} = \frac{10.0^V - C}{\text{scale factor}} \text{ [F.T.U.]} \]

C = clear water value
V = voltage from the sensor

IFREMER nephelometer:

\[ \text{Diffusion} = k \left( \frac{vm - vm0}{vd - vd0} \right) - d0 \]

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

8.17.9.9 IRRADIANCE (PAR)

SEASOFT calculates \( \text{PAR} = \text{multiplier} \times \frac{10^9 \times 10^{V-B}}{M} \) / 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:**

\[ \text{calibration constant} = 10^5 / \text{Biospherical Wet Calibration Factor} \]

\[ \text{offset} = -10^4 \times \text{wet calibration factor} \times 10^{\text{dark voltage}} \]

**LICOR PAR sensors:**

\[ \text{calibration constant} = \text{LICOR in water calibration constant} \]
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

<table>
<thead>
<tr>
<th>Conversion Units</th>
<th>Metric</th>
<th>Grid Lines</th>
<th>gray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y Axis</td>
<td>pressure, decibars</td>
<td>Minimum</td>
<td>0.0000</td>
</tr>
<tr>
<td>Label</td>
<td>pressure, decibars</td>
<td>Maximum</td>
<td>3000.0000</td>
</tr>
<tr>
<td>Major Divisions</td>
<td>3</td>
<td>Minor Divisions</td>
<td>10</td>
</tr>
</tbody>
</table>

| 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/m³... | Minimum = 27.5000 |
| Label = density, sigma-theta, kg/m³...    | 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 the 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:

```
<table>
<thead>
<tr>
<th>MISCELLANEOUS X-Y PLOT PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add File Name to the Plot Label = Yes</td>
</tr>
<tr>
<td>Plot Line Type = Connected</td>
</tr>
<tr>
<td>Automatic Paging of the Display = No</td>
</tr>
<tr>
<td>Output Selection = Plot</td>
</tr>
<tr>
<td>Screen Dump/Plot Selection = Print When CTRL+F9 is Pressed</td>
</tr>
<tr>
<td>Screen Disp/Dump/Plot Parameters = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Lift the Pen Over Values Marked Bad in SEAPLOT = Yes</td>
</tr>
<tr>
<td>Plot Scans Marked Bad Selection = Plot</td>
</tr>
</tbody>
</table>
```
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 to 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:

<table>
<thead>
<tr>
<th>Screen Dump Printer Selection =</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaserJet+, Series II, or Series III</td>
</tr>
<tr>
<td>Epson FX</td>
</tr>
<tr>
<td>Epson LX or MX</td>
</tr>
<tr>
<td>Others (DOS GRAPHICS or other memory resident printer drivers)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Plotter Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP LaserJet III</td>
</tr>
<tr>
<td>HP Pen Plotter (7475A/7550A) with Paper Size A/A4</td>
</tr>
<tr>
<td>HP Pen Plotter (7475A/7550A) with Paper Size B/A3</td>
</tr>
</tbody>
</table>

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.
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:

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
<table>
<thead>
<tr>
<th>Display Archived Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Real-Time Data</td>
</tr>
<tr>
<td>ASCII Output Set Up</td>
</tr>
</tbody>
</table>

<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:

<table>
<thead>
<tr>
<th>ASCII Output Set Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output ASCII Data = Yes</td>
</tr>
<tr>
<td>ASCII Data Output Port = LPT1</td>
</tr>
<tr>
<td>Num of Seconds (data time) between ASCII Updates = 60.000000</td>
</tr>
<tr>
<td>Send Data to SBE 14 Remote Display = No</td>
</tr>
<tr>
<td>Remote Display Data Type = Pressure, 50, 5000 decibars</td>
</tr>
<tr>
<td>Remote Display Port = COM1</td>
</tr>
<tr>
<td>Num of Seconds (data time) between Remote Updates = 1.000000</td>
</tr>
<tr>
<td>Enable SBE 11 Deck Unit Alarm on Minimum Pressure = Yes</td>
</tr>
<tr>
<td>SBE 11 Deck Unit Alarm Parameters = &lt;Press Enter to Modify&gt;</td>
</tr>
</tbody>
</table>

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:

1. 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:

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:

<table>
<thead>
<tr>
<th>Miscellaneous X-Y Plot Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status Line Variables = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Plot Label = Station 140</td>
</tr>
<tr>
<td>Plot Line Type = Connected</td>
</tr>
<tr>
<td>Plot Data Selection = Plot All Data</td>
</tr>
<tr>
<td>Plot Status = Yes</td>
</tr>
<tr>
<td>Automatic Paging of the Display = No</td>
</tr>
<tr>
<td>Screen Dump Selection = Print When CTRL+F9 is Pressed</td>
</tr>
<tr>
<td>Printer Control Selection = LaserJet+, Series II, or Series III</td>
</tr>
<tr>
<td>Number of Pts to Compute between Status Line Updates = 9</td>
</tr>
</tbody>
</table>

<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

<table>
<thead>
<tr>
<th>Miscellaneous Run Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Seconds Between Screen Updates = 0.500000</td>
</tr>
<tr>
<td>Header Choice = Prompt for Header Information</td>
</tr>
<tr>
<td>Header Form = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Mark Variable List = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Number of Scans to Average in the Deck Unit = 8</td>
</tr>
<tr>
<td>Water Sampler Type = SBE Carousel</td>
</tr>
<tr>
<td>Store Lat/Lon in Raw Data File = Add to Header Only</td>
</tr>
<tr>
<td>COMM Port Configuration = &lt;Press Enter to Modify&gt;</td>
</tr>
</tbody>
</table>

<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.
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:

<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.
## 8.19.6 SEASAVE: DISPLAY ARCHIVED DATA

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

<table>
<thead>
<tr>
<th>Display Archived Data Set Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Data File = 5453.DAT</td>
</tr>
<tr>
<td>Configuration File [.CON] = NANCY.CON</td>
</tr>
<tr>
<td>Input File [.CON, .DAT, .HEX] Path = C:\CTDDATA\SBE911P\</td>
</tr>
<tr>
<td>Display File [.DSP] = TEST.DSP Display Type = Scrolled Display</td>
</tr>
<tr>
<td>Variables to Display = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Misc X-Y Plot Parameters = &lt;Press Enter to Modify&gt;</td>
</tr>
<tr>
<td>Number of Scans to Skip Over = 0</td>
</tr>
<tr>
<td>Number of Scans to Skip between Computations = 0</td>
</tr>
<tr>
<td>Save Display Parameters to .DSP File = &lt;Press Enter Twice to Save&gt;</td>
</tr>
</tbody>
</table>

<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:

![Graph Image]

Data file name: S112C1.DAT
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** Seaseave 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:

<table>
<thead>
<tr>
<th>SECTION Set Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Data File = D1.CNV</td>
</tr>
<tr>
<td>Input File [.CNV] Path = C:</td>
</tr>
<tr>
<td>Output Data File Path = C:</td>
</tr>
<tr>
<td>SECTION Selection Variable = Pressure</td>
</tr>
<tr>
<td>Pressure Cast Section = downcast</td>
</tr>
<tr>
<td>SECTION Minimum Value = 1040.000000</td>
</tr>
<tr>
<td>SECTION Maximum Value = 1048.000000</td>
</tr>
</tbody>
</table>

<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 <name> Use <name> 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
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

<table>
<thead>
<tr>
<th>split_date</th>
<th>System time when SPLIT was run</th>
</tr>
</thead>
<tbody>
<tr>
<td>split_in</td>
<td>Input filename</td>
</tr>
<tr>
<td>split_excl_bad_scans</td>
<td>If yes, pressure values in scans marked bad will not be used to determine the maximum pressure</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Variables to be Included =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include scan number = Yes</td>
</tr>
<tr>
<td>Include pressure, decibars = Yes</td>
</tr>
<tr>
<td>Include temperature, primary, deg C = Yes</td>
</tr>
<tr>
<td>Include conductivity, primary, S/m = Yes</td>
</tr>
<tr>
<td>Include oxygen, current, microamps = Yes</td>
</tr>
<tr>
<td>Include oxygen, temperature, deg C = Yes</td>
</tr>
<tr>
<td>Include salinity, PSS-78 [PSU], T0, C0 = No</td>
</tr>
<tr>
<td>Include density, sigma-theta, kg/m^3, T0, C0 = No</td>
</tr>
</tbody>
</table>

<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 <mame>` 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
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:

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRANS.CFG</td>
<td>trans configuration</td>
</tr>
<tr>
<td>.CNV</td>
<td>converted data file</td>
</tr>
</tbody>
</table>

Bad flags are not modified.

Lines Added to Header:

none
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:**
\[
w(n) = \frac{1}{L} \quad \text{for } n = \frac{-L-1}{2}, \ldots, \frac{L-1}{2}
\]

**Cosine:**
\[
w(n) = 1 \quad \text{for } n = 0
\]
\[
w(n) = \cos\left(\frac{n \times \pi}{L + 1}\right) \quad \text{for } n = \frac{-L-1}{2}, \ldots, 1, \ldots, \frac{L-1}{2}
\]

**Triangle:**
\[
w(n) = 1 \quad \text{for } n = 0
\]
\[
w(n) = \frac{|n|}{K} \quad \text{for } n = \frac{-L-1}{2}, \ldots, 1, \ldots, \frac{L-1}{2}
\]
\[\text{where } K = \frac{L-1}{2} + 1\]

**Gaussian:**

\[
\text{phase} = \frac{\text{offset (sec)}}{\text{sample interval (sec)}}
\]
\[
\text{scale} = \log(2) \times \left(2 \times \frac{\text{sample rate}}{\text{half width (scans)}}\right)^2
\]
\[
w(n) = e^{-\text{phase} \times \text{phase} \times \text{scale}} \quad \text{for } n = 0
\]
\[
w(n) = e^{-(n \cdot \text{phase})^2 \times \text{scale}} \quad \text{for } n = \frac{-L-1}{2}, \ldots, 1, \ldots, \frac{L-1}{2}
\]
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.
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\nOutput Data File Path = F:\USERS\DJM\nVariables 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
```

101
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.

<table>
<thead>
<tr>
<th>Boxcar Filter Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Size (scans) = 32</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Gaussian Filter Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Size (scans) = 32</td>
</tr>
<tr>
<td>Half Width (seconds) = 4.000000</td>
</tr>
<tr>
<td>Offset (seconds) = 3.000000</td>
</tr>
</tbody>
</table>

WFILTER: COMMAND LINE PARAMETERS

- **-a** Process all .CNV files. Display the setup 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 <name>** 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:

<table>
<thead>
<tr>
<th>run</th>
<th>pass 1 std dev</th>
<th>pass 2 std dev</th>
<th>points per block</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

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:

| 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

<table>
<thead>
<tr>
<th>TERM</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERM1619</td>
<td>SBE 16 SEACAT or SBE 21 THERMOSALINOGRAPH</td>
</tr>
<tr>
<td>TERM17</td>
<td>SBE 17 SEARAM</td>
</tr>
<tr>
<td>TERM19</td>
<td>SBE 19 SEACAT PROFILER</td>
</tr>
<tr>
<td>TERM25</td>
<td>SBE 25 SEALOGGER CTD</td>
</tr>
<tr>
<td>TERM37</td>
<td>SBE 37 MicroCAT</td>
</tr>
<tr>
<td>TERMAFM</td>
<td>SBE 90208 Carousel Auto Fire Module</td>
</tr>
</tbody>
</table>

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

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 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 instruments.
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

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.
**Upload File Name Choice:**

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:

\[\text{NNNNXXYY.HEX}\] 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

<table>
<thead>
<tr>
<th>Line</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>conductivity sensor serial number</td>
</tr>
<tr>
<td>2</td>
<td>conductivity M, A, B, C, D, PCOR</td>
</tr>
<tr>
<td>3</td>
<td>conductivity cell const, series_r, slope, offset, use GHIJ coefficients?</td>
</tr>
<tr>
<td>4</td>
<td>temperature sensor serial number</td>
</tr>
<tr>
<td>5</td>
<td>temperature F0, A, B, C, D, slope, offset, use GHIJ coefficients?</td>
</tr>
<tr>
<td>6</td>
<td>secondary conductivity sensor serial number</td>
</tr>
<tr>
<td>7</td>
<td>secondary conductivity M, A, B, C, D, PCOR</td>
</tr>
<tr>
<td>8</td>
<td>secondary conductivity cell const, series_r, slope, offset, use GHIJ coefficients?</td>
</tr>
<tr>
<td>9</td>
<td>secondary temperature sensor serial number</td>
</tr>
<tr>
<td>10</td>
<td>secondary temperature F0, A, B, C, D, slope, offset, use GHIJ coefficients?</td>
</tr>
<tr>
<td>11</td>
<td>pressure sensor serial number</td>
</tr>
<tr>
<td>12</td>
<td>pressure T1, T2, T3, T4, T5</td>
</tr>
<tr>
<td>13</td>
<td>pressure C1, C2, C3, C4</td>
</tr>
<tr>
<td>14</td>
<td>pressure D1, D2, slope, offset, pressure sensor type, AD590_M, AD590_B</td>
</tr>
<tr>
<td>15</td>
<td>oxygen sensor serial number</td>
</tr>
<tr>
<td>16</td>
<td>oxygen M, B, K, C, BOC, TCDR</td>
</tr>
<tr>
<td>17</td>
<td>oxygen NT, PCOR, TAU, BOC</td>
</tr>
<tr>
<td>18</td>
<td>pH sensor serial number</td>
</tr>
<tr>
<td>19</td>
<td>pH M, B, VREF</td>
</tr>
<tr>
<td>20</td>
<td>PAR light sensor serial number</td>
</tr>
<tr>
<td>21</td>
<td>PAR cal const, multiplier, M, B, surface_cc, surface_r, offset</td>
</tr>
<tr>
<td>22</td>
<td>transmissometer sensor serial number</td>
</tr>
<tr>
<td>23</td>
<td>transmissometer A, B, path length</td>
</tr>
<tr>
<td>24</td>
<td>fluorometer sea tech sensor serial number</td>
</tr>
<tr>
<td>25</td>
<td>fluorometer sea tech scale factor, offset</td>
</tr>
<tr>
<td>26</td>
<td>tilt sensor serial number</td>
</tr>
<tr>
<td>27</td>
<td>tilt XM, XB, YM, YB</td>
</tr>
<tr>
<td>28</td>
<td>ORP sensor serial number</td>
</tr>
<tr>
<td>29</td>
<td>ORP M, B, offset</td>
</tr>
<tr>
<td>30</td>
<td>OBS sensor serial number</td>
</tr>
<tr>
<td>31</td>
<td>OBS gain, offset</td>
</tr>
<tr>
<td>32</td>
<td>ALT scale, alt_set, alt_hyst, alt min pressure, alt hysteresis</td>
</tr>
<tr>
<td>33</td>
<td>microstructure temperature sensor serial number</td>
</tr>
<tr>
<td>34</td>
<td>microstructure temperature pre_m, pre_b</td>
</tr>
<tr>
<td>35</td>
<td>microstructure temperature num, denom, A0, A1, A3</td>
</tr>
<tr>
<td>36</td>
<td>microstructure conductivity sensor serial number</td>
</tr>
<tr>
<td>37</td>
<td>microstructure conductivity A0, A1, A2</td>
</tr>
<tr>
<td>38</td>
<td>microstructure conductivity M, B, R</td>
</tr>
<tr>
<td>39</td>
<td>number of external frequencies, number of bytes, number of voltages, instrument type, computer interface, scan rate, interval, store system time?</td>
</tr>
<tr>
<td>40</td>
<td>data format channels 0 - 9</td>
</tr>
<tr>
<td>41</td>
<td>data format channels 10 - 19</td>
</tr>
<tr>
<td>42</td>
<td>data format channels 20 - 39</td>
</tr>
<tr>
<td>43</td>
<td>sbe16: use water temperature?, fixed pressure, fixed pressure temperature</td>
</tr>
<tr>
<td>44</td>
<td>firmware version</td>
</tr>
<tr>
<td>45</td>
<td>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?</td>
</tr>
<tr>
<td>46</td>
<td>IFREMER nephelometer sensor serial number</td>
</tr>
<tr>
<td>47</td>
<td>IFREMER nephelometer VM0, VD0, D0, K</td>
</tr>
<tr>
<td>48</td>
<td>Chelsea nephelometer sensor serial number</td>
</tr>
<tr>
<td>49</td>
<td>Chelsea nephelometer clear water voltage, scale factor</td>
</tr>
<tr>
<td>50</td>
<td>ZAPS sensor serial number</td>
</tr>
<tr>
<td>51</td>
<td>ZAPS m, b</td>
</tr>
<tr>
<td>52</td>
<td>calibration date for conductivity sensor</td>
</tr>
<tr>
<td>53</td>
<td>calibration date for temperature sensor</td>
</tr>
<tr>
<td>54</td>
<td>calibration date for secondary conductivity sensor</td>
</tr>
<tr>
<td>55</td>
<td>calibration date for secondary temperature sensor</td>
</tr>
<tr>
<td>56</td>
<td>calibration date for pressure sensor</td>
</tr>
<tr>
<td>57</td>
<td>calibration date for oxygen sensor</td>
</tr>
<tr>
<td>58</td>
<td>calibration date for pH sensor</td>
</tr>
<tr>
<td>59</td>
<td>calibration date for PAR light sensor</td>
</tr>
<tr>
<td>60</td>
<td>calibration date for transmissometer sensor</td>
</tr>
<tr>
<td>61</td>
<td>calibration date for fluorometer sensor</td>
</tr>
</tbody>
</table>
62. calibration date for tilt sensor
63. calibration date for ORP sensor
64. calibration date for microstructure temperature sensor
65. calibration date for microstructure conductivity sensor
66. calibration date for IFREMER nephelometer sensor
67. calibration date for Chelsea nephelometer sensor
68. calibration date for ZAPS sensor
69. calibration date for secondary oxygen sensor
70. secondary oxygen sensor serial number
71. calibration date for secondary oxygen sensor
72. secondary oxygen MT, PCOR, TAU, BOC
73. userpoly1 sensor serial number
74. calibration date for userpoly1 sensor
75. userpoly2 sensor serial number
76. calibration date for userpoly2 sensor
77. userpoly3 sensor serial number
78. calibration date for userpoly3 sensor
79. Dr. Haardt Chlorophyll sensor serial number
80. calibration date for Dr. Haardt Chlorophyll sensor
81. Dr. Haardt Chlorophyll A0, A1, A2, A3
82. Dr. Haardt Phycoerythrin sensor serial number
83. calibration date for Dr. Haardt Phycoerythrin sensor
84. Dr. Haardt Phycoerythrin A0, A1, B0, B1, modulo bit, gain range switching
85. Dr. Haardt Turbidity sensor serial number
86. calibration date for Dr. Haardt Turbidity sensor
87. Dr. Haardt Turbidity A0, A1, B0, B1, modulo bit, gain range switching
88. IOW oxygen sensor serial number
89. calibration date for IOW oxygen sensor
90. IOW oxygen A0, A1, A2, B0, B1
91. IOW sound velocity sensor serial number
92. calibration date for IOW sound velocity sensor
93. IOW sound velocity A0, A1, A2
94. biospherical natural fluorometer sensor serial number
95. calibration date for biospherical natural fluorometer sensor
96. biospherical natural fluorometer Cfn, A1, A2, B
97. sea tech ls6000 sensor serial number
98. calibration date for sea tech ls6000 sensor
99. sea tech ls6000 gain, slope, offset
100. fluorometer chelsea sensor serial number
101. calibration date for fluorometer chelsea sensor
102. fluorometer chelsea scale factor, slope, offset, Vacetone, V(t) (static), V(t)ug/l
103. fluorometer turner sensor serial number
104. calibration date for fluorometer turner sensor
105. fluorometer turner scale factor, offset, fluorometer turner-10au full scale concentration, full scale voltage, zero point concentration
106. conductivity G, H, I, J, TC, PC
107. temperature F1, G, H, I, J
108. secondary conductivity G, H, I, J, TC, PC
109. secondary temperature F1, G, H, I, J
110. WET Labs beam transmission sensor serial number.
111. calibration date for WET Labs beam transmission sensor.
112. WET Labs beam transmission CH2O, CH2O, CH2O, absorption CH2O, CH2O, g, h, i, j coefficients.
113. WET Labs WETstar fluorometer sensor serial number.
114. calibration date for WET Labs WETstar fluorometer sensor.
115. WET Labs WETstar fluorometer sensor serial number.
116. calibration date for WET Labs WETstar fluorometer sensor.
117. WET Labs WETstar fluorometer sensor serial number.
118. calibration date for WET Labs WETstar fluorometer sensor.
119. WET Labs WETstar fluorometer sensor serial number.
120. calibration date for primary conductivity sensor using g, h, i, j coefficients.
121. calibration date for primary conductivity 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. PFG pressure sensor #0 serial number
125. calibration date for PFG pressure sensor #0
126. PFG pressure sensor #0 scale factor, offset
127. PFG pressure sensor #1 serial number
128. calibration date for PFG pressure sensor #1
129. PFG pressure sensor #1 scale factor, offset
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.

<table>
<thead>
<tr>
<th>Ver</th>
<th>Problems fixed / Features added / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.002</td>
<td>14 March 1992 first general release</td>
</tr>
<tr>
<td>4.003</td>
<td>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</td>
</tr>
<tr>
<td>4.004</td>
<td>27 March 1992 Add IFREMER fluorometer modify command line options -b, -bx, -px change output format for PAR, SPAR, CPAR to exponential</td>
</tr>
<tr>
<td>4.005</td>
<td>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</td>
</tr>
<tr>
<td>4.006</td>
<td>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</td>
</tr>
<tr>
<td>4.007</td>
<td>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</td>
</tr>
</tbody>
</table>
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 \texttt{-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 \texttt{-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 \texttt{-s} and \texttt{-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 doctime 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.
LOOPENEDIT:
- 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 occurred 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 output.
- 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.
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.

4.211 14 April 1995

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)
4.212 17 May 1995

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 a 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 a 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".

4.213 13 June 1995

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.

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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:
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- 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.
4.216  30 October 1995

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.

4.217  26 February 1996

1. BUG FIXES:

DATCNV:
   - A divide by zero runtime math error occurs 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.
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.

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.
4.223 20 December 1996

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.

4.224 10 January 1997

1. NEW FEATURES:

CNV37:
- New release.

TERM37:
- New release.

4.225 15 April 1997

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.

4.226 14 July 1997

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.
4.227  28 September 1997

1. NEW FEATURES:

DERIVE:
   - Add Specific Conductance to derived variable list.

2. MODIFICATIONS:

TERM37:
   - Improve support for RS-485 and Inductive Modem MicroCats

4.228  8 October 1997

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.

4.229  17 November 1997

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.

4.230  8 December 1997

1.  MODIFICATIONS:

TERM37:
   - Improve support for inductive modems.
4.231 12 February 1998

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.

4.232 23 February 1998

1. BUG FIX:

SEACON:
- Sometimes would hang or give invalid help context values. This bug was introdced in version 4.228.

4.233 12 May 1998

1. MODIFICATION:
- SEASAVE:
  Add command line option -gd to disable DMA transfers with IEEE-488.

2. NEW FEATURES

4.234 2 October 1998

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
4.235 24 February 1999

1. BUG FIX
   - SEAPLOT:
     Fix plotting list of files bug

2. MODIFICATION:
   - ALIGNCTD:
     Align Sea-Tech, WetLabs, or Turner Fluorometer

4.236 8 March 1999

1. BUG FIX
   - DATCNV:
     Was not reading start time correctly from SBE 19 header in year 2000.

4.237 8 October 1999

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

4.238 14 October 1999

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).
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

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**4.240**    14 December 1999

1. **MODIFICATIONS**

   - Change compiler optimization options. Celltm was hanging on some PCs.

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**4.241**    3 January 2000

1. **Bug Fix**

   - **Seasave**
     Linker incompatibility with WIN98 caused Seasave to crash

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**4.242**    1 February 2000

1. **Bug Fix**

   - **Rossum**
     Year 2000 was output in the .BTL file as 1969

---

**4.243**    15 February 2000

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

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**4.244**    20 March 2000

1. **MODIFICATION**

   - **DATCNV**
     Use year from system upload time as start time. Datcnv was using the current PC system time.
4.245  20 June 2000

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:


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:

<table>
<thead>
<tr>
<th>action</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>login to internet</td>
<td></td>
</tr>
<tr>
<td>ftp ftp.seabird.com</td>
<td>start ftp session</td>
</tr>
<tr>
<td>Name: anonymous</td>
<td>login as anonymous</td>
</tr>
<tr>
<td>Password: your e-mail address</td>
<td></td>
</tr>
<tr>
<td>ftp &gt; cd /pub/seabird/OUT</td>
<td>go to the SEASOFT area</td>
</tr>
<tr>
<td>ftp &gt; dir</td>
<td>you should see 7 (or more) files:</td>
</tr>
<tr>
<td></td>
<td>manual.txt, manual.wp, readme.1st</td>
</tr>
<tr>
<td></td>
<td>sinstall.bat, ss42nnd1.exe</td>
</tr>
<tr>
<td></td>
<td>ss42nnd2.exe, versions.doc</td>
</tr>
<tr>
<td>ftp &gt; binary</td>
<td>set to image transfer!</td>
</tr>
<tr>
<td>ftp &gt; get sinstall.bat</td>
<td>this gets one file</td>
</tr>
<tr>
<td>ftp &gt; mget *.exe</td>
<td>this gets SEASOFT</td>
</tr>
<tr>
<td>ftp &gt; mget <em>.</em></td>
<td>this will get all the files</td>
</tr>
<tr>
<td>ftp &gt; bye</td>
<td>end ftp session</td>
</tr>
</tbody>
</table>

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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