
User Manual for
DST magnetic
and
SeaStar
Graphic Supporting Software

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1. Introduction

SeaStar is supporting software for the DST magnetic Data Storage Tag. SeaStar can run under Win98, Win 2000, WinXP, WinNT and Vista. This manual takes you step-by-step through the program installation, hardware connections and use of the SeaStar Program. New updates of SeaStar will be available for free download at:

<http://www.star-oddi.com/Online-Support/Software-updates/>.

Please note that the downloaded file has to be installed into the existing SeaStar folder. The update alone is not a complete program and therefore will not work like that. Follow the instructions on the update website for correct installation.

This manual guides the users of DST magnetic through the operation of the recorder. Setting the operating parameters as well as data retrieval requires access to a PC computer with a standard RS-232C serial interface or USB.

DST magnetic is a compact microprocessor-controlled compass, tilt, temperature and depth recorder with electronics housed in a waterproof ceramic housing.

The sensors are located as shown on the diagram below.

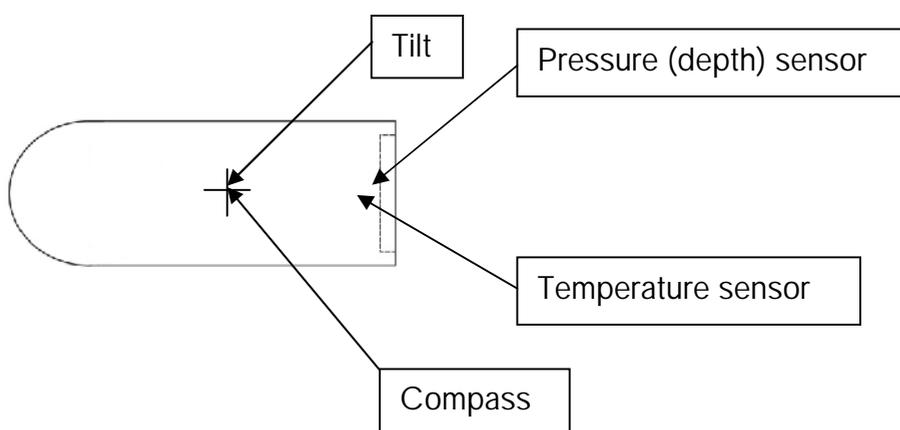


Figure 1.1 DST Sensors

It is extremely important that the area is kept free where the pressure sensor is, to allow free flow of water/liquid to the temperature and pressure sensors. Please note that the pressure sensor membrane is

fragile, and objects should not be pressed against it, as it might cause damage.

1.1 Install

The installation program is on the SeaStar CD. Insert the CD into your compact disc drive. To install the program, follow the automatic InstallShield Wizard.

Follow the instructions on the screen. You will be prompted for a directory name for your SeaStar program.

1.2 Uninstall

To uninstall the program, do the following:

1. Click on the Start button in Windows.
2. Go to Settings and Control Panel.
3. Choose Add/Remove Programs.
4. Choose SeaStar and click on Change/Remove, and 'Yes to all'.

2. Preparation

This chapter describes preparations that should be carried out before connecting to the recorder.

Start SeaStar and the following window appears:

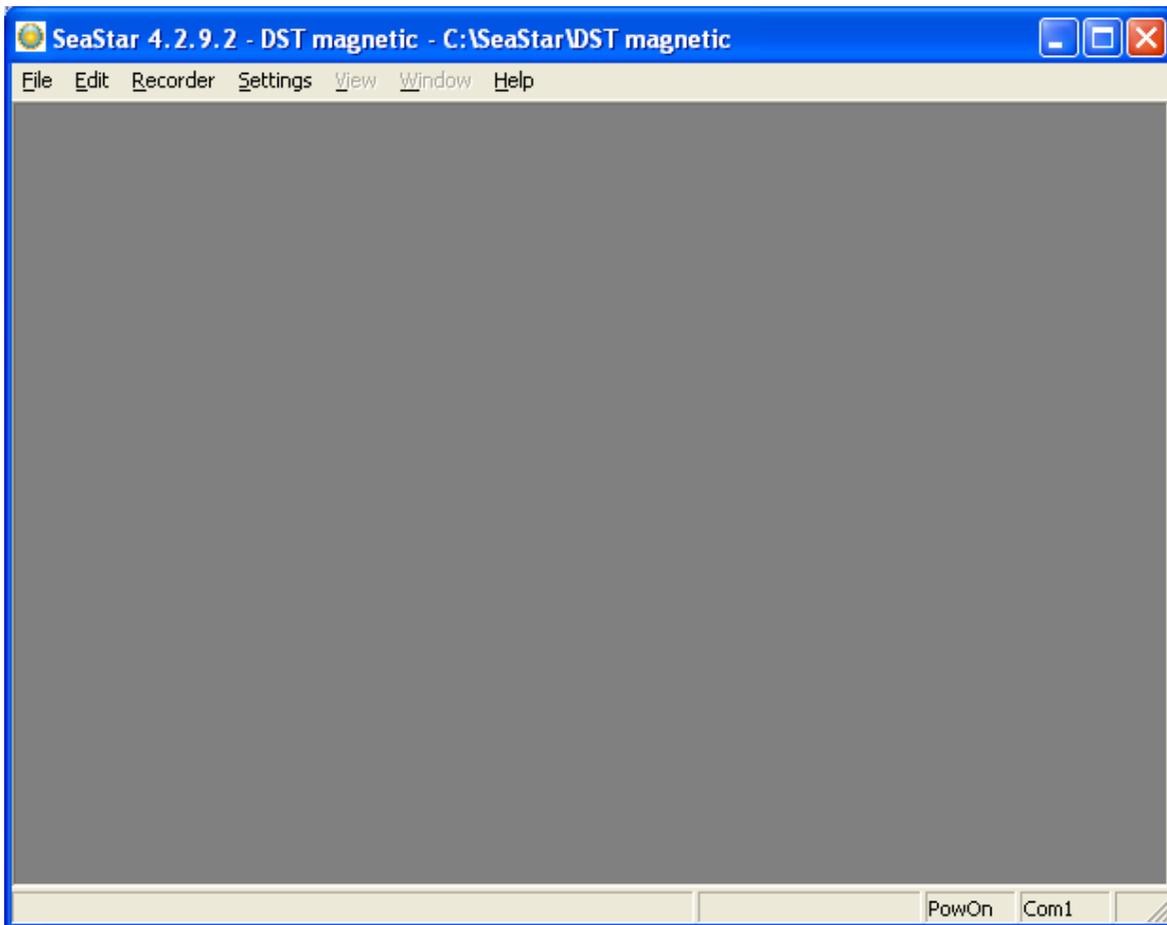


Figure 2.1 SeaStar Main Window

2.1 Select Recorder Type

SeaStar is compatible with other Star-Oddi instruments. A recorder type must be selected before connecting to the recorder. The default setting in the software is set to Starmon mini as a recorder type. Change the recorder type to DST magnetic by doing the following:

1. Choose the File menu and the New Recorder Type command.
2. Select DST magnetic as a recorder type.

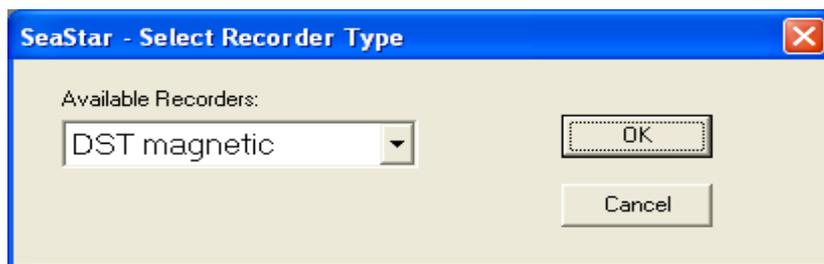


Figure 2.2 Select DST Magnetic as Recorder Type

Before connecting to the recorder, it is important that the clock on the PC computer is correct. This is important since the recorder automatically downloads the PC clock settings.

2.2 Configuration of the Communication Port

It is necessary to define which serial port on your PC computer you will use for connecting the Communication Box. This is done in the following way:

1. Choose the Communication command in the Settings menu.
The Communication definition dialog box appears.
2. Select a serial port for communications.
3. Choose the OK button.

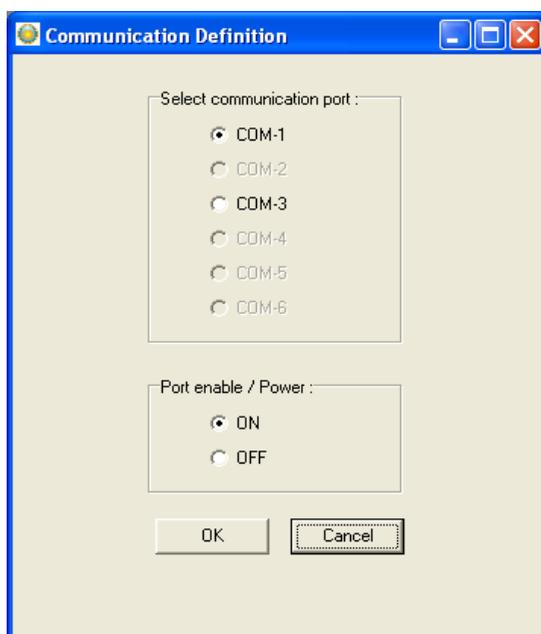


Figure 2.3 Communication Port Configuration

To check which communication ports are available on your computer, open your Device Manager. On Windows XP you can do it following way: Control panel > system > hardware > device manager.

Under Ports you can view all available ports. Make sure that the port you are intending to use is enabled: right-click on the appropriate port and select properties. Under 'Device usage' it should state 'use this device (enable)'.

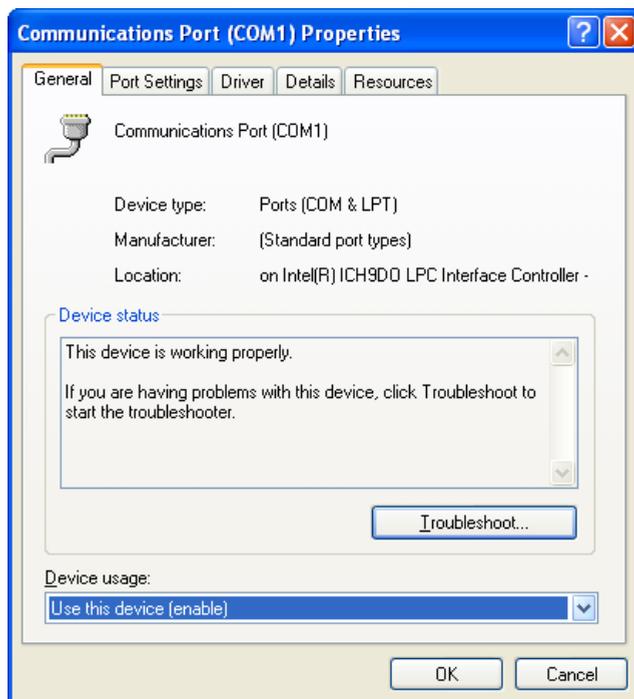


Figure 2.4 Enable Communication Port

2.3 Using the USB Serial Converter

If you are using the USB serial converter you will need to install the driver first that comes on the provided CD. Please, read the 'Quick Installation Guide' booklet to get further instruction on how to proceed.

After you plug in the USB cable you will see a new communication port in your device manager, called 'Prolific USB-to-Serial Comm Port'. Make sure that the port is enabled and select the appropriate port in SeaStar.

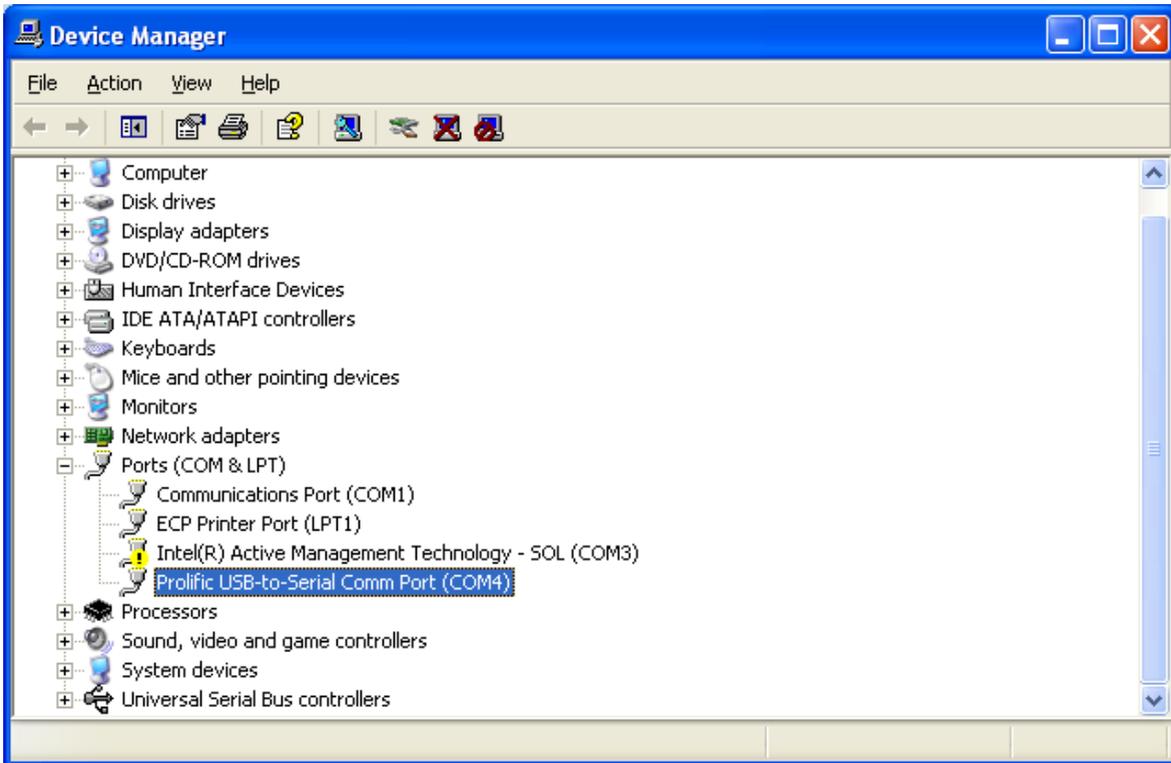


Figure 2.5 USB Communication Port in Device Manager

3. Communication Box

This chapter provides details concerning the Communication Box and how to place recorder in the box prior to connection.

3.1 Communication Box

The DST Communication Box is a PC-RS-232C compatible communication interface, specially designed to communicate with DST recorders wirelessly via RF (radio frequency). A USB serial converter plug can optionally be used with the Communication Box.

The Communication Box has three diodes:

1. Red – shows that power is fed from the power supply to the Communication Box.
2. Yellow – shows that SeaStar has made connection with the box, the appropriate DST has been selected as a recorder type and that correct COM port has been selected.
3. Green – shows that recorder is in correct position for seeking connection.

Connect the serial cable between the serial port of the computer and the Communication Box. Plug the power supply connection to a power-socket. The voltage from the power supply should be set to 9V, although there is no damage to use up to 20V. Before inserting the power plug into the box, it is important to note that the polarity should be:

-(O+ (minus on the outside and the plus on the inside)

The polarity is usually shown where the arrows meet on the power plug, and the power supply. After the power supply has been connected to the Communication Box, the red light should be on. After SeaStar has been started, the yellow light should be on (if correct COM port is selected).

The box will power the recorder while communicating with the PC. In case the battery is dead, the PC and interface are still able to connect to the recorder and retrieve data.

3.2 Connection Point

In order to get the green light, the red and the yellow light must be on. The recorder is inserted into the hole of the box as shown in the figure below:

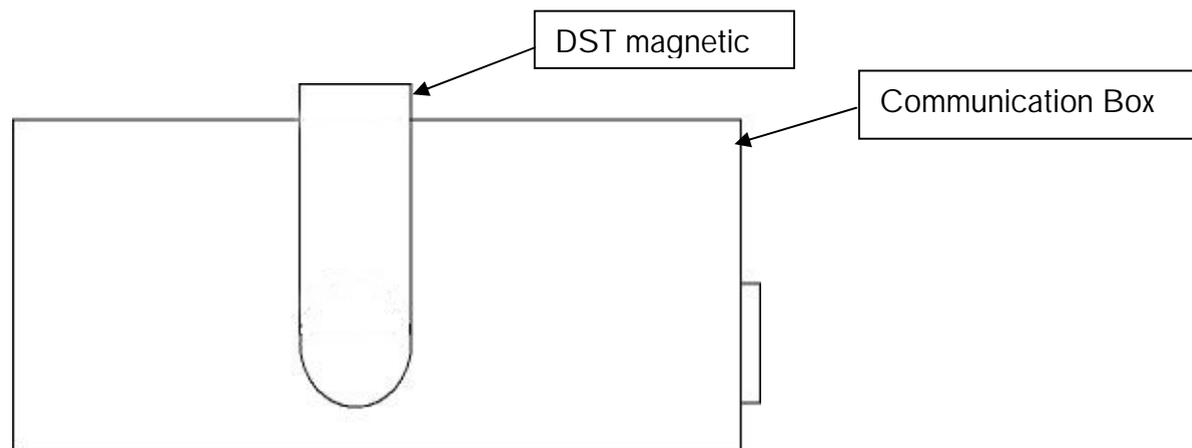


Figure 3.1 Inserting Recorder into the Communication Box

If the recorder has been recording in the waters, then please wipe it dry before inserting it into the box. The spherical end of the recorder faces down and flat end faces up. Recorder is rotated until the green light illuminates.

When green light is on, communication can be established with the software. For best connection conditions, recorder is placed in the middle of the area where the green light is on.

For our latest products we have added a mark on both the housing and the Communication Box to help finding the right position. Simply turn the logger until the small grey mark on top of the sensor meets the marking that is drilled into the surface of the Communication Box.

If the recorder fails to connect, please refer to the Troubleshooter.

3.3 COM Connection

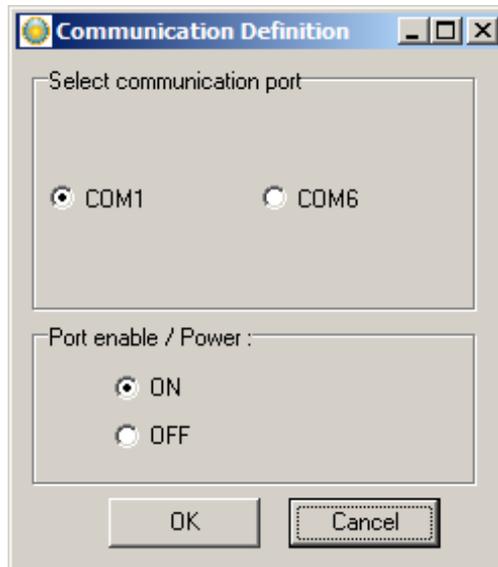


Figure 3.2 Communication Definition

Choose Settings-Communication-Serial Ports to display available ports. Com ports up to COM255 can be selected.

3.4 Connection Wizard

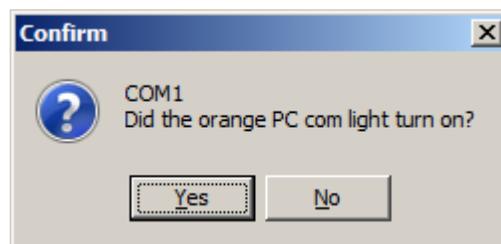


Figure 3.3 Connection Wizard

Choose Help-Wizards-Connection to enter the connection wizard. The wizard goes through available ports and activates them one at a time and asks the user to confirm that the communication box displays an orange light.

4. DST magnetic

4.1 General Description

The DST magnetic measures additionally to temperature and depth, compass heading of the DST (with reference to the magnetic north) and tilt in 3-D three directions (with reference to the Earth gravity). Tilt range is $\pm 180^\circ$ for each of the three axis X, Y and Z. The magnetic field is measured in three directions providing a relative reading of the magnetic field strength at each point.

Compass heading measurements are compensated with the tilt measurements. This enables good tilt compensation on compass heading and thus more accurate heading readings.

The diagram below shows the measuring directions of the sensor relative to the DST housing. In this position the heading (nose of housing) is Northeast (45°).

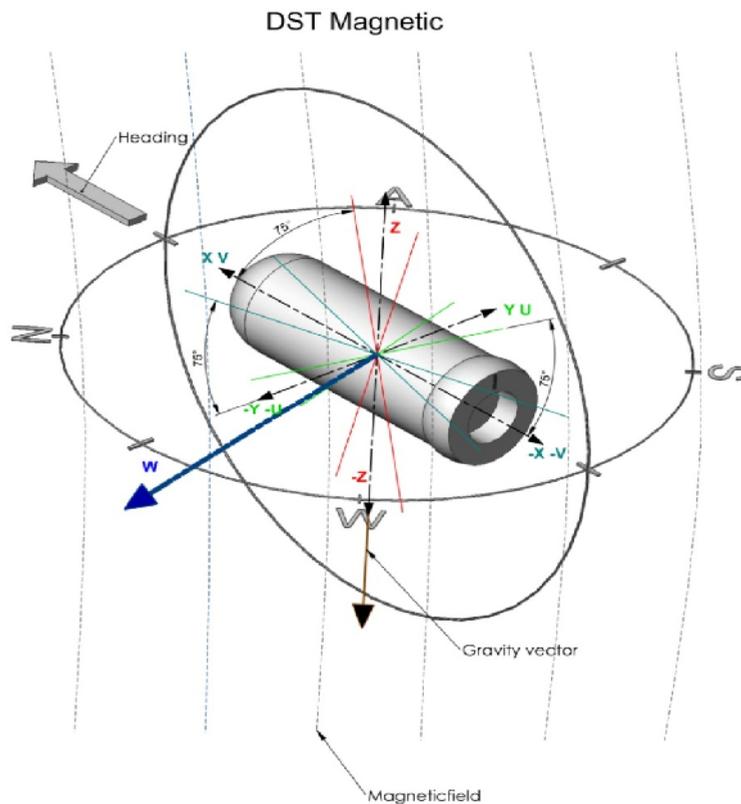


Figure 4.1 DST Magnetic

The performance of the DST magnetic is optimal when it is placed in the horizontal plane, the further the magnetic pitches and/or rolls from the horizontal plane the larger the error reading becomes. However the 3-D tilt measurements compensate for the pitching and rolling, minimizing the compass heading error, which can be +/-15° worst case when pointing directly up/down.

To optimize the compass heading accuracy, the recorder needs to be placed horizontally on the subject, having the nose facing in the same direction as the subject is moving (for example if the DST is attached to fish, the nose of the DST should face in the same direction as the nose of the fish). Normally the two holes should have the same distance from the flat plane and housing text (DST magnetic or specified text) face up. A mark on the end of the recorder's flat end should face directly up. The data are shown in degrees:

0° = North
90° = East
180° = South
270° = West

Other measurements in between, like 45° would mean N/E etc.

In the SeaStar software you can define if the data point resolution of the magnetic measurements should be 4 point, 8 point or 16 point degree. This is defined under 'Settings - Preferences - Units'.

4.2 Hands On Description

DST magnetic is calibrated at Star-Oddi, but it's possible that the sensor's direction may differ slightly in other surroundings, including underwater environments. Therefore it is recommended that the user performs reference measurements at the beginning of a measuring period. For that purpose, please synchronize your own clock with the PC computer's clock, to see in which directions the recorder is placed at each time. If you have a standard compass meter, it would be useful to do some comparison measurements.

Also because the horizontal and vertical components of the earth's magnetic field vary considerably in different locations it is possible to calibrate the compass in SeaStar, under 'Edit - Reconvert Definitions -

Compass Definitions' and put in an offset value for declination (more on pages 47-48).

To understand declination it should first be realized that there are two North Poles. There is a True Geographic North Pole at the top of the world, and a Magnetic North Pole which is over 1,250 miles from the True North Pole. A magnetic compass like DST magnetic always points toward the Magnetic North Pole. Maps are oriented to the True North Pole. The angular difference between True North Pole and Magnetic North is called declination. Declination varies from 0 to 30 degrees in most populated regions of the world. These declination values usually change slightly over time, as the Earth's plates shift. The actual value of declination can be found on the internet (The declination value can be found at www.ngdc.noaa.gov/geomagmodels/struts/calclGRFWMM). This will be expressed as either an Easterly or Westerly declination, depending on your location.

The date-time, latitude and magnetic field vector should be noted at release and recapture point. That information can be put in the SeaStar software under 'Edit – Reconvert Definitions – Deploy/Retrieve Location'. To correct/improve the tilt and magnetic field calculations the user should enable that option. This will give more accurate compass and tilt data.

5. Using DST magnetic - Tutorial

This chapter guides users in 8 quick steps through the process of utilizing SeaStar to set up DST magnetic prior to recording and data retrieval.

5.1 DST magnetic Set Up

Step 1 - Start Program

Start SeaStar as described in chapter 1. Remember to carry out the software preparation outlined in chapter 2.

Step 2 - Connect

Connect the Communication Box as described in chapter 3. Insert DST magnetic into the hole in the box, and twist the recorder until the green light illuminates on the box.

Step 3 - Connect to the Recorder

Choose the Recorder menu and the Connect command. A window appears with information on the recorder's mode, example:

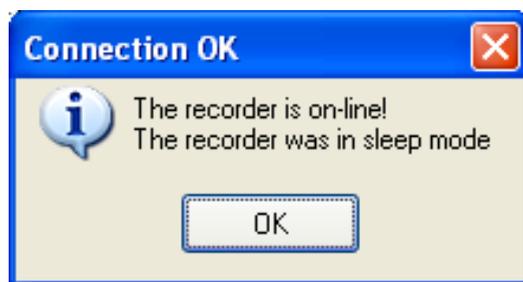


Figure 5.1 Connecting to the Recorder

Press OK. The Recorder is now on-line, as indicated at the bottom of the SeaStar window.

Connection Time Registration

Each time SeaStar connects to a Recorder, the PC time and recorder time is registered to a binary file, with a CLK extension. This information is also saved to a text file with the extension CCT.

Another text file is created with the extension CCD, containing various information, for example on previous connection and time comparisons, depending on the status of recorder.

If a previous CCT file exists and the recorder was in sleep or slumber mode, a PC vs. recorder clock comparison is calculated, indicating difference in seconds and ppm.

If the recorder was in measurement mode, then a drift calculation is performed, based upon PC-time comparison to the recorder's clock and measurement sequence.

The RIT file contains partly the same information as the CCD file.

Upon retrieving data from a recorder and converting the data, the last measurement retrieved time and the next scheduled measurement time is compared to the PC time. The results are added to the CCD file and the MIT file.

Note: If the retrieved number of data does not match the last measured number of data, erroneous results are to be expected.

Step 4 - Set New Measurement Parameters

(If the recorder has already been set up to record data and you want to retrieve data, go directly to step 6).

Choose the Edit menu and the New Measurement Sequence Definition command. The following window appears:

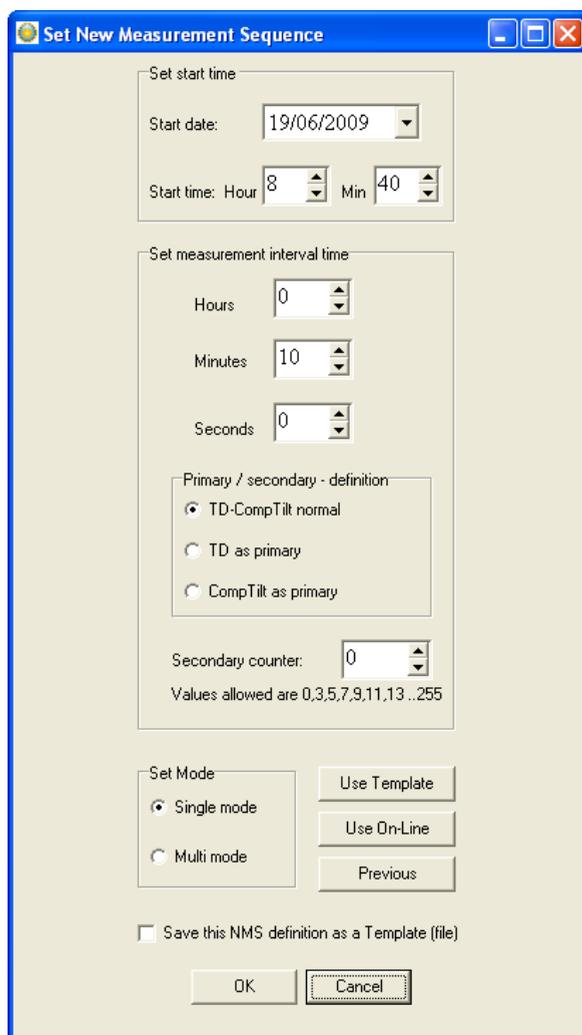


Figure 5.2 Measurement Sequence Definition

Select the start time of recordings (date-month-year, hours-minutes).
Set the sampling interval (hours-minutes-seconds).

With default settings, Temp-Depth (TD) and CompTilt will be recorded at each sampling (TD-CompTilt normal). The user has the option to select either TD or CompTilt as a primary sensor. The objective with this feature is to save memory size, increase recording period, and get more data on the sensor that is of more interest (primary sensor). In this case, a secondary counter can be defined, which can only be odd numbers. If for example CompTilt is selected as a primary sensor, and the number 3 is defined as a secondary counter, then TD will only be recorded every third time when CompTilt is recorded, and the majority of the memory is used for CompTilt recordings. If CompTilt is set as primary and secondary counter to 0, then it is only making Comp-tilt recordings, even though the first recording is always a CompTilt-TD measurement.

If the user wants to program several recorders with the same sampling interval and start time, it is recommended to select Multi mode. By choosing Multi mode, the settings are fixed; giving each recorder connected to thereafter, the same settings. The recorders connected to, following the first recorder, automatically get the same settings as the first recorder. This saves time in the programming process. For programming more than one sampling interval, please refer to chapter 9. Multiple Intervals.

The three buttons Use Template, Use Sequence, and Previous are not commonly used, but can be handy when wanting to use a previously programmed sequence. To read more about templates see chapter 8.13.

After the settings have been selected, press the OK button.

Step 5 - Start a New Measurement Sequence

To set the recorder in Measurement Mode (start recording), choose the Recorder menu and Start New Measurement Sequence command. A window appears on the screen in order to verify the settings to be downloaded into the recorder, example:

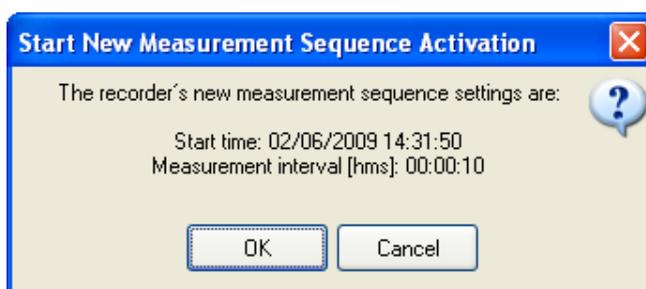


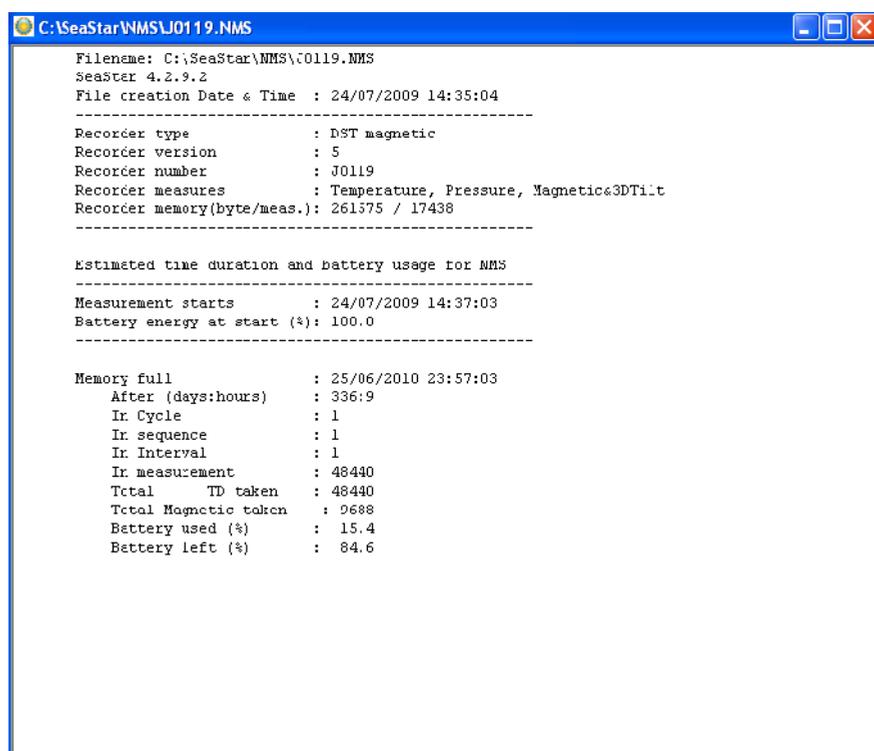
Figure 5.3 Start New Measurement Sequence

Press OK and the recorder will be in Measurement Mode.

NMS Calculation

Upon setting up a NMS the estimated measurement sequence is calculated and memory and battery energy usage predicted. The results are written to a text file, bearing the recorder name with a NMS extension. If a recorder has not been selected then the file bears the recorder type name, still the NMS extension.

The file is placed in the SeaStar\NMS directory. An example of the *.NMS file is shown in fig. 5.4.



```
C:\SeaStar\NMS\J0119.NMS
-----
Filename: C:\SeaStar\NMS\J0119.NMS
SeaStar 4.2.9.2
File creation Date & Time : 24/07/2009 14:35:04
-----
Recorder type      : DST magnetic
Recorder version   : 5
Recorder number    : J0119
Recorder measures  : Temperature, Pressure, Magnetic&3DTilt
Recorder memory(byte/meas.): 261375 / 17438
-----

Estimated time duration and battery usage for NMS
-----
Measurement starts : 24/07/2009 14:37:03
Battery energy at start (%): 100.0
-----

Memory full      : 25/06/2010 23:57:03
After (days:hours) : 336:9
Ir. Cycle        : 1
Ir. sequence     : 1
Ir. Interval     : 1
Ir. measurement  : 48440
Tctal TD taken   : 48440
Total Magnetic token : 9688
Battery used (%)  : 15.4
Battery left (%)  : 84.6
```

Figure 5.4 Results from NMS Calculation

When starting the recorder in a NMS, the *.RDT file shows the sequence settings, plus information on the sequence time duration and battery usage (same as in the *NMS file).

Step 6 - Retrieve Data

Choose the Recorder menu and the Retrieve Data command. Data will be uploaded from the recorder and presented in graphical and tabular form. With default settings, SeaStar automatically creates a sub-directory in the Seastar directory, named DST magnetic. In the DST magnetic directory, a directory named after the recorder's serial number (Qnnnn) is created. All files related to the recorder are automatically saved in the serial number directory. The default data directory can be viewed in the Settings menu, and Directories. The user has the option to define a new data directory path if desired.

The data is retrieved in a non-destructive manner. This means that you can repeatedly read the data without erasing it from the memory. Each time data is retrieved, a new file will automatically be created. The name of the data file consists of the measurement sequence number and the serial number of the recorder. The recorder cannot be loaded with new settings if it contains data that has not been retrieved. This is a safety feature

which prevents data from being accidentally lost. New recordings overwrite previous recordings that have been retrieved.

Step 7 - Disconnect

After the recorder has been set up for measuring, it should be removed from the Communication Box. If the recorder is not put in measurement mode, it will automatically go into sleep mode when removed from the box.

If you simply remove the tag SeaStar will still have the recorder in on-line mode in the program and won't allow selecting another recorder or using certain options. Select Recorder > Disconnect to go into off-line mode.

Step 8 - View Data

If data is retrieved from the recorder, a new file will automatically be created and opened in graphical and tabular form. To open existing data files on the computer, choose the File menu, Select Recorder command, and then the Select Measurement command. When a data file has been opened, a new window appears with the data shown as a chart and a table. The next chapter will describe in detail how to view and process data.

6. View Data

This chapter describes how to open a data file and the options available in SeaStar for viewing the data.

6.1 Open Data

To open an existing data file that has already been retrieved, do the following:

1. Choose the File menu and the Select Recorder command. When a recorder has been selected, its serial number will be displayed in the blue top bar of the software.
2. Select the data file by choosing the File menu and the Select Measurement command.

The name of the data file consists of the measurement sequence number (number of times the recorder has been set up to measure) plus the serial number of the recorder. The 'Measurement sequence no.' can also be seen at the bottom in the SeaStar window. When the data file (.mid) has been selected, the chart and data tables are opened. The following figure shows a chart and data table which have been opened:

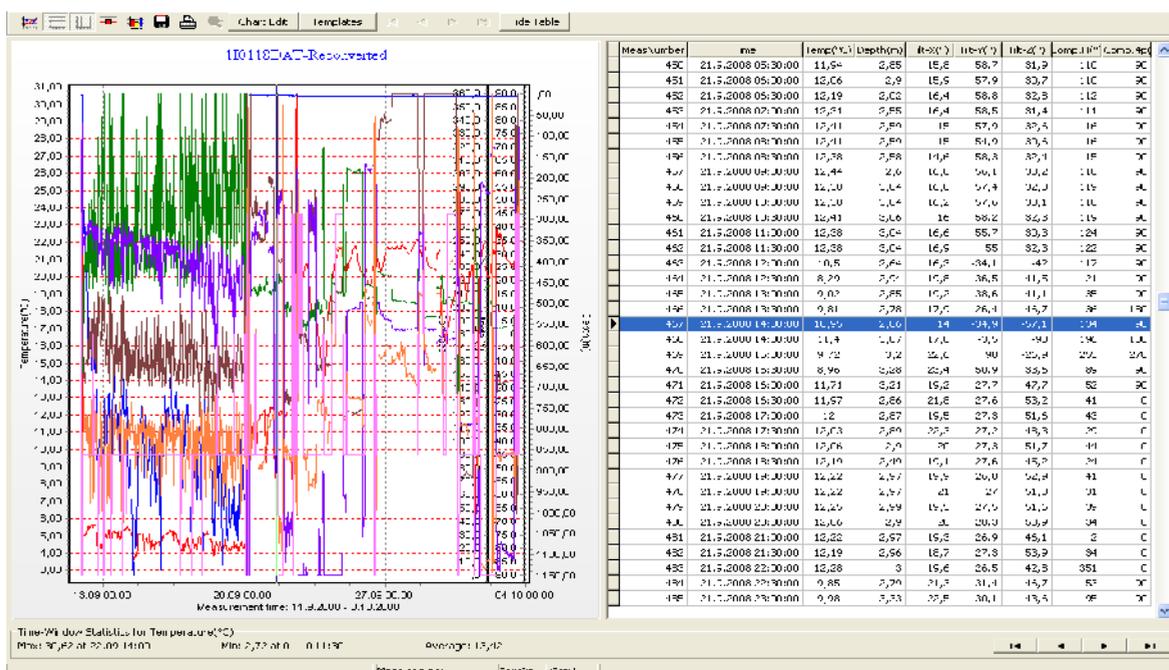


Figure 6.1 Chart and Data Tables of an open File

Import

Data files from other recorders than DST can be imported into SeaStar and viewed as charts and tables. The imported file must be a text file with the extension DAT, and with SeaStar's conventional DAT file structure. See more about data files and headers in the Appendix.

Buttons

When the chart is opened, buttons related to the chart are displayed.



Active Series List

This button can be useful when working with a multi-sensor recorder, in order to select which parameters to display in the chart.



Horizontal/Vertical Gridlines

These two buttons give the option of hiding/displaying the horizontal/vertical gridlines in the chart.



Data Point Marker

This button gives the option of displaying/hiding data points in the chart.



Histogram

The graph can be shown as histogram, showing various data statistics.



Save Window Data

Retrieved data is automatically saved, but if changes are made with the graph, for example with the time scale, the save button enables the user to save the graph (as a DAT file).



Print

The chart can be printed. Please see chapter 7 for more details.



Data Zoom

This button adjusts the axis in order to display all data within the zoomed timeline.



Chart Edit

By clicking this button, the following window appears:

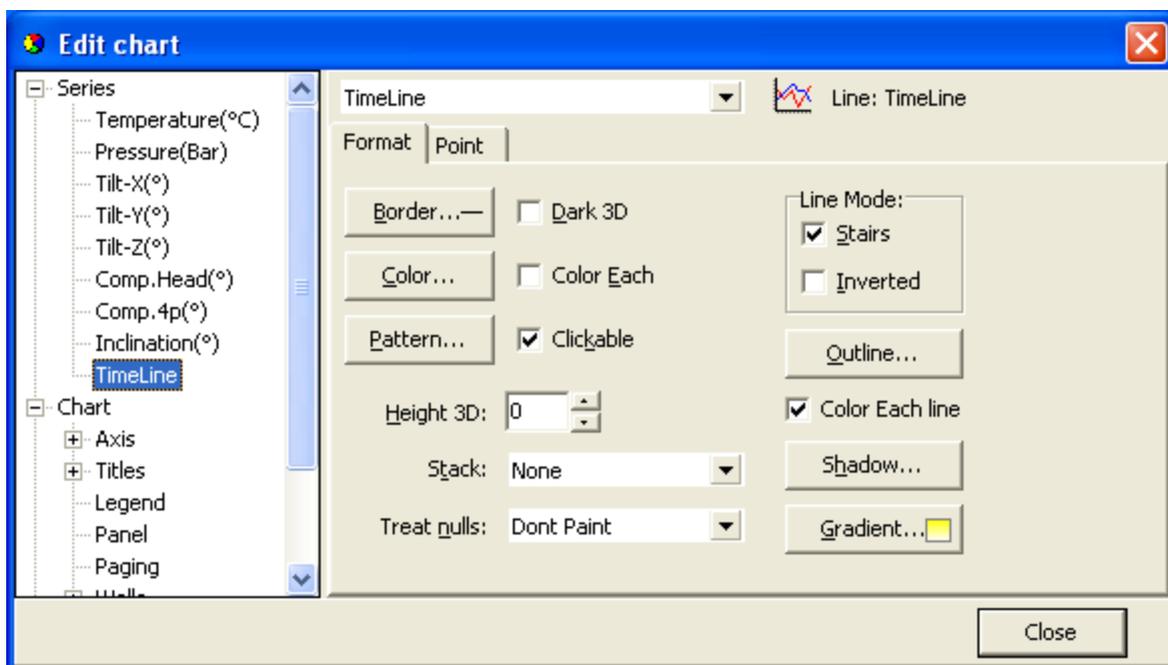


Figure 6.2 Editing Chart

This button gives several options regarding the look of the graph. The axis can be defined (max and min), titles and legend can be set visible. Under 'Panel' the color of background, borders and gradient can be selected. Under 'Walls - Back' the colors and gradient of the graph itself can be selected. The 'Visible' option must be enabled to activate the features. The graph can be exported in formats as jpg, gif, bitmap, metafile, pdf, htm and svg.

A rectangular button with a light beige background and a thin black border. The text "Templates" is centered in a dark grey font.

Templates

If the changes have been made to the graph under 'Chart Edit', it is possible to save that template. It is also possible to load a previously saved template.

A rectangular button with a light beige background and a thin black border. The text "Hide Table" is centered in a dark grey font.

Hide/Show Table

The data table can be either displayed or hidden using this option.

Using the Mouse

Max and Min Values

Click once on any line in the chart, and the maximum and minimum values for that line (sensor) are now shown. A straight vertical line should be visible in the graph (to the left). By clicking on this line and holding the left button on your mouse down, the line can be dragged through the chart and the data table will scroll along with the position of the line.

Zoom

The chart can be zoomed in by holding down the left button of the mouse, and using the cursor to create a box to the right, around the desired area to zoom in on.

Scroll the Chart

The chart can be scrolled upward, downwards and to the sides, by holding down the right button of the mouse and moving the cursor in the desired direction.

Go Back to Initial View

To go back to the initial view of the chart, simply hold down the left button of the mouse and make a box to the left with the cursor. The position of the box on the chart is irrelevant.

Change the Axis

By double clicking on the X and Y-axis, the measurement time and temperature/depth range can be changed.

Change the Title

To change the title of the chart, double click on the title of the chart

6.2 The View Menu

When a recorder has been selected, the files in the View menu can be opened.

Data Trend and Table

This view is automatically selected when data is retrieved or a data file is opened. If the chart is closed, but a recorder has been selected, this command can be selected to view the chart. The software will open the latest chart that was viewed for that recorder.

Recorder Information (RIT)

This is a text file containing basic information about the recorder, serial number, production date, estimated battery life etc.

Recorder Calibration Information (RCI)

This text file contains information about the calibration constants of the recorder, calibration range of the parameters. The range is both showed as decimal values (DV) and unit values (UV). The survival depth of the recorder is also shown.

Recorder Download Information (RDT)

This text file contains information about the measurement sequence that was last downloaded into the recorder, including the start time, sampling interval and the measurement sequence number.

Viewing Text Files

Under <View\Text files> the user can select a text file, via a file browser, for viewing.

This option is meant to give the (advanced) user a chance to view files that are not directly supported for viewing in SeaStar, but are a part of the SeaStar documentation system.

The files that the file browser accepts must have the following extensions:

- TXT
Frequently, users copy SeaStar data to text processors and spreadsheets, like Word and Excel, and later save the data as TXT files for viewing in other applications.
- INI

There are a number of INI files that SeaStar uses for store settings. These files are described in the Appendix under 'Information files'. The latest members in the INI files family are the Template files.

- DAD
This is the original data file. It contains the raw data (in Ascii format) retrieved from recorder. The DAD together with the MID are converted to the DAT file.
A word of warning: The DAD file should never be tempered with, as that might give cause to erroneous data conversion.
- CCT
Every time SeaStar connects to a recorder, the PC time and the recorder's clock data are stored in a <recorder name>.CCT file.
- CCD
Every time SeaStar connects to a recorder, the PC time and the recorder's time are compared to the last CCT, if found, and stored in <recorder name>.CCD file, <measurement sequence name>.CCD.
- NMS
Upon completion of a NMS editing session, estimation of memory and battery usage is calculated and the results placed in a NMS file, which is then displayed to the user.

SNMS LOG File

To improve the "Start New Measurement Sequence", SNMS, indication/registration of success or failure, a log file for each recorder type is placed in the SeaStar directory.

The log file name, for DST magnetic, is DSTJ.LOG, i.e. the same naming convention as for the type INI files.

Each time a SNMS is performed then the appropriate LOG file is updated.

The LOG file can be viewed via "View\SNMS Log file (LOG)".

In addition to the LOG file, if an error occurs during the SNMS, the MDD file is created as a text file, with a description of what went wrong. This MDD file is displayed as a clear message for the user as shown in figure 6.3.

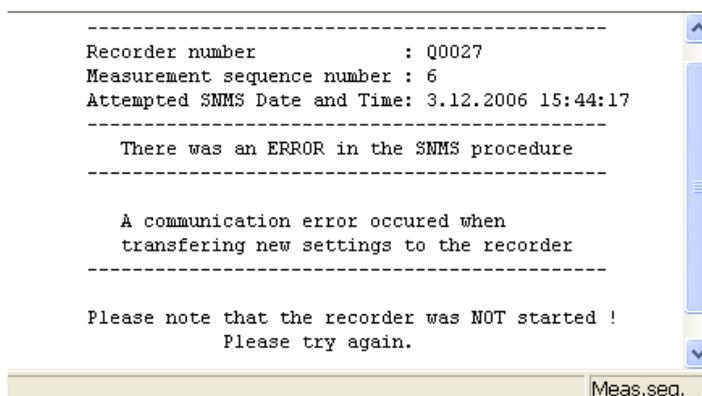


Figure 6.3 The MDD SMNS Error Message

Usually the MDD file is a binary file, and the MDT is created from the MDD. If the SNMS is repeated successfully the MDD file is overwritten and the MDT file created.

Measurement Data

Measurement Download Information (MDT)

This text file contains information on data downloaded into the recorder for the measurement file being viewed, including the start time and sampling interval.

Measurement Information (MIT)

This text file contains information concerning the measurement upload time, start date, start time and number of measurements in the measurement data file.

Conversion Information (CIT)

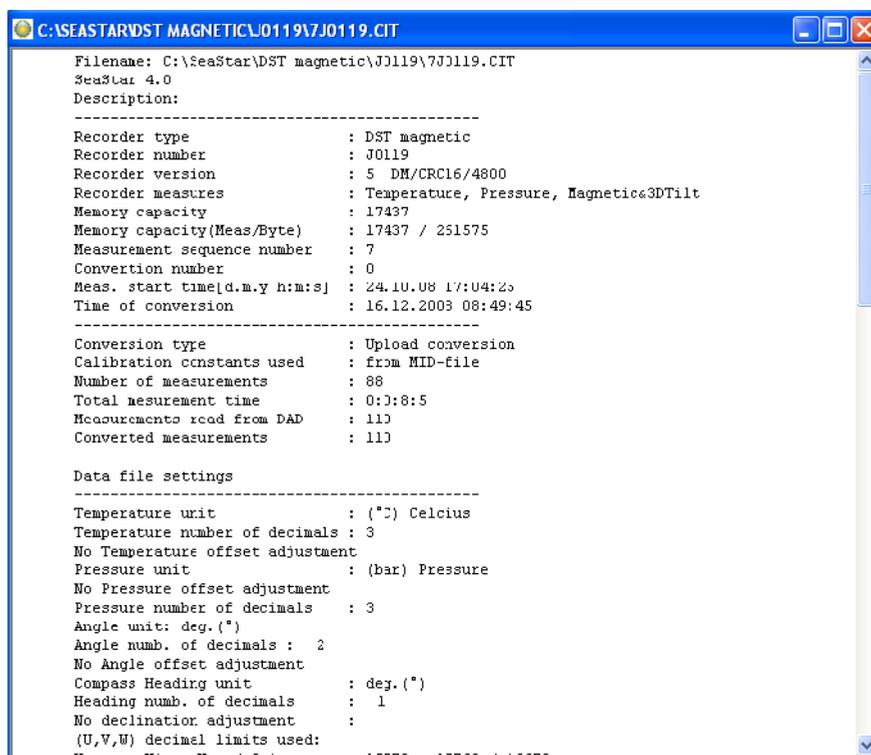
This text file contains conversion information on the units and the data file format.

Statistics in CIT

The CIT has been enhanced with more detailed information on the converted data.

As can be seen in figure 6.4, the statistical data, that have been tabulated, are split into two sections, the Unit values statistics and the Decimal value statistics. Values are given for each parameter. The file can be viewed under 'View\Measurement Data\Conversion Information (CIT)'.

A one line description/comment is available for the user to fill out in the Reconvert data menu. This description is placed in line two of the CIT file.



```

C:\SEASTAR\DST MAGNETIC\J0119\J0119.CIT
-----
Filename: C:\SeaStar\DST magnetic\J0119\J0119.CIT
SeaStar 4.0
Description:
-----
Recorder type       : DST magnetic
Recorder number    : J0119
Recorder version   : 5 DM/CRC16/4800
Recorder measures  : Temperature, Pressure, Magnetic&3DTilt
Memory capacity    : 17437
Memory capacity(Meas/Byte) : 17437 / 251575
Measurement sequence number : 7
Conversion number  : 0
Meas. start time[d.m.y h:m:s] : 24.10.08 17:04:23
Time of conversion : 16.12.2008 08:49:45
-----
Conversion type    : Upload conversion
Calibration constants used : from MID-file
Number of measurements : 88
Total measurement time : 0:0:8.5
Measurements read from DAD : 113
Converted measurements : 113
-----
Data file settings
-----
Temperature unit   : (°C) Celcius
Temperature number of decimals : 3
No Temperature offset adjustment
Pressure unit      : (bar) Pressure
No Pressure offset adjustment
Pressure number of decimals : 3
Angle unit: deg.(°)
Angle numb. of decimals : 2
No Angle offset adjustment
Compass Heading unit : deg.(°)
Heading numb. of decimals : 1
No declinator adjustment :
(U,V,W) decimal limits used:

```

Figure 6.4 Statistics in CIT File

Out of Range (OOR)

This text file lists all the measurements that were outside decimal value calibration range, as well as the unit value range. If correction has been performed according to the user definition, then the corrected values are shown. See more in chapter 8.7.Out of Range.

Binary Data (DAB)

This file contains raw data of the measurements in the data file. Calibration files are not calculated into the data.

View DAB Files as Trend

When converting the DAD -> DAT the DAB file is created simultaneously. The DAB shows the recorder's native data, i.e. decimal values in the range 0-4095. These values originate from the recorders 12 bit ADC (Analog to Digital Converter).

It can be of interest to view the data in its native form, for example to spot saturation/out of range intervals.

The DAB can be viewed graphically as a trend via: 'View\Data Trend and Table\Decimal (Binary) data (DAB)' (figure 6.5).

SeaStar cannot view older DAB files, and will inform the user to that effect, if an attempt to view an older DAB file is performed. By reconverting the data, a viewable file is produced.

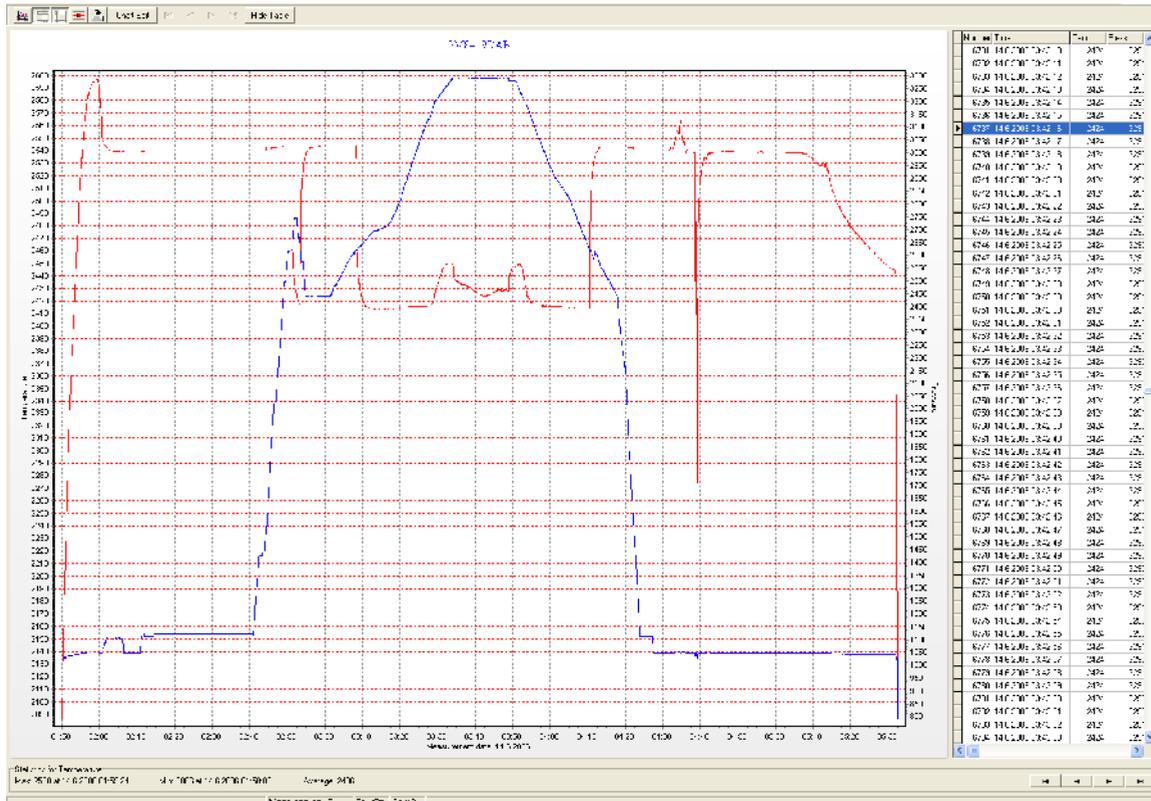


Figure 6.5 DAB Trended

Converted Data (DAT)

This is the text file for the converted data. The DAT file as well as the other text files can be opened in other programs (Excel, Notepad, Word etc.).

Time Synchronise Data (TSD) and Rate of Change (ROC)

If the TSD and/or ROC file creation has been enabled under the Settings menu, then it's possible to view these files.

You can find more in chapter 8.8 TSD and chapter 8.9 ROC.

You can find more about files in chapter 13. Appendix.

SeaStar Log

SeaStar stores events in the file <SeaStar.log>. The events are:

- Recorder Connected
- Retrieving data from a recorder
- Uploading a measurement sequence to a recorder
- Recorder disconnected.

This file can be opened in SeaStar under <View/SeaStar Log> or by opening it with a text editor.

6.3 Opening Data in Excel

When retrieving data, the SeaStar software automatically creates a text file with the data, called *.DAT. This text file can be opened in Excel and in other programs.

Under the 'Settings' menu, 'Preferences – Data File Format', the default factory settings is set to 'joined date and time'. If this option is not disabled, the following is performed, for opening data in Excel:

1. Excel is started.
2. The *.dat file is found from 'File/Open'.
3. Excel comes up with the 'Text import wizard'. This is a three step process:
 - a. No changes should be made in first step, so press the next button.
 - b. 'Text qualifier' should be set as 'None'. Press the next button.
 - c. Column 2, that is date and time, is set as 'Text'. Press the finish button.
4. You can now create the graph with columns B, C and D.

7. Printing

All charts and text files can be printed from the SeaStar software. Choose the File menu and the Print command. If a chart is in the active window, the following dialog box appears:

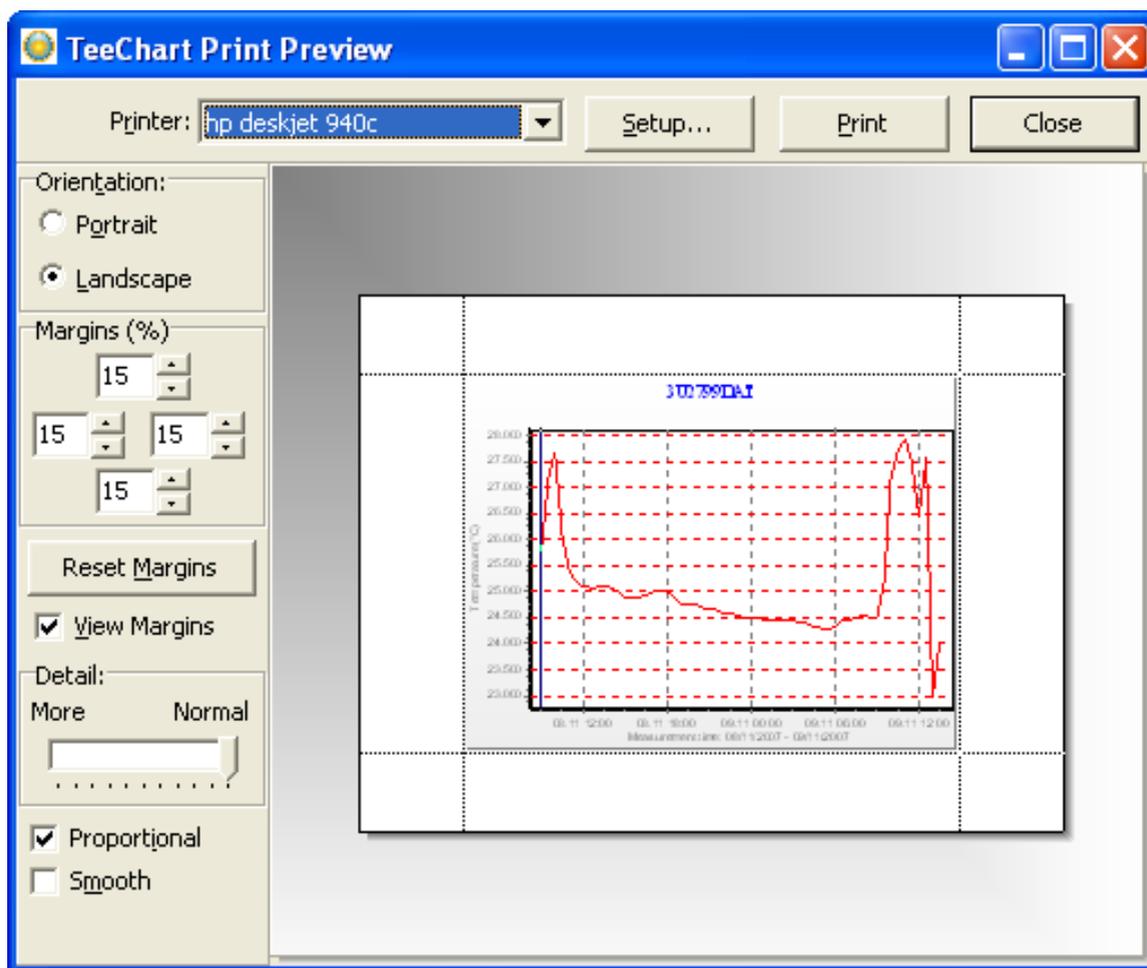


Figure 7.1 Print Dialog Box

7.1 Orientation

The chart can be printed in either portrait or landscape format.

7.2 Margins

By changing the margins, the chart's length and width can be re-scaled. The margins can be varied by either changing the numbers given for the

left, right, top and bottom margins, or by moving the margin lines with the mouse by pressing and holding the left button as the lines are dragged.

7.3 Move

When the cursor is located on the chart, a hand becomes visible. By clicking on the graph and holding down the left button of the mouse, the graph can be moved around the page to a desired position.

7.4 Details

The size of horizontal and vertical gridlines as well as the texts on the X and Y-axis can be re-scaled by using the scroll bar. The number of gridlines is increased when the bar is moved to the left.

8. Settings

This chapter describes the options in the Settings menu. These settings are automatically saved when exiting the program.

8.1 Directories

The path definition can be set as Default SeaStar path structure or User defined paths. Choose the Settings menu and the Directories command. A dialog box appears:

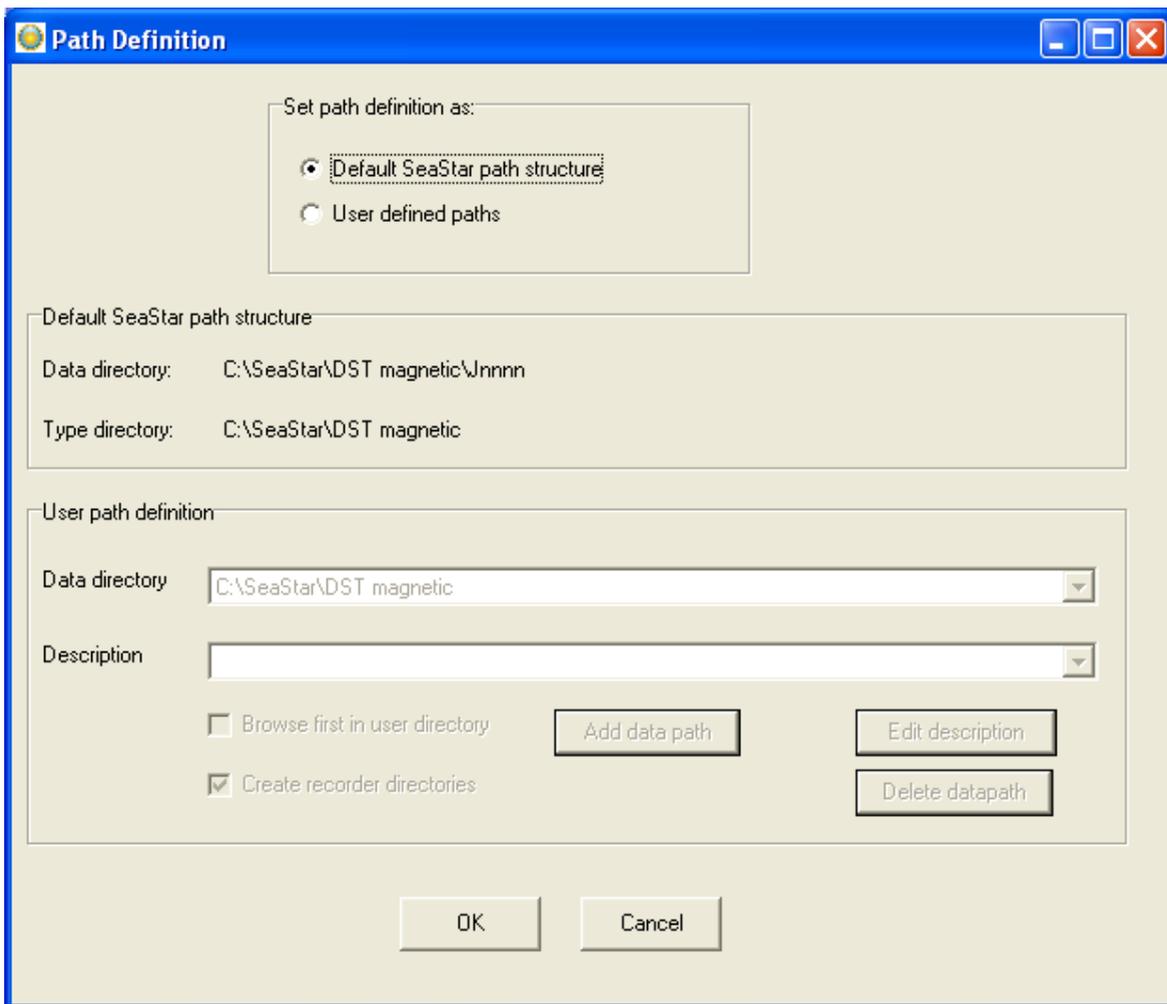


Figure 8.1 Directory Path Definition

Default SeaStar Path Structure

By choosing DST magnetic as a recorder type, SeaStar automatically creates a 'DST magnetic' type directory in the 'SeaStar' directory that

was created when the software was installed on the computer. Upon connection with DST magnetic, another directory is automatically created in the 'DST magnetic' directory, which is named after the serial number of the recorder.

All data files and other files related to that recorder are stored in this 'serial number' directory. Each DST magnetic recorder has its own data directory.

User Defined Paths

If this option is selected, the User definition data directory becomes active. The data path/directory can be defined by the user. For defining a path on the network, the particular drive must be mapped (under Windows Explorer) in order to browse for the drive under 'Add data path'.

Browse First in User Directory

With default off, the user is first directed to the path where SeaStar was installed, to look for the INI file. If this option is enabled, SeaStar will start looking for the INI file in the user-defined directory. More information on files and directories can be found in the Appendix.

Create Recorder Directories

This option is default on, and means that a recorder type and serial number directory is created for every recorder connected to.

8.2 Preferences

Units

By choosing the Settings menu, the Preferences command, and Units, a dialog box appears:

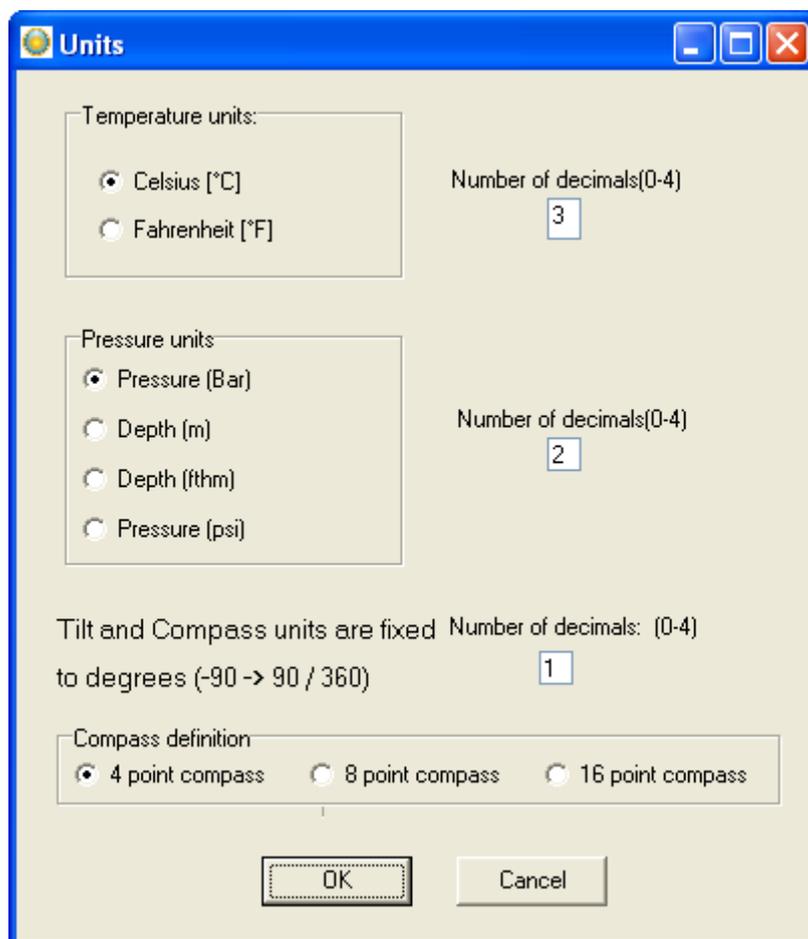


Figure 8.2 The Units Dialog Box

Select Units

The user defines whether degrees Celsius or Fahrenheit are used as a unit for temperature measurements. The pressure measurements can be displayed as pressure (bar), depth (m), fathom (fthm) or PSI. Number of decimals for the values can be selected. The magnetic heading is default set to 4 point compass (N-E-S-W) but also possible to increase it to 8 or 16 point compass.

8.3 Data File Format

By choosing the Settings menu, the Preferences command, and Data File Format, a dialog box appears:

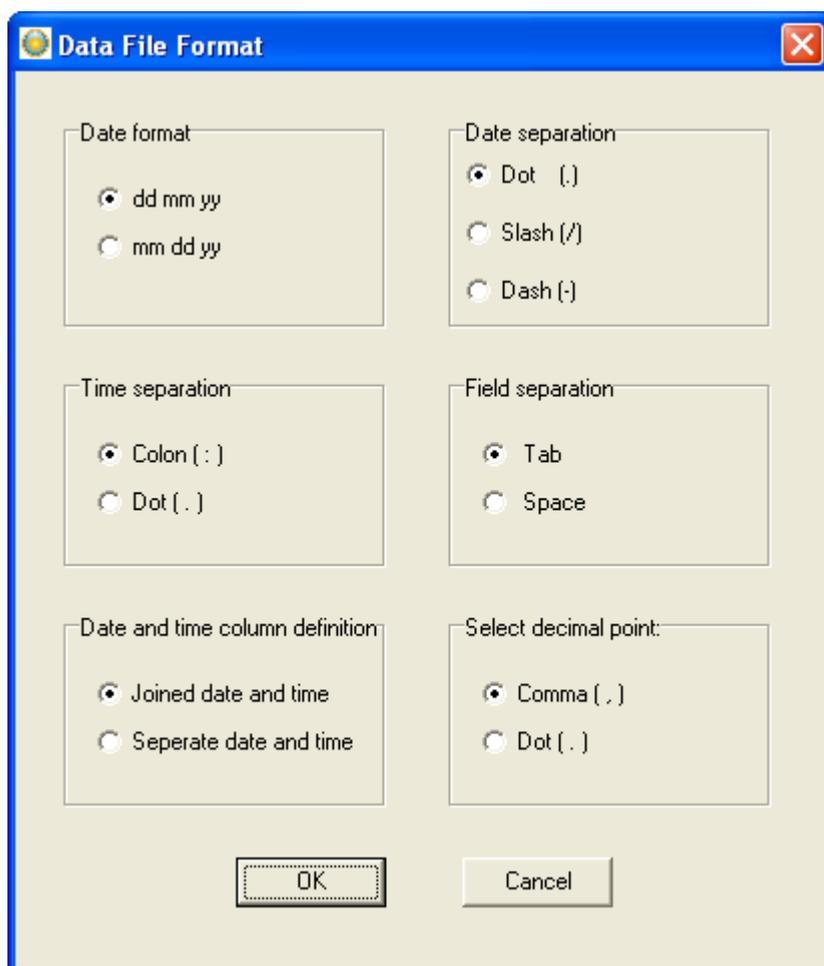


Figure 8.3 Data File Format Dialog Box

Date Format

The user defines whether the date should be shown as dd mm yy (day, month, year), or mm dd yy (month, day, year).

Date Separation

The user defines whether a dot, slash or dash should be used to separate the date.

Time Separation

The user defines whether a colon or a dot should be used for the time separation.

Field Separation

For the text files created, the user defines whether a tab or a space should be used to separate the fields.

Date and Time Column Definition

If data is to be exported to other programs, it is recommended that the date and time be joined in one column.

Select Decimal Point

The user defines whether a comma or period is used for the values displayed in SeaStar and for text files that are created.

Measurement Interval

The default setting in the software is set to 'Single interval', as most users utilize. By choosing 'Multiple intervals' the software enables programming of several different sampling intervals, enabling memory saving efficiency. By choosing the Settings menu, the Preferences command, and then Sampling Intervals, the following dialog box appears:

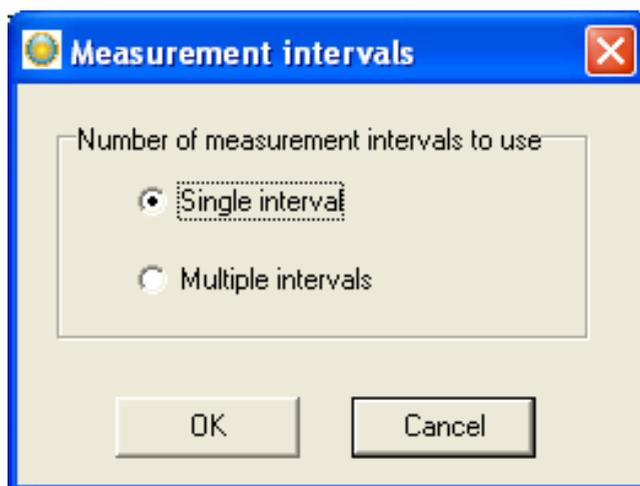


Figure 8.4 Measurement Intervals

By choosing 'Multiple intervals' the effects are shown in the dialog box that appears when you choose the New Measurement Sequence Definition command under the Edit menu. More details about multiple intervals in chapter 9.

8.4 Connection

Choose the Settings menu and the Connection command. A dialog box appears:



Figure 8.5 Connect and Retrieve Data Options

Perform CRC Test When Retrieving RID

The CRC test is a safety check performed by the software when retrieving Recorder Information Data (RID). If the CRC test is not successfully carried out, it means that some errors have occurred in the transfer of files or constants, between the recorder and the computer. If a CRC test failure occurs, the user is notified. This option is enabled by default but if disabled there is a risk of errors in the constants.

Check Data Echo in SNMS

Normally the Check Data Echo in SNMS and updating settings in Disconnect and Retrieve Data should be enabled (figure 8.5). In case of communication problems using a USB serial converter the user can try to disable this option, as it will bypass data echo checks, resulting in less restriction on communication protocol.

Automatic Data Retrieval upon Connection

By enabling this option, the software will automatically check for data in the recorder upon connection. If this option is not enabled, data retrieval is done manually by choosing the 'File' menu, and 'Retrieve Data' command.

8.5 Retrieve Data

Choose the Settings menu and the Retrieve Data command. A dialog box appears:

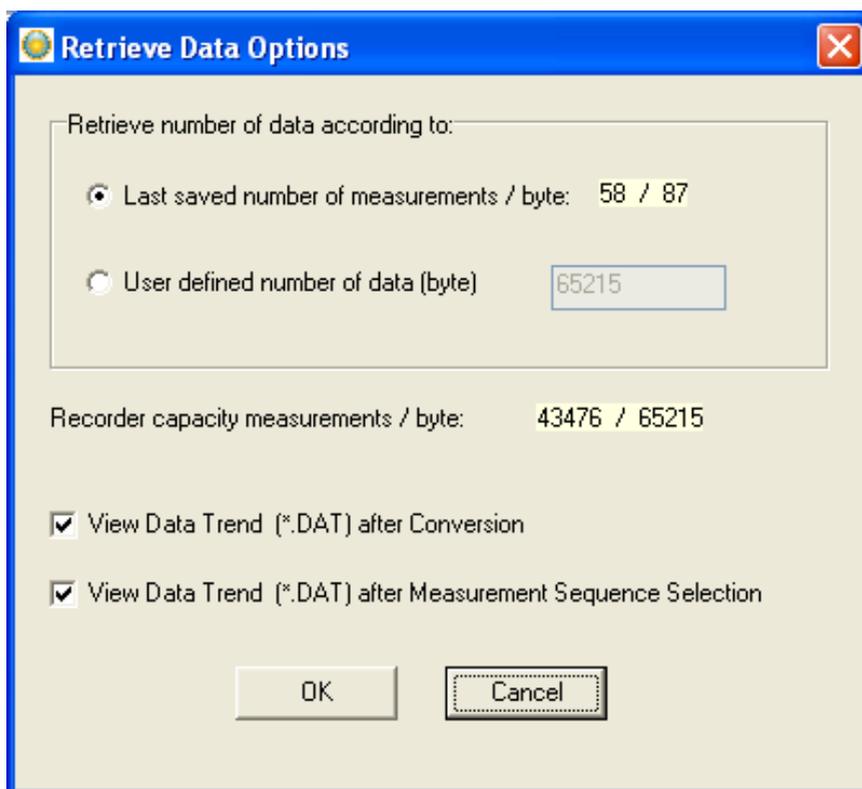


Figure 8.6 Retrieve Data Options

Retrieve Number of Data

With default settings, the software retrieves the last measurement sequence recorded. The user has the option of retrieving older data that is still in the recorder's memory. By choosing the User defined number of data, the number of measurements retrieved from the recorder can be set. Memory capacity is 20,120 measurements per sensor compass, 3-D tilt, depth and temperature (261,575 bytes). When retrieving data, it is optional to view the Data Trend after conversion.

As the complexity of measurement intervals give incoherence in the calculation from measurement number to the number of data byte to retrieve, the user has the option to define number of bytes to retrieve.

Also when not online working with measurement data, it is optional to view the Data Trend after a Sequence Selection.

If for some reason or another it becomes necessary to retrieve data more than once or even several times, the previous DAD and MIT files are not overwritten before a backup has been made. The backup files are in the same directory as the "original" or the last DAD file.

A backup number system is in use that marks the first retrieved file as number one, the second number two etc. The number sign #, is used to identify the backup up files.

Thus if a data file has for example the name 25M1106.DAD then the backup file, that was the first retrieval, gets the name 1#25M1106.DAD, and the 25M1106.MIT file that is associated with the DAD file, is backed up as 1#25M1106.MIT.

8.6 ReConversion

Choose the Settings menu and the ReConversion command. A dialog box appears:

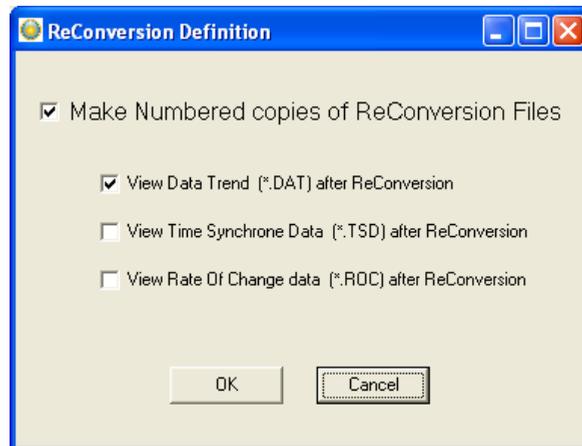


Figure 8.7 Reconvert Menu

With all the options in SeaStar, the user may want to do a lot of reconvert (<File\Reconvert Data>) on data files after defining the preferences; changing units, data formats, OOR settings, TSD settings, ROC settings, offset settings and converting different sections of the data file, all of which result in numerous files. To ease the task of remembering settings and results and/or renaming and copying files, a backup system of reconverted files has been implemented.

A reconvert number is now associated with each sequence. This number is saved in the recorder's INI file and updated each time a reconvert is implemented. A copy is made of the DAT, CIT, DAB, OOR, TSD and the

ROC files with the reconvert number attached to the filename.

Thus if a data file is for example named 5Q1024.DAT, then after the first reconvert, a copy of the DAT is named 1-5Q1024.DAT, and the same naming convention is applied to the other files.

Each time data retrieval is performed, a subdirectory, which name is the sequence number, is created in the data directory, where a copy of the "original" DAT, DAB, CIT and OOR files is placed. These files have a "0-" in their names. All the reconverted files are placed in the sequence directory. The reconvert number system is optional, and the user can disable it in the reconvert menu. When the reconvert number system is in use, and when viewing trended reconverted data, the reconverted "backup" file is displayed, thus eliminating the need to close the "last" converted trend data window.

8.7 Out Of Range

If measurements are outside the calibrated range, they are less accurate. The out of range measurements (if any) are shown in the OOR file (View – Measurement Data – Out Of Range Data). For example when depth measurements are outside the first calibration range (at very shallow depth or in air) the data may look strange and the user may want to set those data to 0.

Choose the Settings menu, Out Of Range - UV and DV definition command. A dialog box appears:

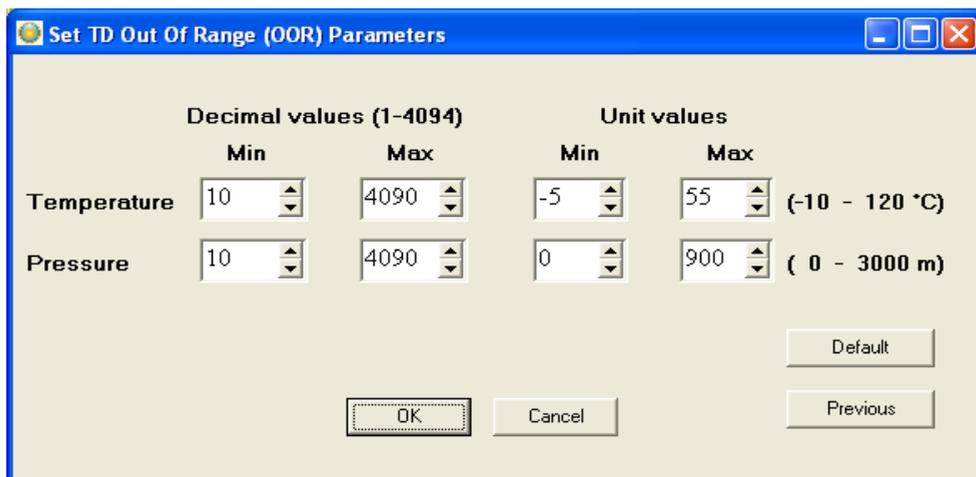


Figure 8.8 Set Ranges for the Parameters

The Unit Values (UV) ranges can be set, eliminating all values that are outside the calibration range.

Decimal Values

Decimal Values (DV) are raw measurements, sometimes referred to as binary data. The decimal value is between 0 and 4095, which is the range for the 12 bit AD converter. The decimal values are the recorder's calibration range. The user should not define the decimal value range, unless he has obtained these values for that particular recorder from Star-Oddi.

Unit Values

The decimal values are converted to Unit Values (UV), for example a decimal value of 2000 could give 20°C. The user can select a specified range for the parameters. If unit values in the data are outside the measurement calibration range of the recorder, the user has the option to set a max and min range for these unit values. After selecting the unit value ranges and pressing the OK button, the following window appears:

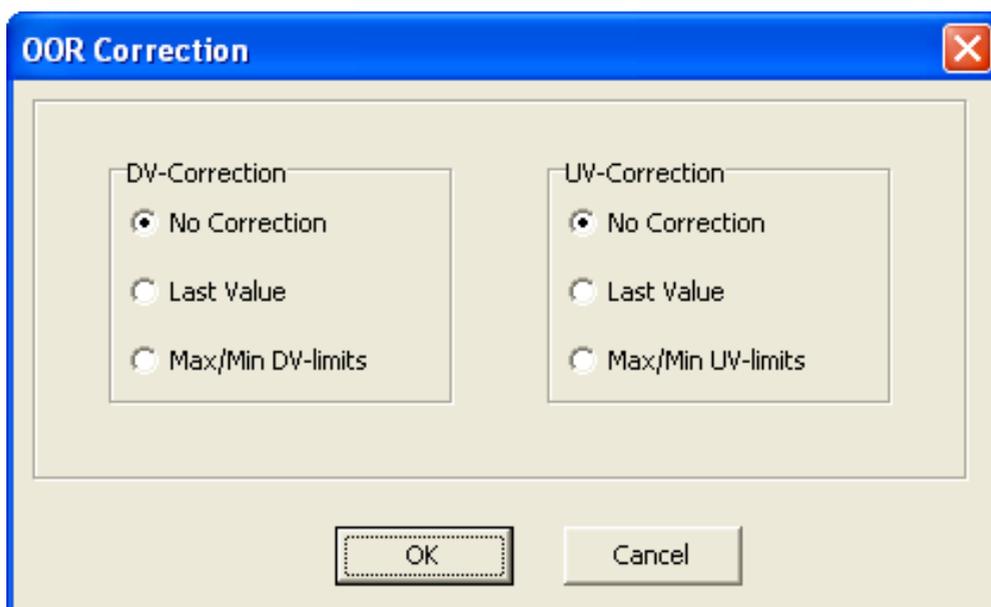


Figure 8.9 Out Of Range (OOR) Correction

If no values have been selected for the Decimal Value (DV), 'No Correction' should be selected for 'DV-Correction'. If Unit Values (UV) ranges were specified, the user has two options:

1. Last Value: Change the out of range measurements to the last value that was recorded before the out of range measurement was recorded
2. Max/Min UV-limits: Change the out of range value to the max/min unit value as specified earlier. In this case the software will know if the value is under the minimum or maximum limit.

The data needs to be reconverted under 'File – Reconvert Data' after the correction has been made (after pressing OK) and data will be changed accordingly. You can find more about reconvert in chapter 10.

8.8 Time Synchronous Data (TSD)

Choose the Settings menu, TSD definition command. A dialog box appears:

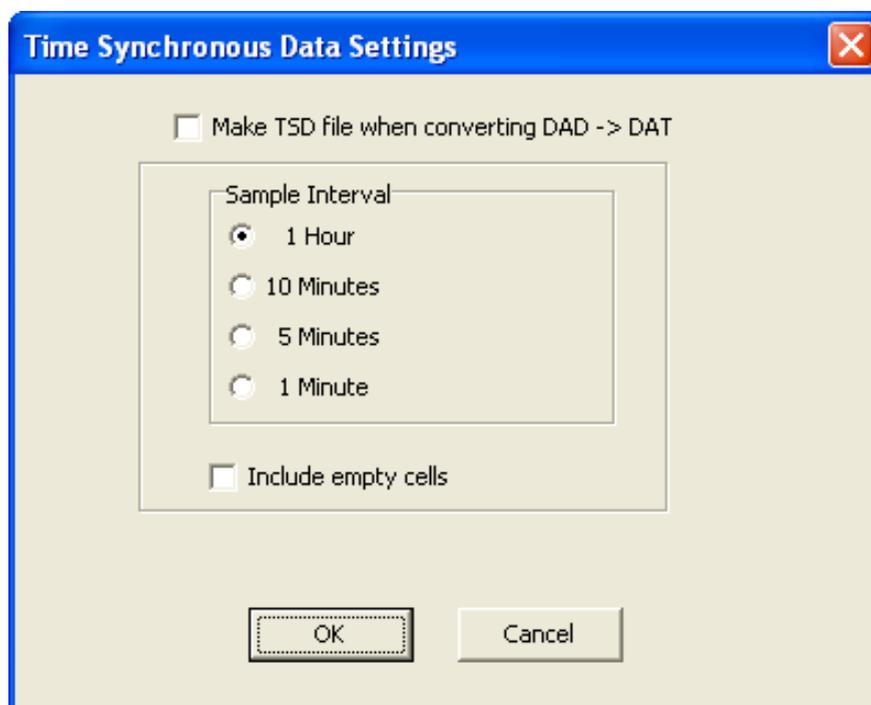


Figure 8.10 Time Synchronous Data Settings

If the user wants to time synchronize two or more data files, it is possible to select three options: 1 hour, 10 minutes, or 5 minutes. The restriction is that the sampling interval selected must be greater than the initial interval, and it must also be dividable by the initial interval. For example, if the initial interval was 15 minutes, only the 1 hour option can be selected for time synchronous.

If the 'Include empty cells' is enabled, the data tables will be empty for those measurements in the original file that are not to be shown.

If the user wants to activate this feature, the 'Make TSD file when converting DAD-DAT' must be enabled. For changing the current measurement file with one of the three intervals, the data must be reconverted by 'File – Reconvert Data'.

8.9 Rate Of Change (ROC)

This new feature gives the user a chance to see how fast the signal is changing, i.e. the estimated velocity of the signal. This applies to all measured parameters. The ROC is calculated via a two point numerical differentiation:

$$\text{ROC} = (P2 - P1) / (t2 - t1)$$

P: Parameter expressed in a user defined unit

t: Time (hour, minute or second)

The way the ROC is set up and viewed is very similar to the TSD. Under 'Settings\ROC' the ROC options can be set:

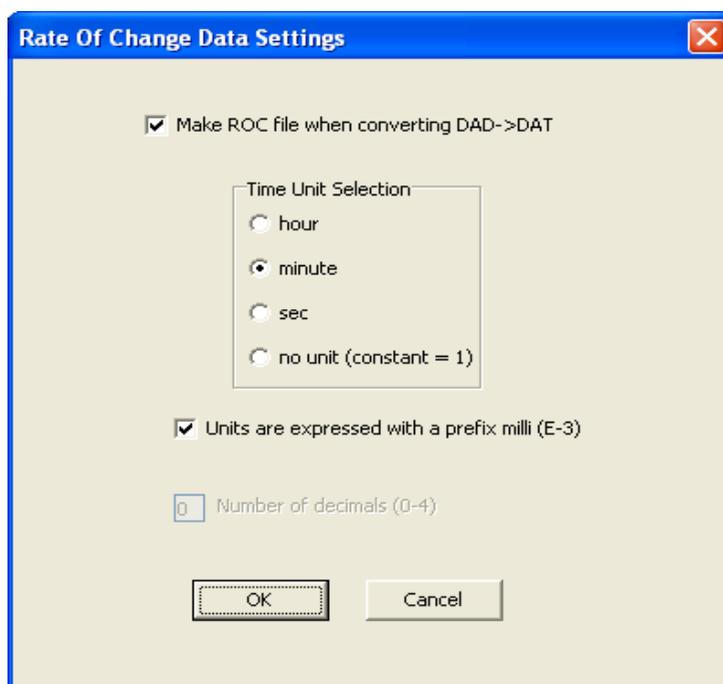


Figure 8.11 ROC Definition

The ROC is only computed when a DAD->DAT conversion is performed, and when the user wishes. The time units are selectable as hour, minute or seconds. For small changes it can be convenient to express the ROC as a milli (10^{-3}) unit. For example if the depth is in meters (m) then millimeters are expressed as (mm).

The ROC can be viewed as a trend under 'View\Data Trend and Table\Rate Of Change (ROC)' or as tabulated data via 'View\Measurement Data\Rate Of Change'.

8.10Chart

1. Title

Click on the title name to change the title of the chart. A dialog box appears:



Figure 8.12 Chart Title Dialog Box

The chart is automatically assigned the data file number as a chart title. To change the chart title, enter a new text string and press the OK button.

2. Time axis

To change the time scale of the chart, click on the X-axis scale. A dialog box appears, figure 8.12.

By disabling the Automatic option, the minimum and maximum time values become active. By clicking on the Change buttons for the maximum and minimum values, the time range can be specified. For creating (saving) a new data file (DAT) with a new specified time scale, please refer to chapter 10.Reconvert Data. By enabling the Automatic option, the measurement time will go back to the initial range.

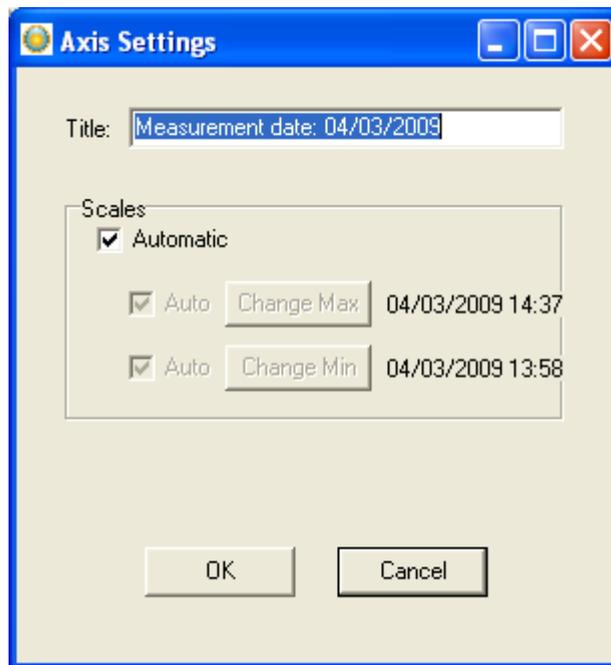


Figure 8.13 X-Axis Settings Dialog Box

3. Value Axis

To change the scale settings for the value axis, click on one of the Y-axis scale. A dialog box appears:

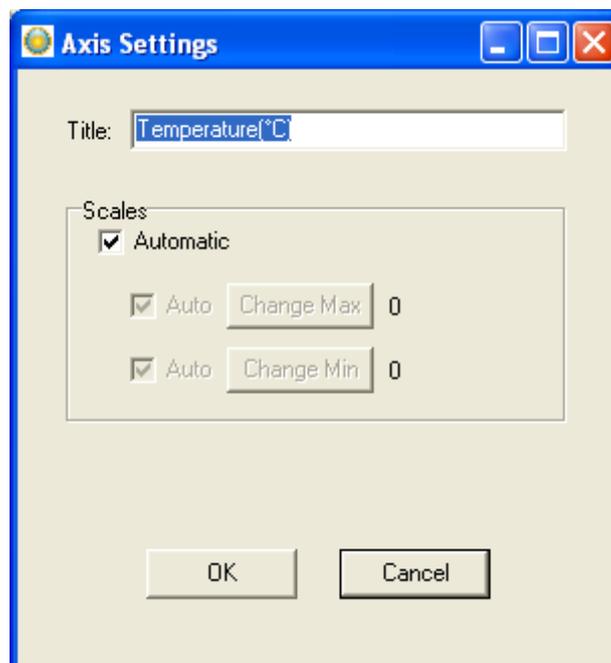


Figure 8.14 Y-Axis Settings Dialog Box

By disabling the Automatic option, the minimum and maximum measurement values become active. By clicking on the Change buttons for the maximum and minimum values, the range to be shown on the chart can be specified. By enabling the Automatic option, the measurements will go back to the initial range.

8.11 Chart Editor

The Chart Edit button (on every graph) gives access to the Chart Editor, a multi-option menu, now with a Tree View interface, as can be seen in figure 8.15.

There are five main branches on the tree:

1. Series
2. Chart
3. Data
4. Tools
5. Export

The tree menu gives access to the same features as the tab menu described in the user's manual. Most of the changes invoked are viewable immediately.

All format and style changes made to the chart, are lost if the data are viewed again or "Reconverted", as the *.DAD and the *.DAT file are not affected by changes made to the chart or the database.

1. Series

The Series window offers the same features as the "Active Series List" button.

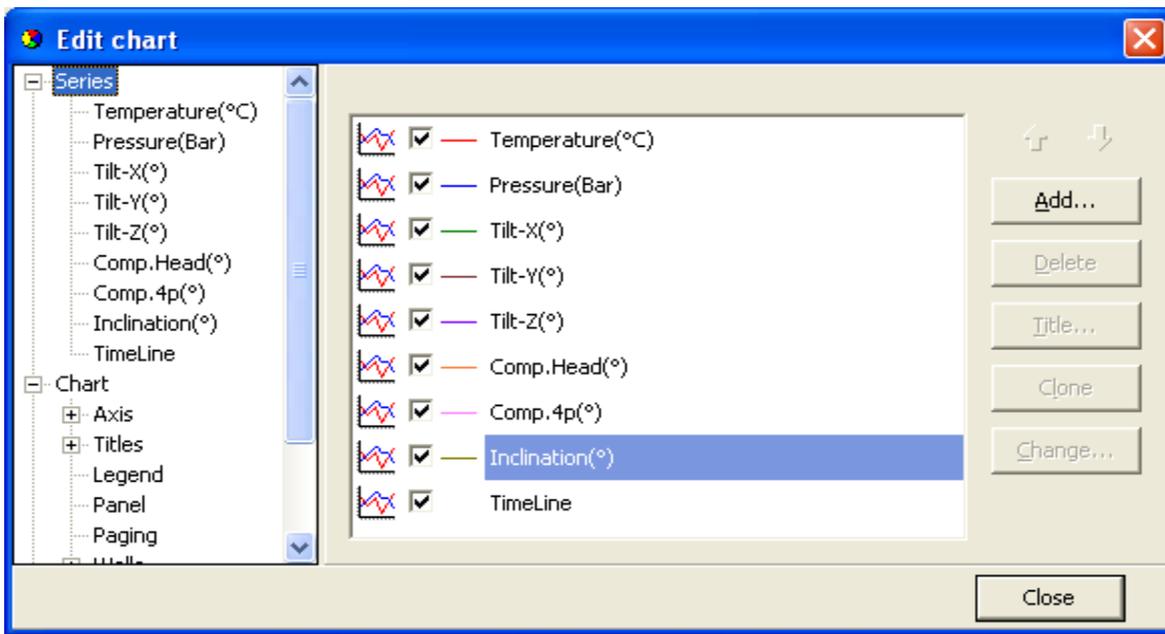


Figure 8.15 Chart Editor

When a particular series is selected, like the Temperature series for example, a two tab menu is revealed, as seen in fig. 8.16, where the user can “format” each series, and set “points” in the graph. The tab “Point” offers visibility to points as the “Data Point Marker” button on the graph, plus formatting of the points.

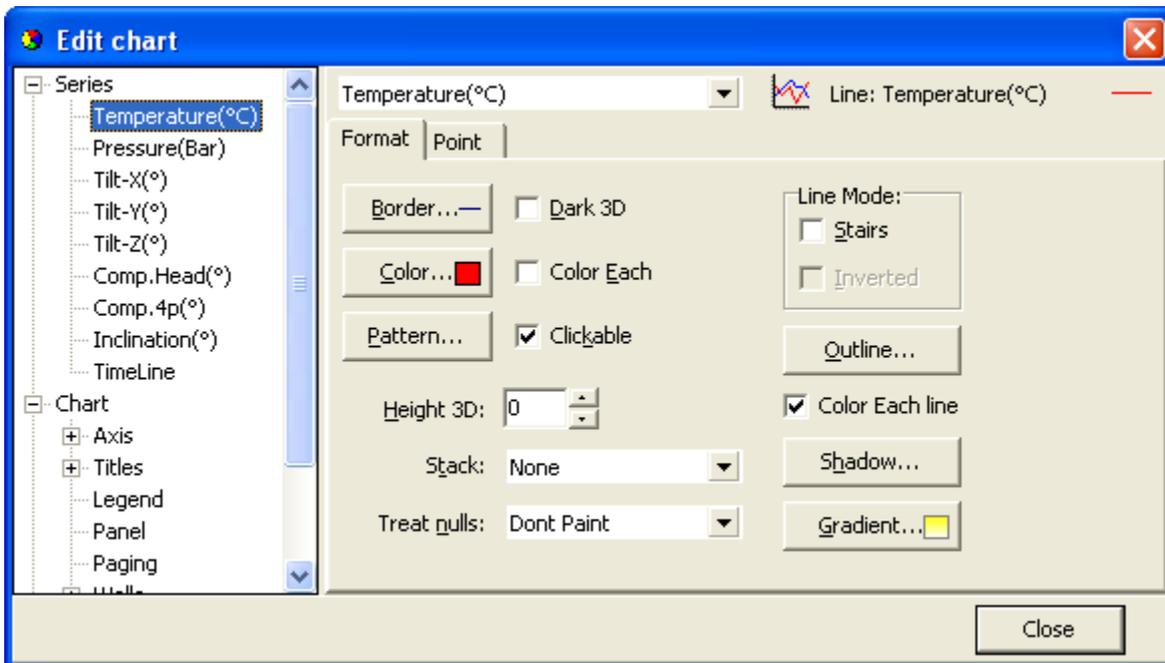


Figure 8.16 Format Series

2. Chart

The chart branch has six sub branches:

- 2.1 Axis
- 2.2 Titles
- 2.3 Legend
- 2.4 Panel
- 2.5 Paging
- 2.6 Walls

2.1 Axis

There are 8 axes in a normal SeaStar chart, the number in use depends on the recorder type. The Left Axis and Custom 1 axis are always in use, the latter is reserved for the timeline.

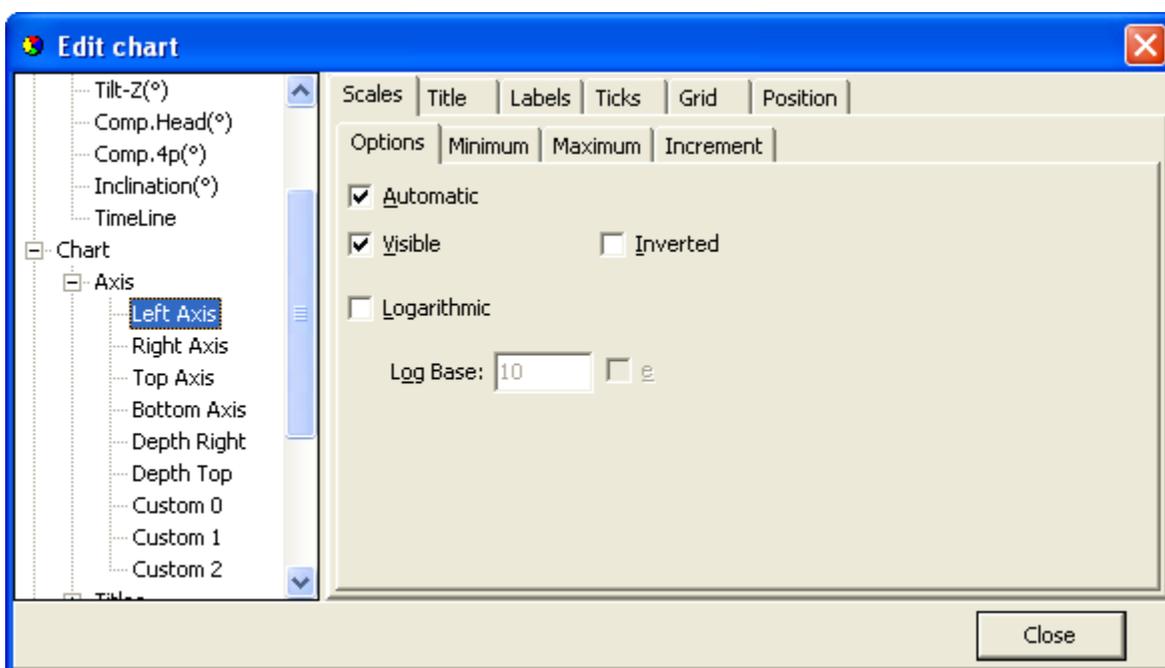


Figure 8.17 Axis Formatting

Figure 8.17 shows a six tab Axis menu. There are numerous options, some of which can drastically change the behavior of the graph. The Minimum and Maximum tabs give options similar to the menu offered when clicking an axis on the graph, the ticks tab gives access to enable and disable gridlines, just as in the "Horizontal gridline" and "Vertical gridline" buttons in the graph.

2.2 Titles

The Titles menu shown in figure 8.18, gives access to 4 tiles, each title a multi line text window, which can be positioned anywhere on the chart. There are multiple formatting options, six tabs, for each title.

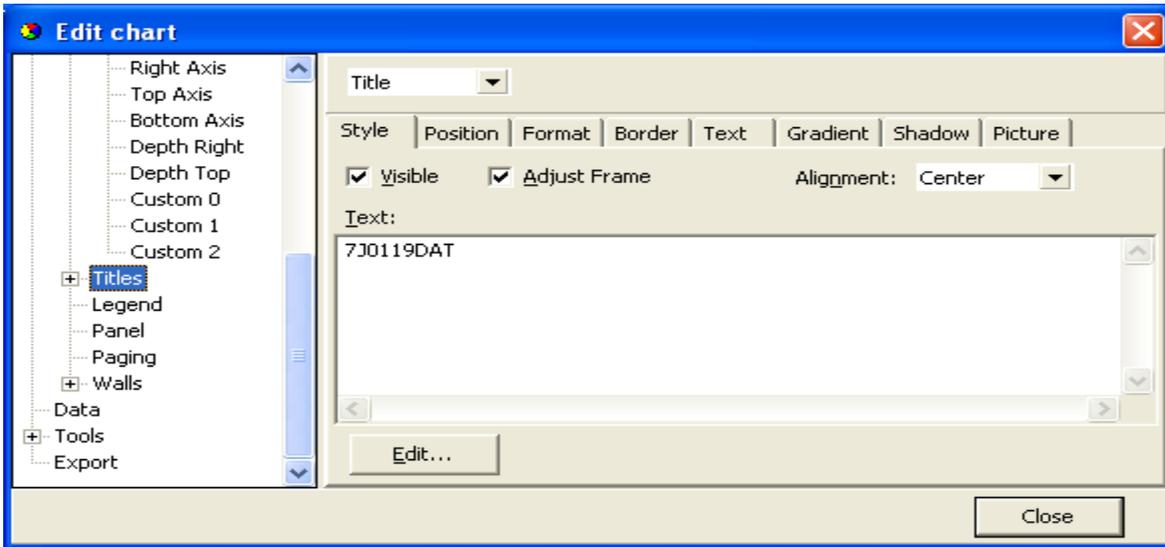


Figure 8.18 Titles Menu

2.3 Legend

The legend menu (see figure 8.19) gives the user an option of showing a series legend. The 8 tab menu gives options in styling positioning and formatting the legend.

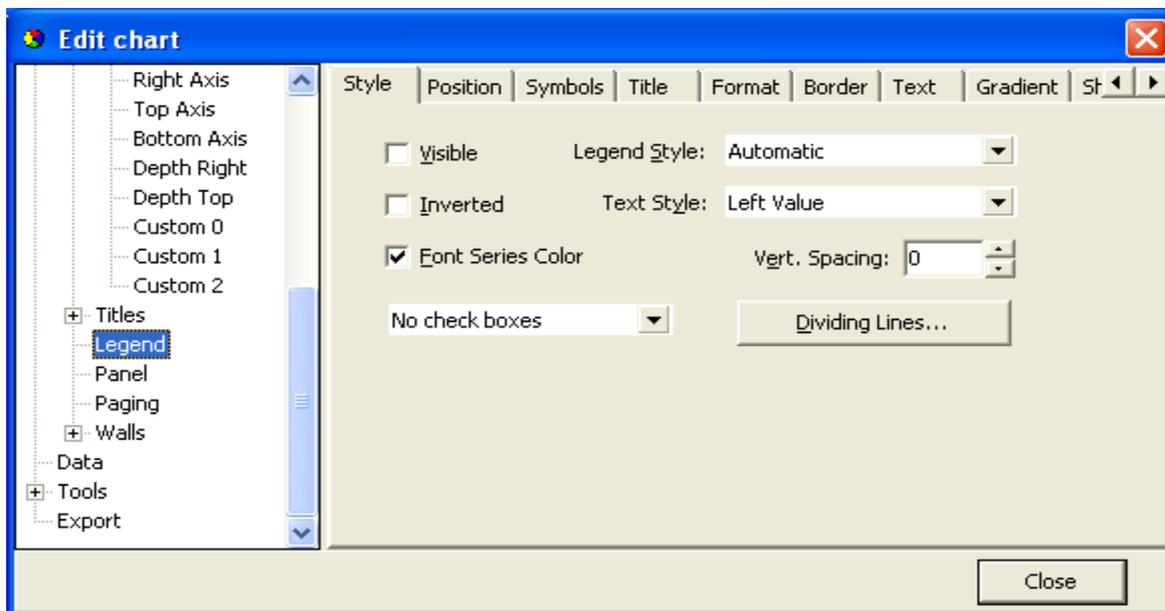


Figure 8.19 Legend Menu

2.4 Panel

The Panel menu (see figure 8.20) offers panel format options. Images, pictures and icons can be imported onto the panel as a back image.

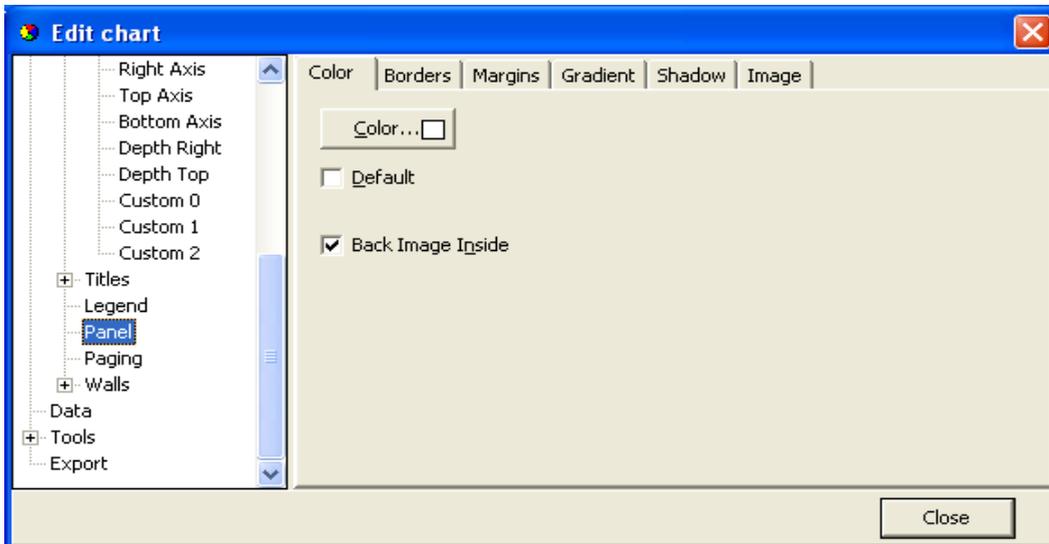


Figure 8.20 Panel Menu

2.5 Paging

With the Paging menu, shown in figure 8.21, the data series can be chopped into pages, with a user defined number of points per page. Only one page is shown at a time, and the user can scroll through the pages via the page buttons, that appear (are enabled) on the chart to the right of the Edit Chart button, when paging is selected.

Paging can be useful for viewing distinct time periods, one at a time, days or hours for example. No offset is offered and sampling periods and start time can limit the usefulness of this option.

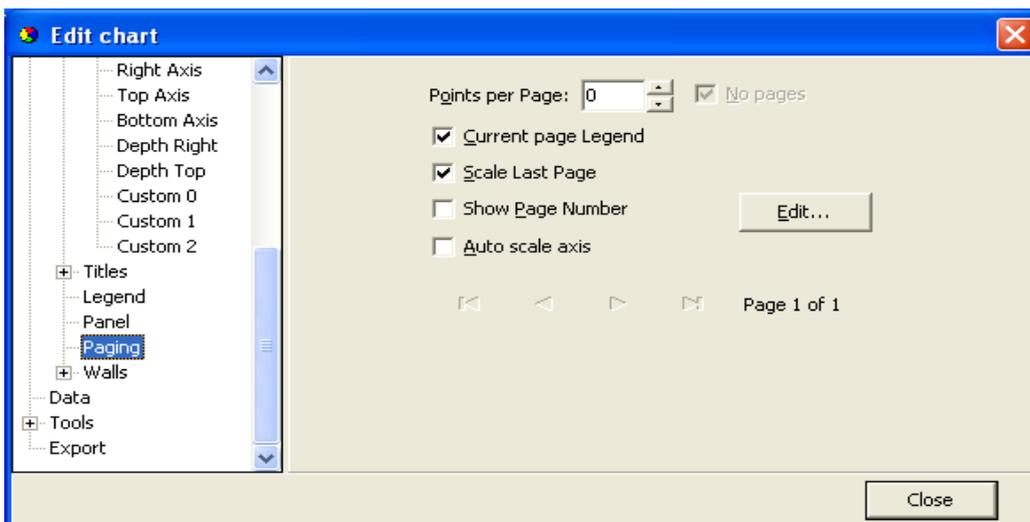


Figure 8.21 Paging Menu

2.6 Walls

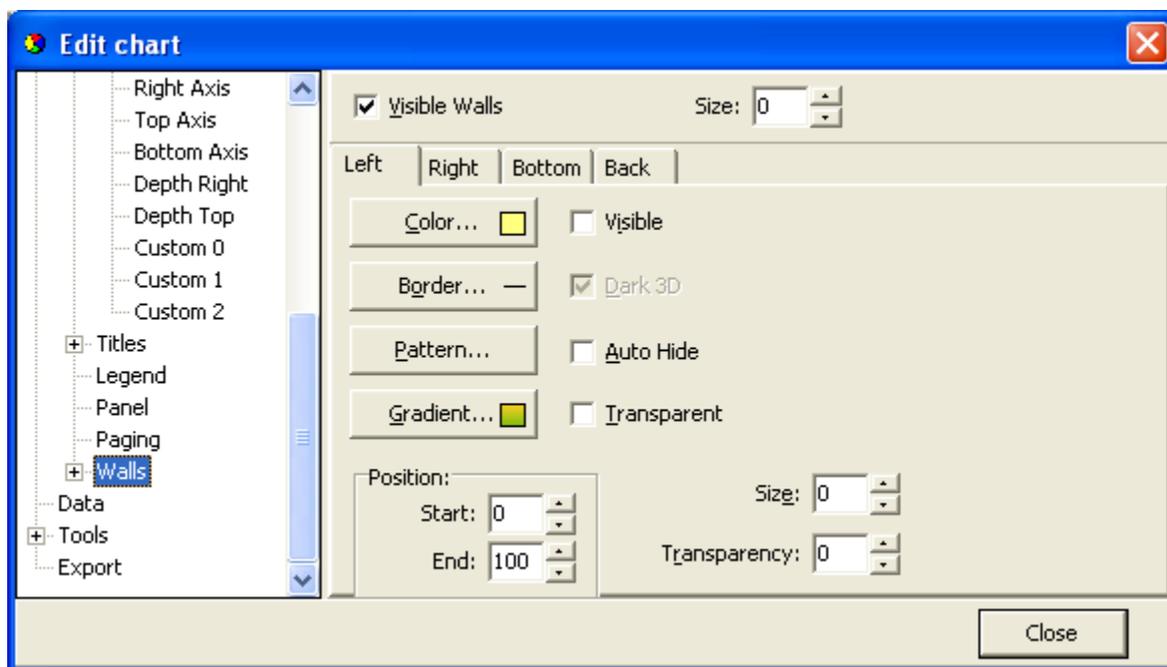


Figure 8.22 Walls Menu

The walls menu, as seen in figure 8.22, gives access to configuration of four walls, but as SeaStar charts are default defined as 2D, only the “Back” wall is visible.

The Walls menu, has similar options as the Panel menu, when defining a pattern, via the “Pattern...” button, as seen in figure 8.22, an image can be imported and placed on the wall. In fact, as the Back Wall lies “on top” off the panel, a pattern or an image can enhance an image on the panel, or the image on the panel can be seen through the wall with the Transparency option.

3. Data

In the data menu, seen in Figure 8.23, gives the user access to the database, upon which the chart rests. Here text labels can be set to each measurement point. Changes can be made to the time and measurement values. Changes made to the data, are included when the data is exported, but if the data are viewed again or “Reconverted” all changes are lost, as the *.DAD and the *.DAT file are not affected by changes made to the database.

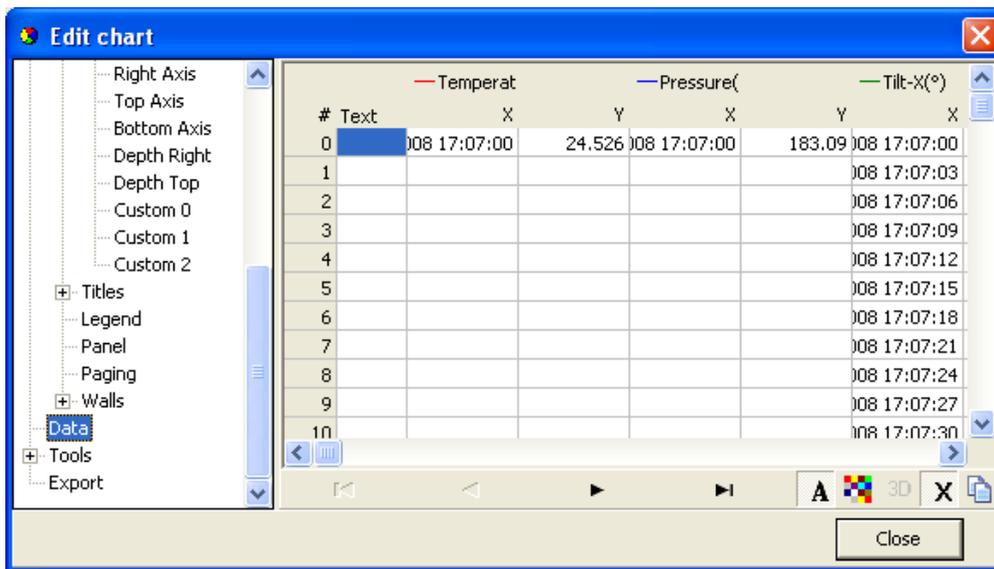


Figure 8.23 Data Menu

4. Tools

Under 'Tools' you will find several options to customize the setting of the cursor and the appearance of the graph, such as page numbering, font, font size etc. To active/deactivate the chosen setting check/uncheck the 'Active' box on top of the first page of this menu.

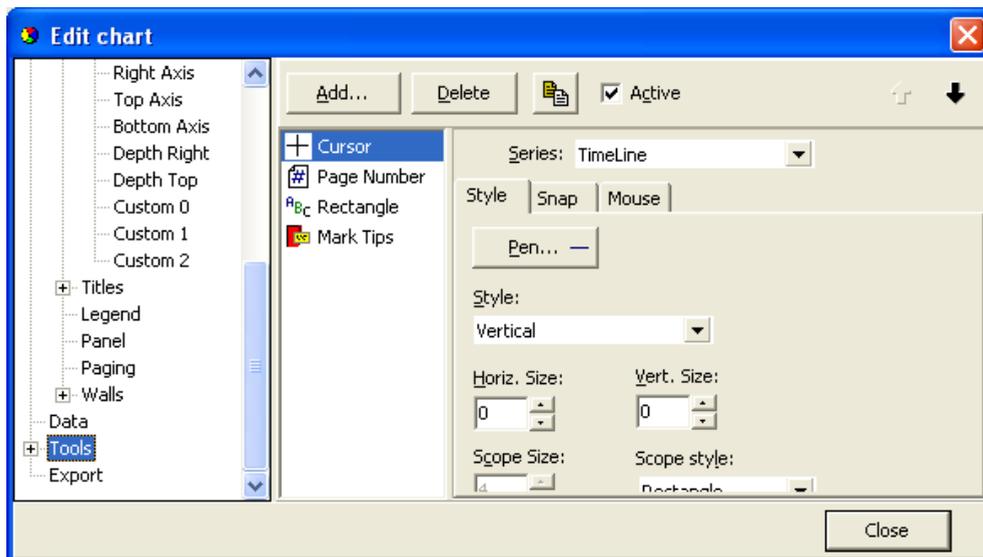


Figure 8.24 First Page of Tools Menu

5 Export

Under the Export menu, three tabs offer as many menus for saving data as:

- 5.1 Pictures
- 5.2 Native (data)
- 5.3 Data (file)

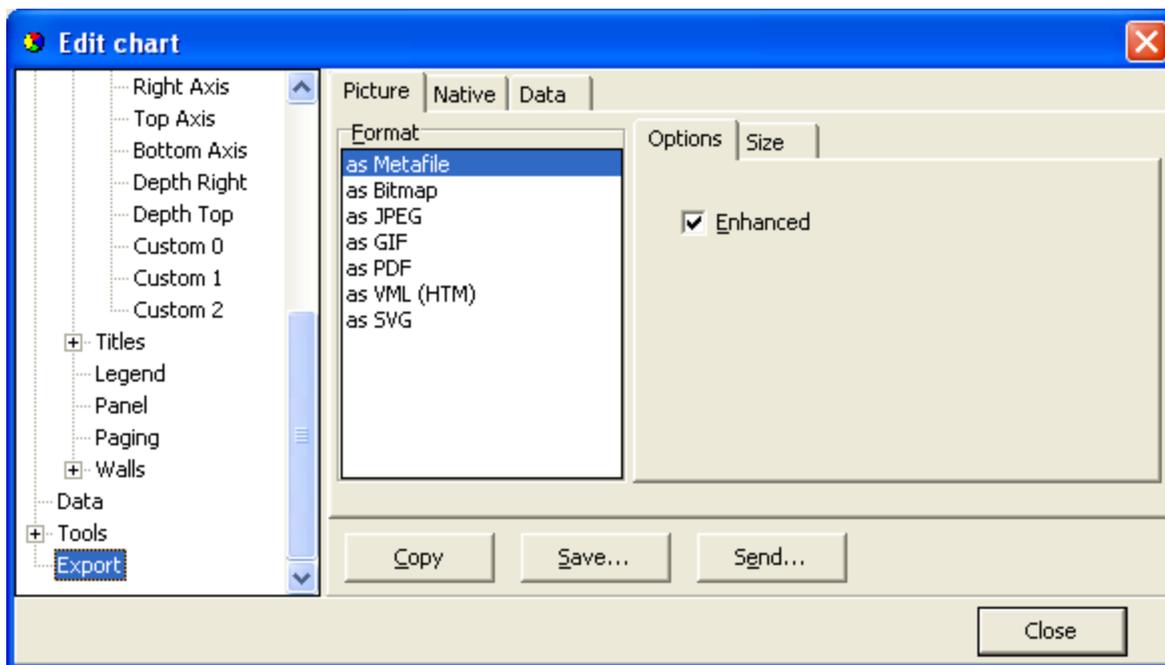


Figure 8.25 Export Menu: Picture

5.1 Pictures

Figure 8.25 shows options when saving the chart as a picture to a file, or copy the picture to the clipboard. There are seven format possibilities.

- Metafile
- Bitmap
- JPEG
- GIF
- PDF
- VML
- SVG

5.2 Native

The Native menu, see figure 8.26, data is saved as "Native" *.tee chart files. Import of these files is not supported in SeaStar at the moment.

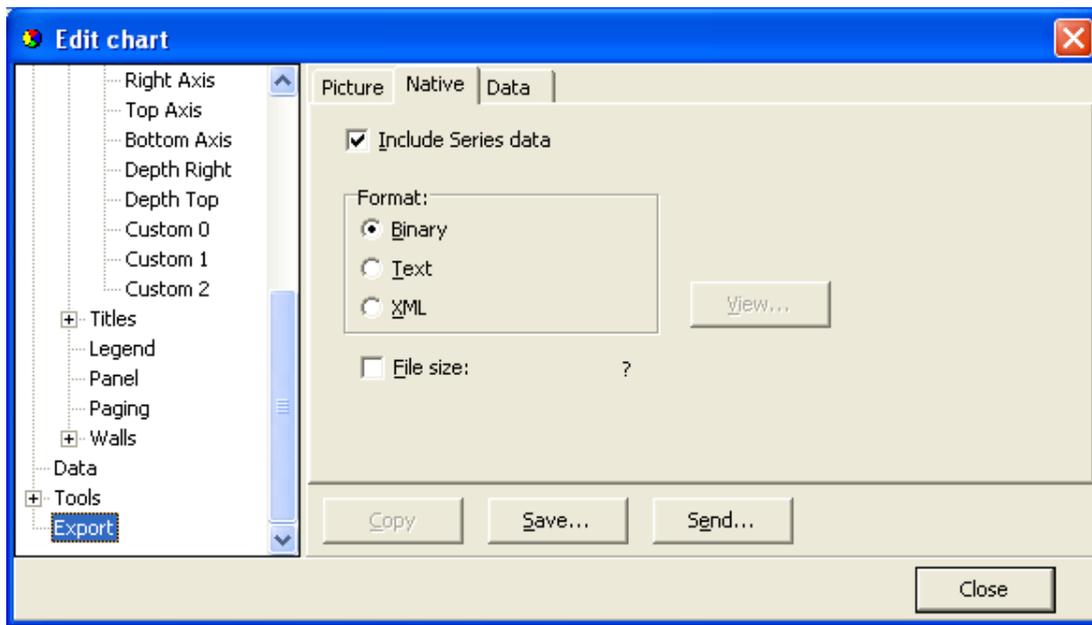


Figure 8.26 Export menu: Native

5.3 Data

Data can be exported to files in four formats, see figure 8.27.

- Text file (.txt)
- XML (.xml)
- HTML (.html)
- Excel (.xls)

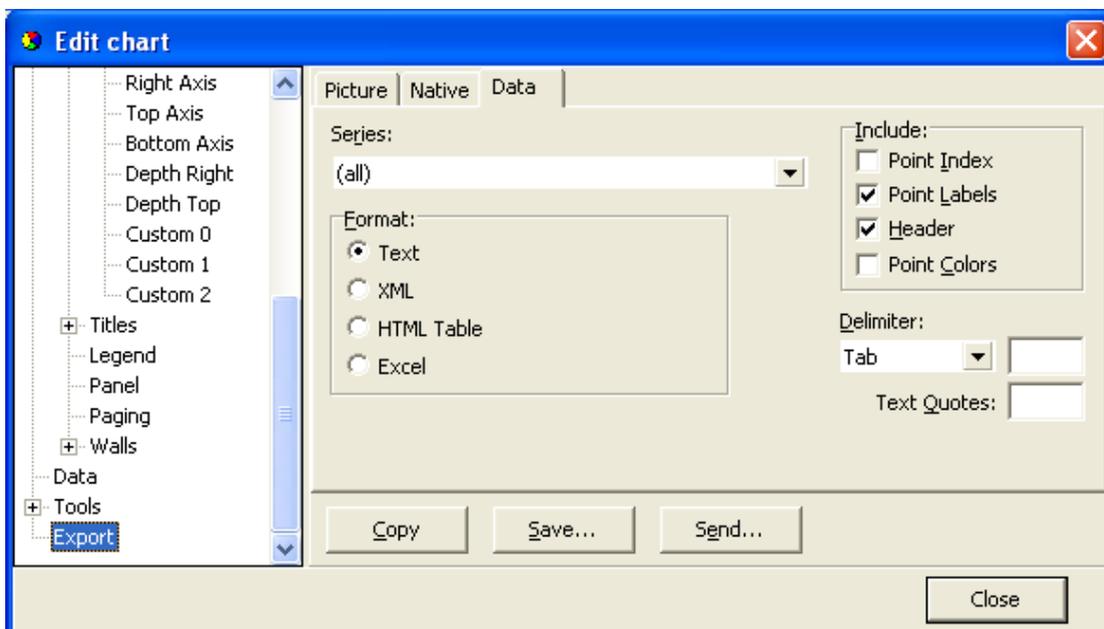


Figure 8.27 Export menu: Data

There are four Include options:

1. Point Index
The point index is the same as the measurement number, but offset by -1, as it starts in 0 instead of 1.
2. Point Labels
If the user has added text labels to points in the DATA menu, these can be included.
3. Header
The same headers as are in the DATA menu.
4. Point Colors
This option is not relevant in SeaStar.

Another method for exporting is to use the Alt+PrintScreen keyboard buttons to copy an image of the SeaStar window to the clipboard, thereafter to paste it to another Windows application. When a dialog box is open, then only that frame is copied to the clipboard.

To copy a part of a data file, for example from a DAT file, then highlight the part you want to copy and use the Ctrl+C keyboard buttons to copy the data snippet to the clipboard. Then use the paste-option in another Windows application to transfer the data from the clipboard.

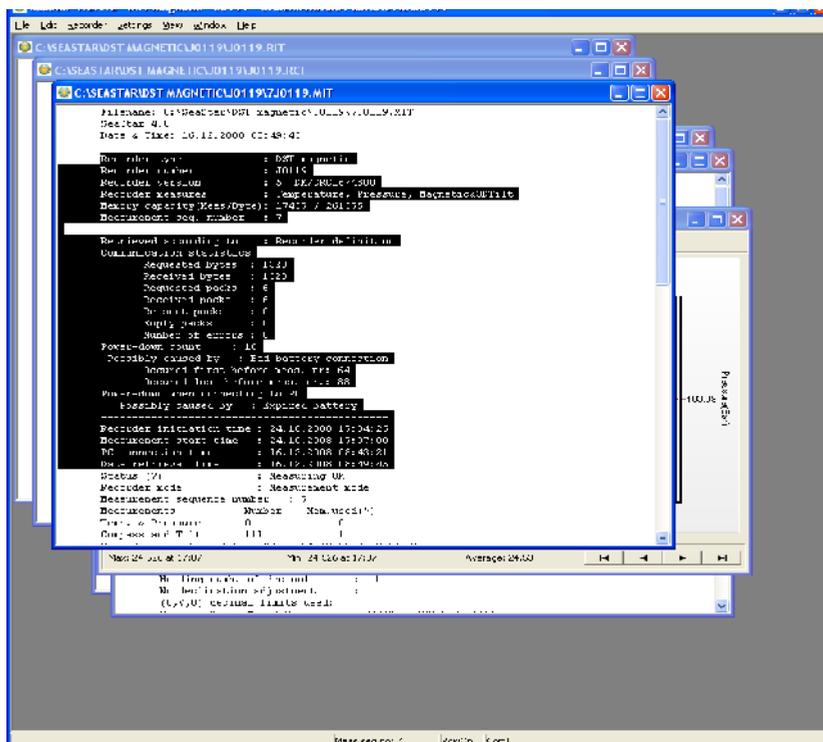


Figure 8.28 Highlighted Text to be copied

8.12 Timeline

The timeline is a graphical viewing aide. Every time a file is loaded for trending, an extra time value is calculated for every measurement point. These time values form the Timeline. The Timeline is an extra series that follows the rules of the other measurement series. When the graph first appears, the Timeline is inactive.

By selecting the Timeline in the Series List (see fig. 8.29), the Timeline becomes visible as shown in figure 8.30.

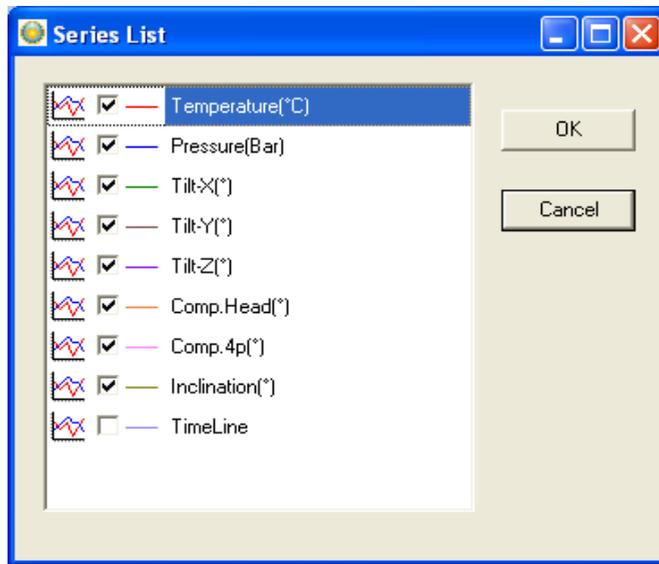


Figure 8.29 Timeline Selection

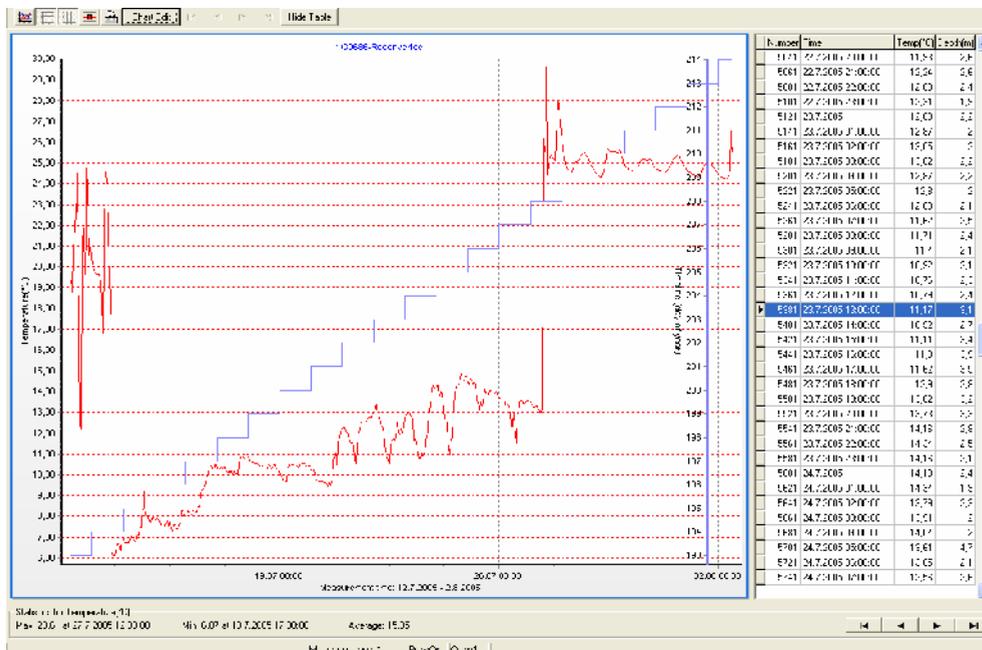


Figure 8.30 Timeline on a graph showing "Day of the Year"

The Timeline is defined under Settings\Preferences\Timeline.
There are several options for the Timeline, as can be seen in fig. 8.31.

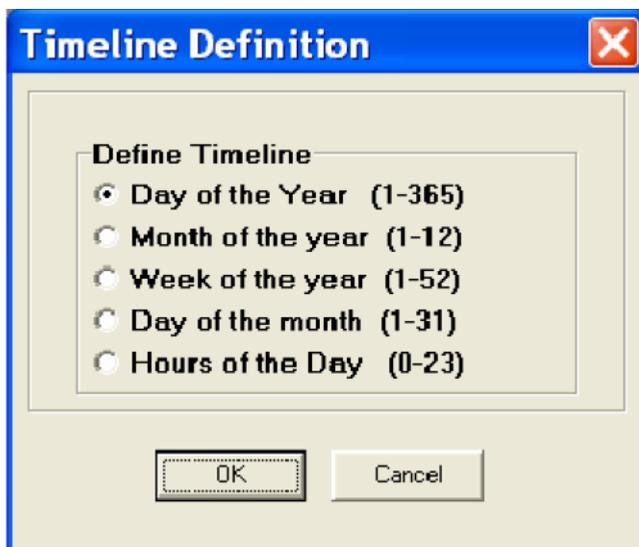


Figure 8.31 Timeline Options

There is no need to reconvert the data, as every time a data file is loaded, the Timeline is calculated in accordance with Timeline settings. The Timeline is not a part of the *.DAT or the *.TSD files, but if the data is exported (see the Export section), then the Timeline, if selected, will be included. Thus, the Timeline can also be used for statistical purposes.

8.13 Templates

There are two scenarios where templates come in handy:

1. When many recorders are programmed with the same settings (multi mode), and circumstances are in a way that the user cannot complete the setup of all the recorders in one session, and he has to exit SeaStar (to continue later).
2. When the user wants to reuse, partly or completely, presumably a complex and/or lengthy measurement setting.

Saving a Template

The user can now, when editing New Measurement Settings (NMS), save his work by enabling "Save this NMS as a Template (file)" option (see fig. 8.32), before acknowledging OK from the Edit NMS menu. Having selected this option and the NMS are OK, and then the user has an

option to write a description for the template (see fig. 8.34). Canceling this option cancels the 'save template' operation. The template is an INI file and saved in the SeaStar\NMS directory. The name of the file is MST<date><type letter>time<Interval mode>.INI.

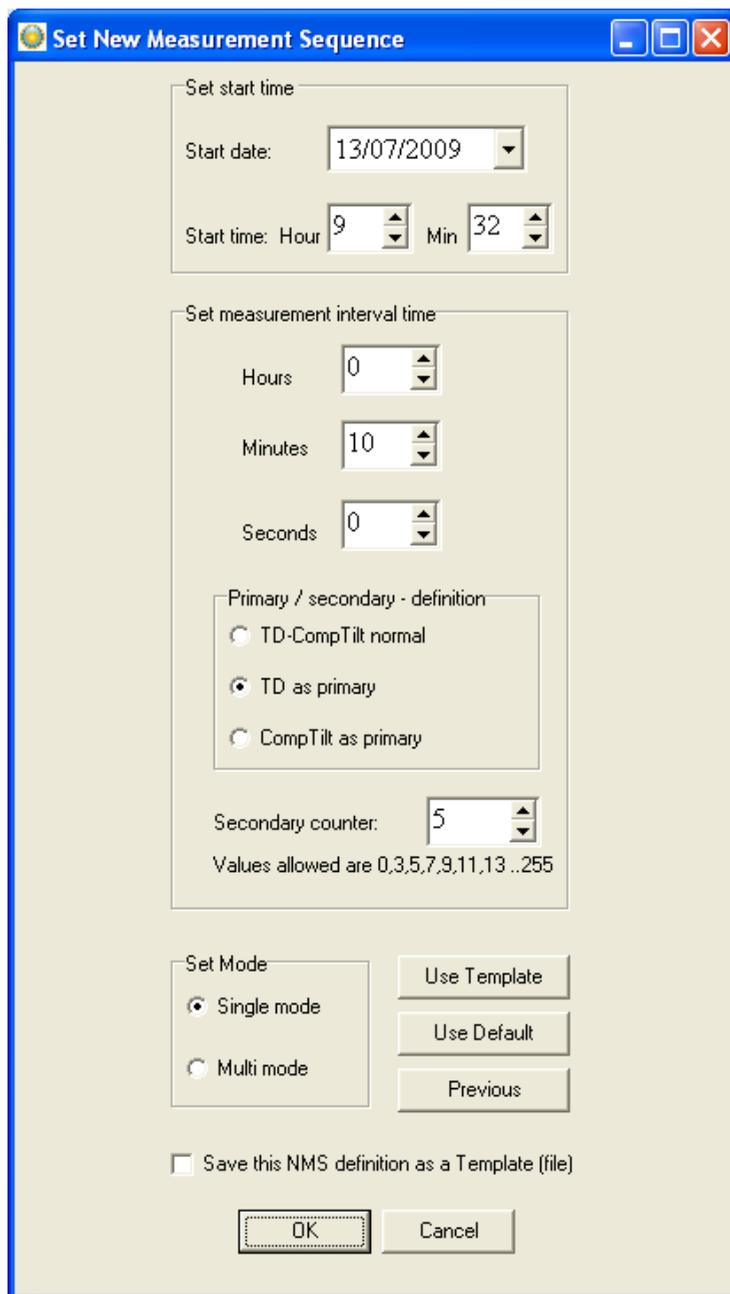


Figure 8.33 Template Options in Edit\New Measurement Sequence

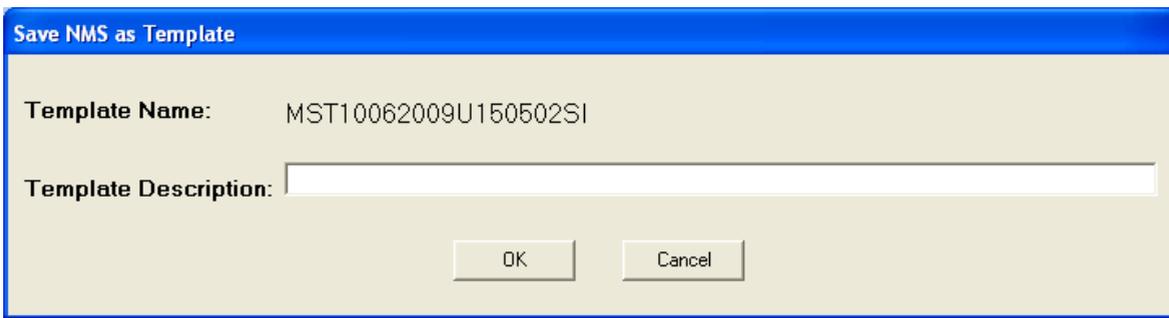


Figure 8.34 Saving NMS as a Template

Using a Template

Templates can be retrieved at a later time to be used directly or modified. The list of templates is kept in the SeaStar\templates.ini file.

As can be seen in fig. 8.32 there are three buttons in the Edit NMS window, the top button is used for retrieving a template.

As can be seen in fig. 8.34, templates are selected via template name or description. Parallel to selecting a template, descriptions can be edited and eventually templates deleted.

The recorder type and interval type, which the template was based on, are visible for each template.

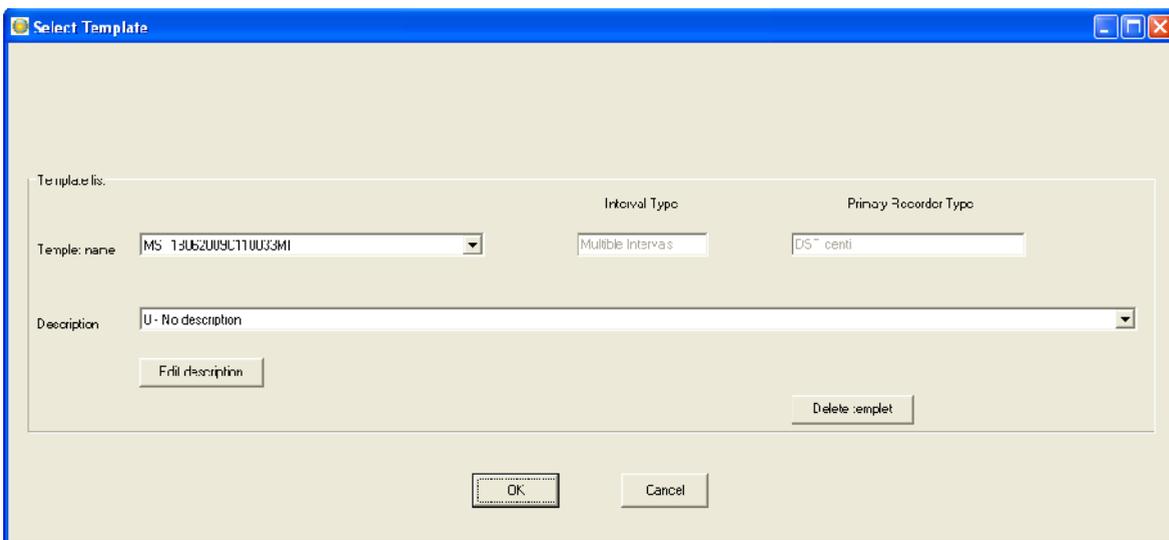


Figure 8.34 Template Selection

Templates can be used across recorder type boundaries and interval types.

Things to keep in mind when selecting a template are:

- Single interval templates converted to a multiple interval NMS. All seven intervals are the same.
- Multiple interval templates converted to a single interval NMS, set the interval as interval one.
- Start time in the past is not allowed as will be apparent when exiting the Edit NMS window.
- Some recorder types are less compatible than others, an example of that is a DST milli template converted to a DST GPS NMS.

After selecting a template the user is returned to the edit window. If the selection is not as what the user expected the "Previous" button will return the previous setting.

The user has one more option to quickly set up the NMS. The button in fig. 1, marked "Use Default", will return default NMS settings. The button can have four descriptions and return four different settings depending on the status of recorder and measurement selection.

1. Use Default: No recorder selected.
2. Use Recorder: Recorder selected but not a measurement sequence.
3. Use Sequence: Measurement sequence selected.
4. Use Online: Recorder is on-line.

9. Multiple Intervals

SeaStar has the option for setting up more than one sampling interval within a measurement sequence. Reasons for wanting multiple intervals can be to save memory, but still be able to have frequent measurements in between. This may be the case with fish tagging, when frequent recording is wanted in a specific period in the fish life cycle. If you want to run on a single interval the whole recording period, this option is not selected.

By choosing Multiple Intervals (under Settings-Preferences-Measurement Intervals), multiple interval setup is activated. Thereafter, choose the Edit menu and New Measurement Sequence Definition command. The following dialog box appears:

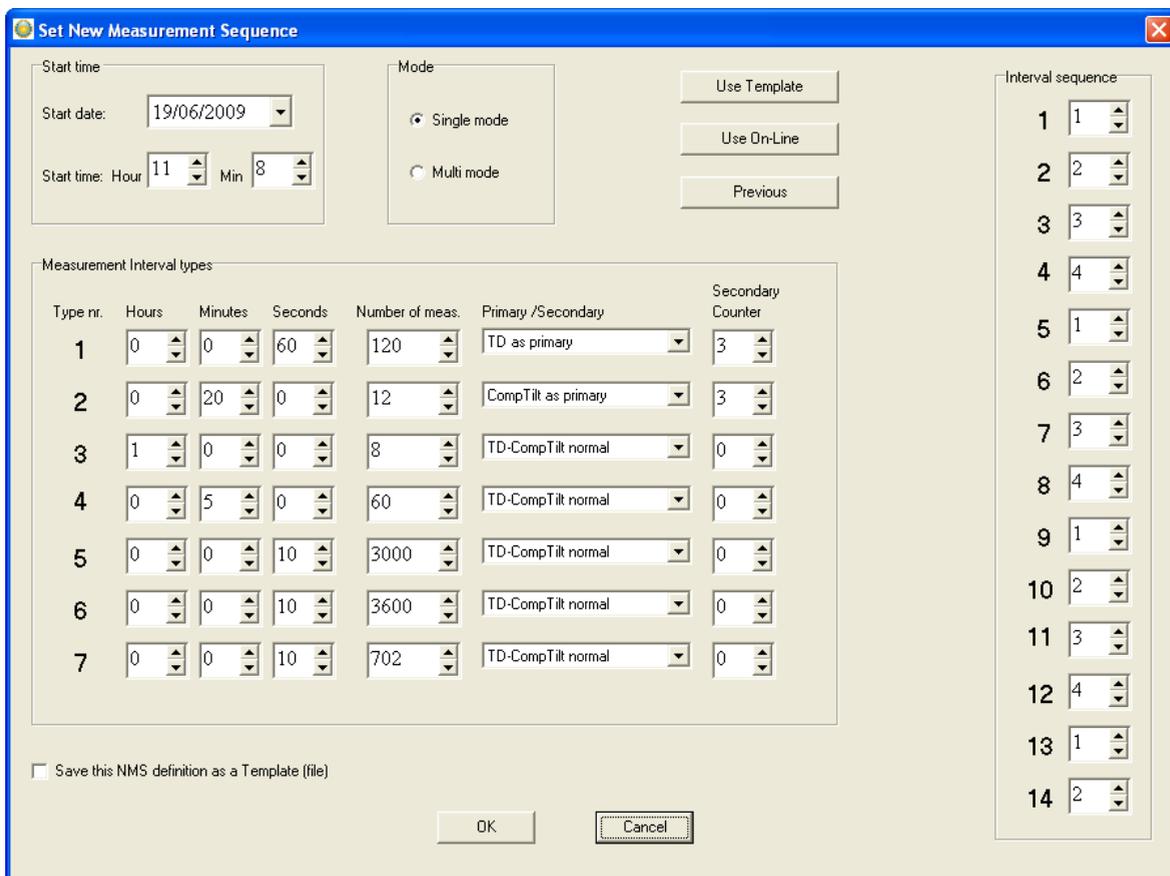


Figure 9.1 Set New Measurement Sequence (with multiple intervals)

9.1 Start Time

The user defines the date and time when recordings should start.

9.2 Measurement Interval

The sampling interval (time between measurements) is defined. Any value from 1 to 99 seconds, or 1 minute to 24 hours with increments of 1 minute. Up to 7 different sampling intervals can be selected. If seconds are used as sampling interval, the multiple of the sampling interval and the number of measurements must be dividable by 60.

9.3 Number of Measurements N1-N7

The user defines the number of measurements to be recorded within each sampling interval. A value from 1 to 60000 must be set. Please note that an initial measurement is taken at the defined 'start time'. This initial recording is not counted as a measurement for the 'Interval 1' number of measurements. For example if the recorder should measure every hour from midnight to ten o'clock (00:00 – 10:00), then the number of measurements defined should be 10. Please note that only this one measurement at the 'start time' does not count as a measurement for the intervals. In this case, the first measurement counted for the 'Interval 1' is at 01:00, and the last measurement is at 10:00, and then it shifts to another interval.

After taking one measurement at the 'start time', the recorder will start on the first interval in the sequence and take the number of measurements as defined. After taking the measurements on the first interval, it will automatically shift to the next interval etc. The sampling intervals and number of measurements will recycle until memory is full, or until connection is made with the recorder through a PC computer.

9.4 Sequence 1-14

The interval sequence must be filled out. As shown in figure 10.1, the user selects to use intervals 1-6 for the recordings. Another example: If two of the first sampling intervals are used, the sequence should be 1, 2, 1, 2 etc., meaning that the recordings shift between the first and the

second intervals, recording the defined number of measurement for the first interval, and then shifting to the second interval taking the number of measurements defined. The shifting between the intervals repeats until memory is full, or until connection is made through a PC computer.

9.5 Primary/Secondary

With default setting, both Temperature-Depth (TD) and CompTilt is recorded at each sampling interval (TD-CompTilt normal). The user has the option to select either TD or CompTilt as a primary sensor for each sampling interval. The objective with this feature is to save memory size, increase recording period, and get more data on the sensor that is of more interest (primary sensor).

The secondary counter is only meaningful if a primary parameter has been selected. The secondary counter defines how frequently the secondary parameter is saved along with the primary parameter. If for example Comp-tilt is selected as a primary sensor, and the number 3 is defined as a secondary counter, the TD will only be recorded every third time when CompTilt is recorded. If the value is 0 (zero), the recorder is in principle a Comp-tilt only, except the first measurement is always a TD-CompTilt measurement.

There are restrictions on the secondary counter settings when multiple intervals are defined. If a primary parameter is selected and secondary counter is 0 then the 'Number of meas.' for the primary counter must be an even number. If a primary parameter is selected then the 'Number of meas.' must be dividable by the secondary counter, and only odd numbers (0,3,5,7...255) can be used as a secondary counter.

The Use Template can be used if older definitions have been saved by enabling the 'Save this NMS as a template (file)'. That way it's possible to get templates that have been set up in the past. With the Use Sequence button it is possible to get same settings as from other recorders, by browsing for their serial no. By hitting the Previous button the settings go back to previous, before changes were made.

10. Reconvert Data

In SeaStar you have the option of re-converting data that has already been retrieved. After re-defining parameters, the data is reconverted by 'File – Reconvert Data'. The main reasons for re-converting data are:

- Adjust the center point for the pitch and roll measurements.
- Shift pressure/depth values according to a reference meter, to increase accuracy.
- Adjust measurements that are outside calibration range.
- Incorrect PC-time at measurement start time.
- Need for temperature or pressure/depth unit alteration.
- Need for data file format alteration.

10.1 Data Reconvert Definition

Under the Edit menu and Reconvert Definition, choose the Data Definition command, and the following dialog box appears:

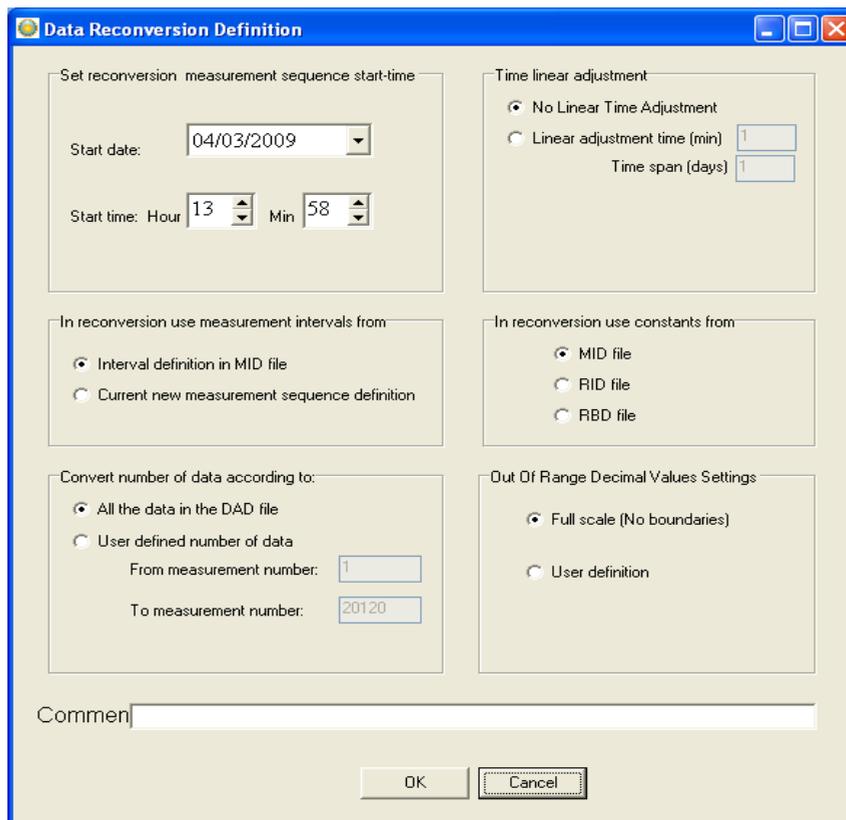


Figure 10.1 Reconvert Data Definition

Set Reconversion Measurement Sequence Start-Time

If the user notes from retrieved data that the PC date and clock were incorrect when measurements were started, it is possible here to specify a new start date and start time.

In Reconversion use Measurement Intervals from

The measurement interval is either the interval settings as shown in the measurement (MID) file, or if that interval is incorrect, a new and correct sampling interval is specified in the 'New Measurement Sequence Definition' command in the 'Edit' menu.

In Reconversion use Constants from

The user can choose to use calibration constants from:

- MID file. This option should normally be selected, as it contains information on the constants from the measurement sequence.
- RID file. The recorder information file contains the same calibration constants as the MID file, except if it has been re-calibrated. If it has been re-calibrated, and the user wants to use the new constants on older measurements, the RID option should be selected.
- RBD file. This option rarely needs to be selected. If the constants from the MID and RID file are corrupt, the user should contact Star-Oddi for an RBD file.

Convert Number of Data

The user can reconvert all the data in the last measurement sequence, or define the number of measurements to be reconverted. The user has the option to define what measurement range should be reconverted (for example to exclude data points when the recorder was above water).

Time Linear Adjustment

The real time clock inside the DST has an accuracy of approximately +/- 1 minute per month. This slight variation might accumulate over time and influence the measurement results. To correct the gradual time shift first check „linear adjustment time“ then type in the time offset value and the length of the measuring period.

Out of Range Decimal Value Settings

Measurements that are outside the calibration range are inaccurate, and may give erroneous results. The out of range (OOR) measurements can be seen in the OOR file. The user has the following decimal value out of range detection options when reconvertng:

- Full scale (no boundaries). This means that literally no 'out of range' detection will be made.
- User definition. With this selection the range definition under 'Settings - Out Of Range - DV definition' will be used. This option is selected when the decimal values (DV) are not available in the RID file. This would normally require the user to contact Star-Oddi for the decimal values.
- RID values. The calibration decimal range is given in the RID file. This is the default option and should normally be selected.

If an RBD file exists in the \Seastar\RBD folder, then SeaStar recognizes this file as a primary source for DV calibration range. In this case, the fourth option appears and is set as default.

10.2 Temperature Definition

Under the Edit menu and Reconvert Definition, choose the Temperature Definition command, and the following dialog box appears:

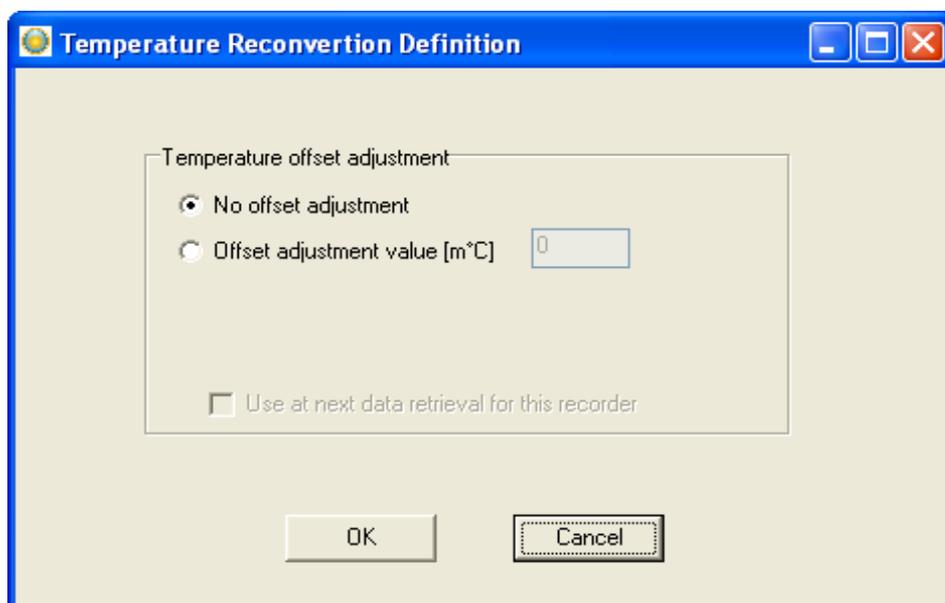


Figure 10.2 Temperature Offset Correction Menu

Offset Adjustment

When recorders are used over a long period of time, the temperature measurements can start to deviate from correct values.

When checking older recorders, it has come apparent that the error in the measurements is mainly due to an offset. Some users feel they can benefit from an offset correction option in SeaStar, for example when a recorder has been in the water for a long time and is later tested to show an offset. The offset is defined in m°C (1000 m°C = 1°C).

10.3 Pressure Definition

Under the Edit menu and Reconvert Definition, choose the Pressure Definition command, and the following dialog box appears:

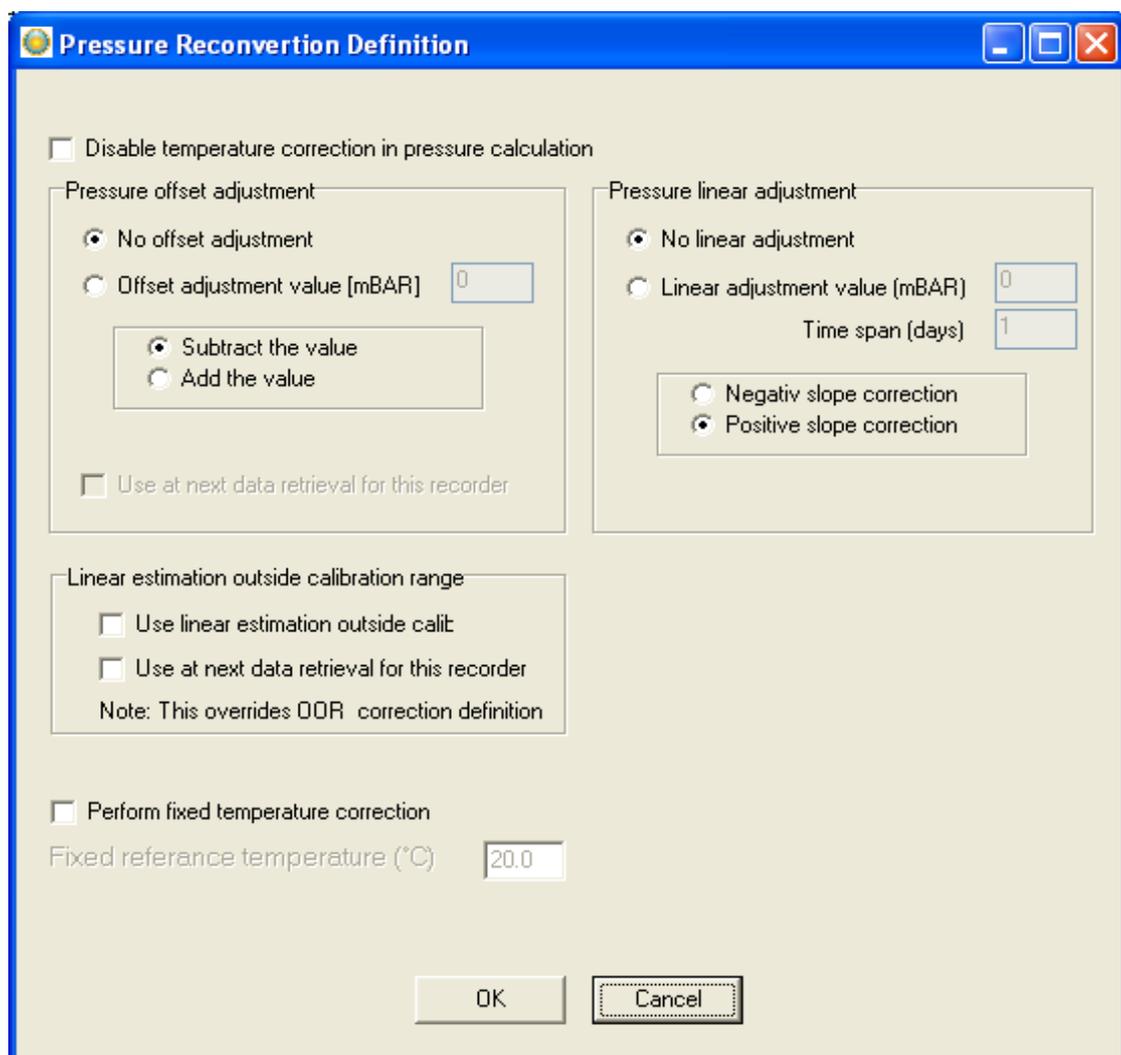


Figure 10.3 Pressure Reconversion Definition

Disable Temperature Correction in Pressure Calculation

In case the temperature sensor is malfunctioning in a way that it will indicate very high temperature values, it will offset the pressure calculation. An automatic temperature correction is set by default in SeaStar. To turn off this feature, check the box next to „Disable temperature correction in pressure calculation“.

Pressure Offset Adjustment

The user can increase accuracy of pressure/depth recordings by finding an offset value, which is the difference between a recorder's depth value and a reference meter's value. Once the offset point has been set in, the data can be reconverted, and all pressure/depth recordings shifted according to the value defined (in mbar).

In cases where a drift has occurred with the pressure recordings, the pressure data can be corrected if the user has a known reference point for correcting the data. To find the offset value, the recorder should be deployed in water, at a known depth (preferably >2 m depth), or placed along with an accurate reference depth meter, where a reference point can be taken. Once the offset value has been found, the offset pressure value is put in the window shown above. The offset value can either be subtracted or added to the pressure values.

When using 9.81 as g , the coefficient for converting cm into mbar is 1.019. For example: $100 \text{ cm} = 101.9 \text{ mbar}$. If the 'Use at next data retrieval for this recorder' is enabled, the offset value is fixed for that particular recorder, and future data uploads of the recorder will use the offset value defined, for shifting the pressure data. The offset value will apply only to that particular recorder, and other offset values can be defined for other recorders.

Pressure Linear Adjustment

Aging of the pressure sensor can result in an offset of the measured pressure values. To correct these offset values you can select a linear pressure adjustment. Check „linear adjustment value“ and fill in the pressure offset value (difference between expected value and real value at the end of the recording period) and the length of the measuring period.

Linear Estimation Outside Calibration Range

The pressure sensor tolerates a significantly higher pressure than its calibration range. If the recorder is exposed to higher pressures than its calibration limit it will result in erroneous data. By choosing this option you will receive more adjusted values. Please note that since these values are outside of the calibration range an exact adjustment is not possible, this feature is mainly for estimation purposes.

Depth Calculation

For converting the pressure units to depth, the standard for the acceleration of gravity is 9.81 (1 bar = 1000 mbar = 9.81 m), but it can optionally be set from 9.78 to 9.83, depending on the gravity in the different areas of the world.

10.4 Pitch & Roll Reconvert Definition

Under the Edit menu and Reconvert Definition, choose the Tilt Reconvert Definition command and a dialog box appears, figure 10.4.

As the 'No angle offset adjustment' is disabled the above box appears. The X, Y and Z angles can be adjusted. The offset value can either be added or subtracted.

Normally the 'No new range' is enabled and not configured by the user unless with consultation from Star-Oddi. The purpose of this feature is to put in a new range when recalibrating the X and Y axis of the compass.

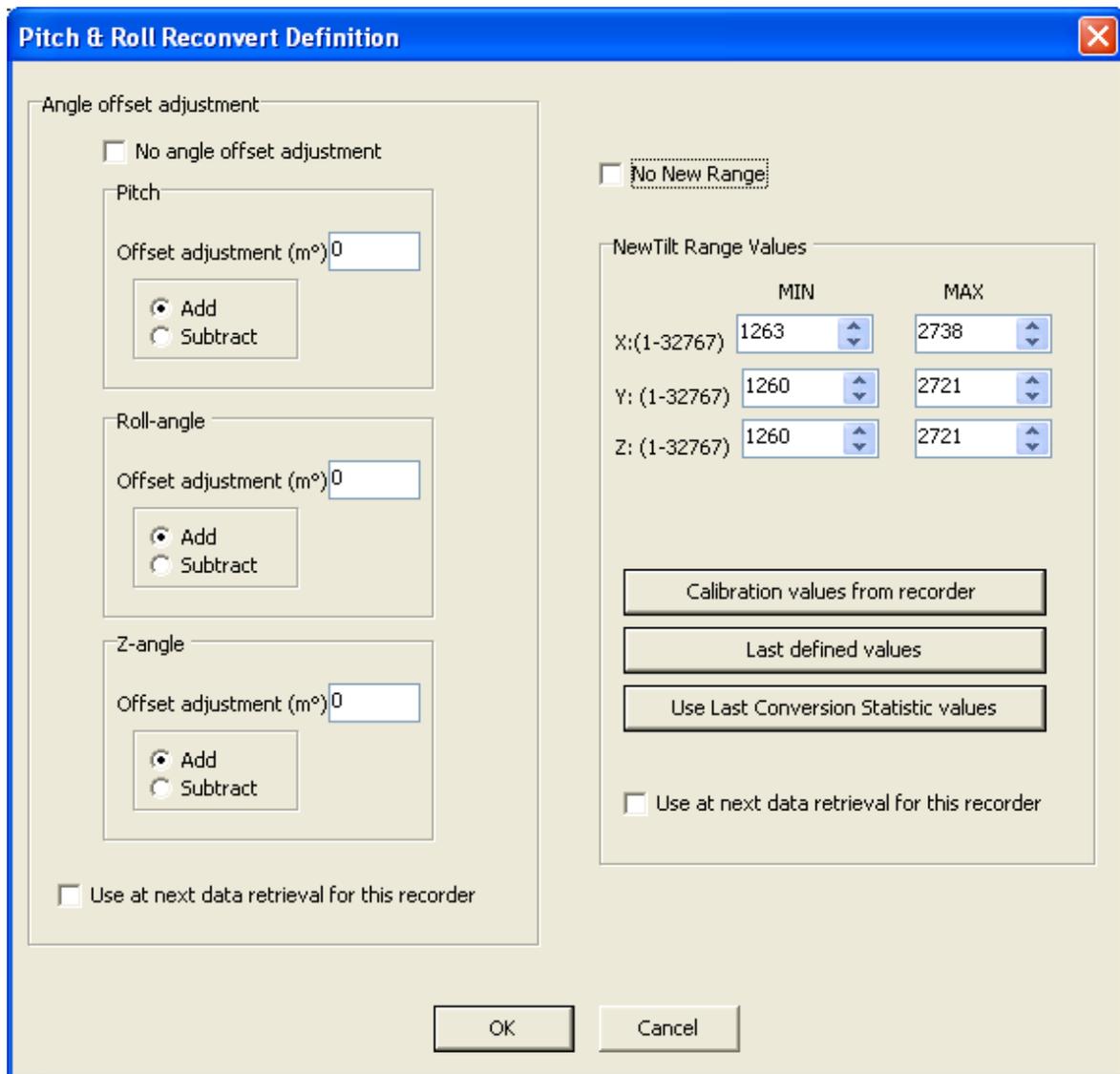


Figure 10.4 Pitch & Roll Reconvert Definition

10.5 Compass Reconvert Definition

Compass Offset Adjustment

Under the Edit menu and Reconvert Definition, choose the Compass-U,V command and a dialog box appears:

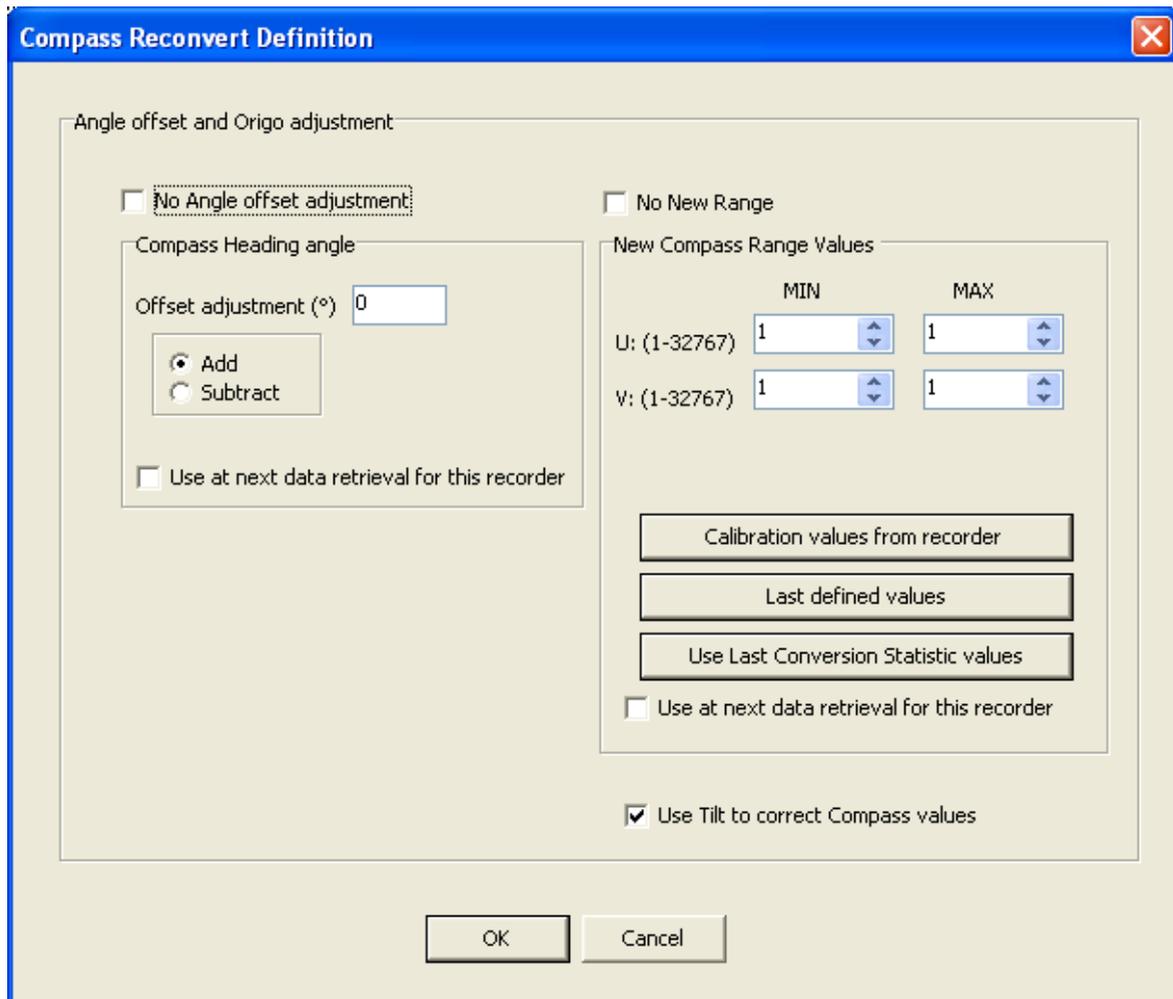


Figure 10.5 Comp-tilt Reconvert Definition

As the 'No angle offset adjustment' and 'No new range' is disabled the above box appears. The Compass heading angle can be adjusted. The offset value can either be added or subtracted. Although the DST magnetic is a two channel magnetic measurement device, the software converts the values into a single heading value. The heading value shows the Magnetic North.

In order to change the heading value into True Geographic North it is necessary to put in an offset adjustment for declination. The declination varies between regions but it is possible to see the declination in each

area on the internet. The declination value can be found at www.ngdc.noaa.gov/geomagmodels/struts/calclGRFWMM.

It is recommended that the user makes reference measurements of the magnetic heading prior to a study.

The performance of the DST magnetic is optimum when it is placed in the horizontal plane, the further the comp-tilt pitches and/or rolls from the horizontal plane the larger the error reading becomes. If it is shown that the recorder has not been mounted in a 0° horizontal position it is possible to put in an approximate offset value based on the tilting of the DST housing.

10.6 Deployment-Retrieve Locations

Under the Edit menu and Reconvert Definition, choose the Deploy/Retrieve Location command and a dialog box appears:

The dialog box titled "Deployment and Retrieval Locations" contains two main sections: "Deployment" and "Retrieve".

Deployment Section:

- Date: 22/02/2008
- Hour: 0, Min: 0
- Latitude: 64 Deg, 7 Min, 0 Sec
- Magnetic field vector (nT): 52379

Retrieve Section:

- Date: 22/02/2008
- Hour: 0, Min: 0
- Latitude: 0 Deg, 0 Min, 0 Sec
- Magnetic field vector (nT): 52379

At the bottom, there is an unchecked checkbox labeled "Use Position to correct/improve Tilt and Magnetic Field calculations" and two buttons: "OK" and "Cancel".

Figure 10.6 Deployment and Retrieval Locations

Before releasing the DST magnetic the user should note down the release time and date, latitude and the magnetic field vector. These information should also be obtained upon recapture of the DST magnetic. To correct/improve the tilt and magnetic field calculations the user should

enable that option and insert the information on time-date, latitude, magnetic field vector, both for release and recapture of the recorder.

10.7 Single Spike Correction

To enable single spike correction choose Edit-Reconvert Definitions-Temperature Definition and the following dialog box appears:

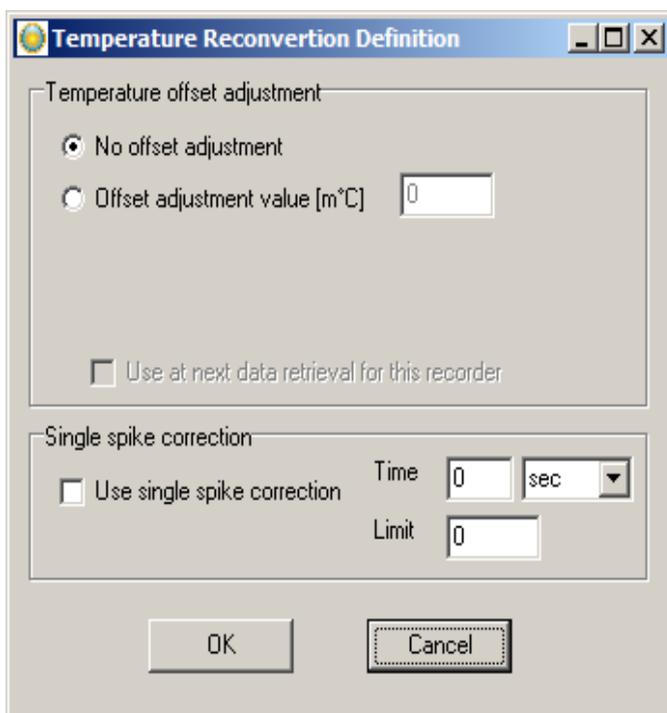


Figure 10.7 Single Spike Correction

Check Use Single Spike Correction.

There are two variables, Time and Limit. The Limit defines how much difference can be between two points over a defined Time.

If a point is outside the range, +/- the limit of adjacent points. That point is then calculated as the average of the adjacent points.

This feature is also available for Pressure.

Reconvert Data

After acknowledging the offset adjustments, the data need to be reconverted, for the adjustments to be effective: <File\Reconvert Data>.

11. Recorder Modes

In this chapter, the three operational modes of DST magnetic are described, that is the PC Mode, Sleep Mode and Measurement Mode

11.1 PC Mode

If the recorder is in the correct position in the Communication Box, and by choosing the Recorder menu and the Connect command, the recorder is put into PC Mode. At the bottom of the SeaStar window, the text On-line is displayed, indicating that the recorder is on-line and in PC Mode.

While in PC Mode, the recorder will remain in an active listening stage. The communication protocol is a simple master/slave arrangement, in which the recorder is the slave. The slave will perform every command the PC issues, and after execution of a command, it will return to listening. When the recorder is connected to the PC, it is powered by the PC, and not taking energy from the battery inside the recorder.

11.2 Sleep Mode

The user receives the recorder in Sleep Mode, but it can easily be awakened by the Connect command in the Recorder menu. If the recorder is not set in Measurement Mode, it goes into Sleep Mode when the recorder is removed from the Communication Box. When the recorder is in this mode, less energy is depleted from the battery.

11.3 Measurement Mode

The recorder is put into Measurement Mode by choosing the Recorder menu, and Start New Measurements Sequence. The recorder starts recording measurements according to the start time (date/month/year) and sampling interval (hours/min.) defined by the user.

When the memory is full, the recorder shifts automatically into Sleep Mode. If the recorder is still in Measurement Mode upon connection through a PC computer, it stops recording and is put into PC Mode.

12. Memory Organization

Data is kept in an EEPROM memory and will not be lost if the battery fails or expires. The memory of the recorder is organized as shown in the figure below:

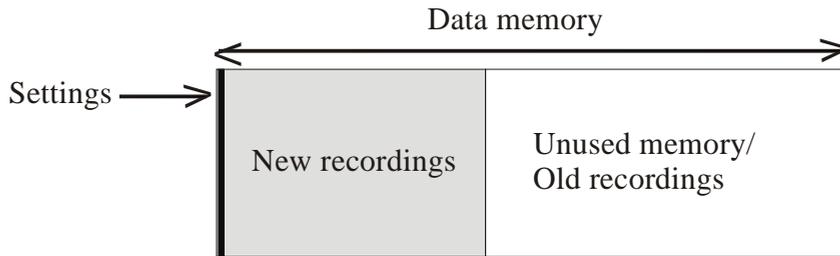


Figure 12.1 Data Memory Organization

When data is retrieved from the recorder, the following occurs:

1. The computer retrieves the data from the recorder and writes the data to the computer's hard drive .
2. The recorder has stopped recording, but still holds the recorded data.

When new settings are sent to the recorder, the following will occur:

1. New settings are sent to the recorder.
2. The data memory pointer is reset to the beginning of the data memory and starts to write over older recordings.

The organization of the memory is now as follows:

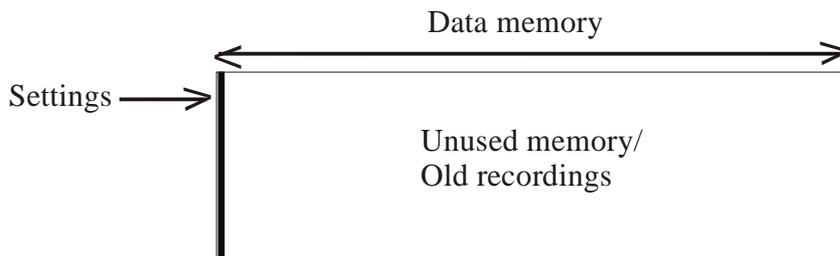


Figure 12.2 Data Memory with New Settings

13. Appendix

13.1 Directories and Files

Directory Structure

The user can choose between SeaStar's default data directory structure (path) or define his own data path. As the SeaStar program is a multi recorder type program, the directory structure branches from the directory where SeaStar is positioned down to type directories, i.e. Starmon mini, DST magnetic etc. From there it branches again into recorder directories, named after the serial numbers of the recorders, designed to hold data for each individual recorder (data directory). All in all it is a three level directory structure.

An example of this directory structure with DST magnetic is:

C:\Seastar\ The installation directory (SeaStar.exe location)

C:\Seastar\DST magnetic\ The type directory for DST magnetic

C:\Seastar\DST magnetic\I2018\ The directory for the I2018 recorder

When a new recorder type is selected in SeaStar (File – New Recorder Type), the directory for that recorder type is created. When connecting to a recorder for the first time, SeaStar creates the recorder directory, named after the serial number of the recorder.

Information Files

SeaStar uses information files to store and retrieve settings. There are two types of information files:

1) The type-INI files, (for example DSTq.ini for DST magnetic).

The information type files are all in the installation directory, they contain information on specific settings for each type. The type-INI files are:

StarmonT.ini	Starmon mini
DSTm.ini	DST milli
DSTr.ini	DST milli recycle
DSTu.ini	DST micro
DSTc.ini	DST centi/centi-ex
DSTs.ini	DST CTD
DSTg.ini	DST GPS
DSTx.ini	DST pitch & roll
DSTq.ini	DST compass
DSTi.ini	DST comp-tilt

2) The recorder-INI files, for example I2018.ini contains settings information and data file positioning for the I2018 recorder. The recorder-INI files are located in the appropriate type directory, i.e. all the Qnnnn.INI files are in the 'DST magnetic' directory.

Files Locations

As stated previously, the type-INI files are placed in the 'Seastar' directory, and the recorder-INI files are placed in the recorder type directory. All other recorder and measurement related files created by SeaStar, are placed in the appropriate recorder's directory. For example: C:\SeaStar\DST magnetic\I2018\ is a directory for the I2018 recorder and all files belonging to I2018 are placed there.

If the user wishes to use his own defined data path, for example C:\Data\, then all the files for all the recorders, except for the INI files, are placed there. If the user has enabled the "Create recorder directories" in the user path definition, individual recorder directories, irrelative to type, are created under the user defined path, for example: C:\DATA\I2018\ for the I2018 recorder. The I2018.ini file (located in the C:\SeaStar\DST magnetic\I2018\ directory) contains the path to the C:\Data\I2018\ directory, and all files related to the I2018 will be placed in that particular directory.

Browsing for a Recorder

When browsing for a new recorder from the 'Select recorder' under the files menu, the default method is to find a recorder-INI file in the type directory. The INI file will then point to the data directory (the recorder's directory). If the user has enabled the "Browse first in the user directory" in the user path definitions, the search starts in the user defined directory, where a *.RID file must be selected.

Recorder Related Files

Every file that is recorder related has the following name format:

Xnnnn: The name is the serial no. of the recorder

Ext	Description	File type
RID	Recorder information data	Binary
RIT	Recorder information text	Text
RBD	Recorder backup data	Binary
RDD	Recorder SNMS* download information data	Binary
RDT	Recorder SNMS* download information text	Text

*SNMS: Start New Measurement Sequence

The recorder ID (RIT) can at a later time be opened, and the related measurement data can be viewed, printed and reconverted. The RDD, RDT and DIR are download information files, created when a new measurement sequence is started.

Measurement related Files

Every file that is specifically measurement related has the following name format:

mmmXnnnn: The name is the measurement number + serial no.

Ext	Description	File type
MID	Measurement information data	Binary
MIT	Measurement information text	Text
MDD	Measurement download information data	Binary
MDT	Measurement download information text	Text
CIT	Measurement conversion information text	Text
DAD	Measurement Data Binary file	Binary
DAB	Measurement Data Binary file	Text
DAT	Measurement Data Binary data	Text

The MID, MIT and DAD files are created upon measurement data retrieval from the recorder. The DAB, DAT and CIT files are created when converting the data. The MDD and MDT are download information files and created when a new measurement sequence is started.

Data Files

Upon data retrieval, three main data files are created.

The *.DAD File

This file is the raw data source file. The data is in mixed binary form. The user cannot access this file in the SeaStar program. When converting these raw data into measurements, the *.MID file is needed. The result from the conversion are two data files, the *.DAB and the *.DAT.

The *.DAB File

This file contains sequential binary representation of the data in columns. The first column is the measurement number. The other columns contain the measured parameters in a binary form.

The *.DAT File

This is the actual result file, where the measurements are converted to their natural units and timed. This is a text file with columns. The first column is the measurement number, the second column the date and the time, depending on the set-up. The third column is the time or the first measured parameter, depending on set-up. The following column(s) contain the converted measured parameters with units and number of decimals according to set-up. Number of parameters can range from 1-3, and number of columns 3-6 accordingly.

Data Header

The *.DAT file contains a data header, which is a detailed description of how the *.DAT file is configured. This feature is used by SeaStar when graphically representing the data, and is practical if the user wants to import the data into other applications or databases. Most of these descriptive items are derived from the 'Settings' menu and the recorder type definition in the 'File' menu.

Each header item is contained in one line, and all header lines start with a # (bookmark) and a number. Then follows a description of the header item, and then 1-4 directives, all separated by tabs. Eventually a comment trails the directives, preceded by a ; (semicolon).