SeaStar

Application Software

User Manual

DST Magnetic

Compass, Tilt (3D), Temperature & Depth Recorder

STAR ODDI

Logging Life Science

This user manual is compiled in October, 2025 and is made using DST Magnetic (v.8) and SeaStar v.9.48.

We recommend users to use the most up to date version of SeaStar since older versions might not support all features explained in this manual.

Contents

1 Introduction

SeaStar is the supporting software for the **DST Magnetic** compass, tilt, temperature and depth recording Data Storage Tag (DST). **SeaStar** can run on PCs with Windows versions newer than Win 7.

This manual guides the users of DST Magnetic through the operation of the recorder. Programming the recorder as well as data retrieval requires access to a PC computer with a standard USB port to connect the Communication Box.

To download SeaStar visit:

http://www.star-oddi.com/support/software

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. Type in your product key that has been shipped with your loggers or emailed to you. Please keep the product key in a safe location as you may need it for future use. The product key works for multiple computers on the same network.

DST Magnetic is a compact microprocessor-controlled compass, tilt, temperature and depth recorder with electronics housed in an implantable grade waterproof housing.

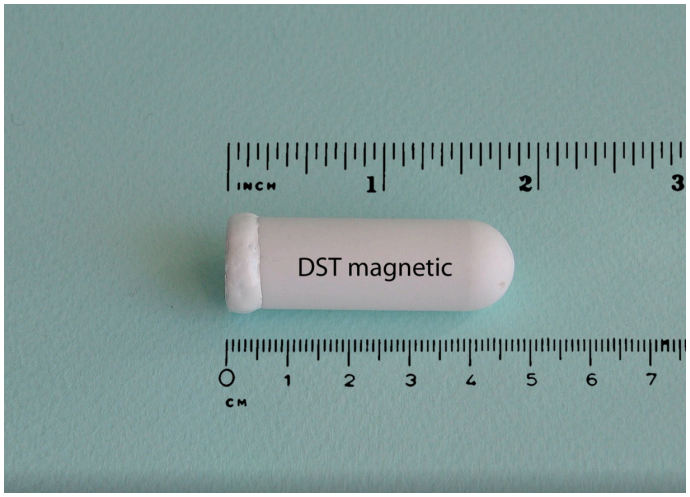


Figure 1.1: DST Magnetic recorder

2 Program Installation

This chapter describes how to install and uninstall the **SeaStar** software on your personal computer.

2.1 Install

To download **SeaStar** visit www.star-oddi.com/support/software. 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.

Type in your product key. Please keep the product key in a safe location as you may need it for future use. The product key works for multiple computers on the same network.

2.2 Uninstall

To uninstall the program, do the following:

1. Click on the **Start** button in Windows.
2. Go to **Settings** > **Control Panel**
3. Choose **Uninstall a program** under **Programs**.
4. Choose **SeaStar**, a dialog window appears, asking **Permanently remove SeaStar?**, click on **OK**.

3 Preparation

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

Start **SeaStar** and the following window appears:

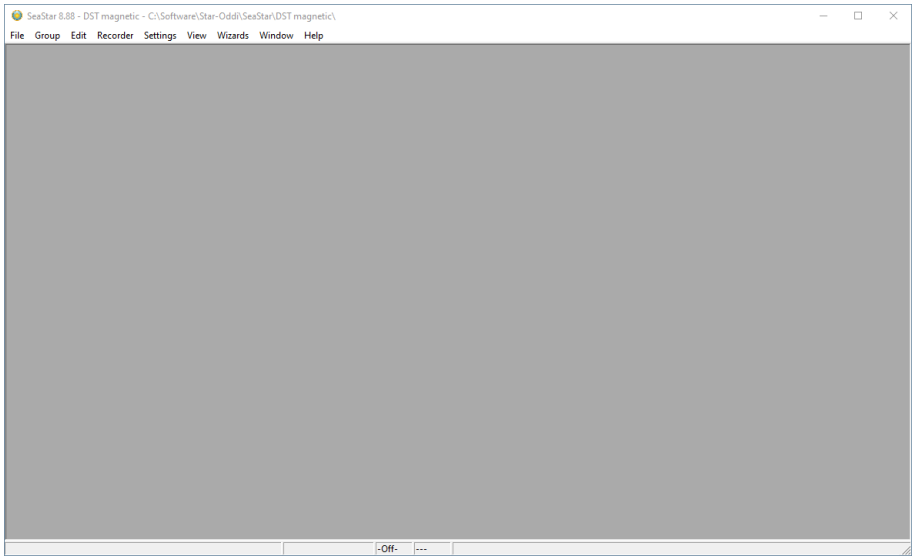


Figure 3.1: SeaStar Main Window

If you are starting the software for the first time, you will be asked if you want the **Connection Wizard** to open automatically each time you start **SeaStar**. If you change your mind you can always change the settings under **Settings** > **Options** > **Startup**.

3.1 Select Recorder Type

SeaStar is compatible with several other Star-Oddi instruments. A recorder type must be selected before connecting to the recorder. The default setting in the software is set to DST micro-T 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.

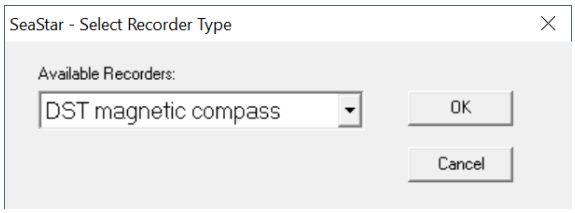


Figure 3.2: Select a new Recorder Type

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

3.2 Configuration of the Communication Port

It is necessary to define which USB or serial port on your PC computer you will use for connecting the Communication Box.

Using USB connection

USB drivers should automatically install on the computer when the cable is connected to an internet connected PC computer. In case a manual download is necessary you can download and install the USB driver from our website, depending which cable is being used: https://www.star-oddi.com/support/software.

The easiest way is to use the Connection Wizard. When opening the software the following window appears:

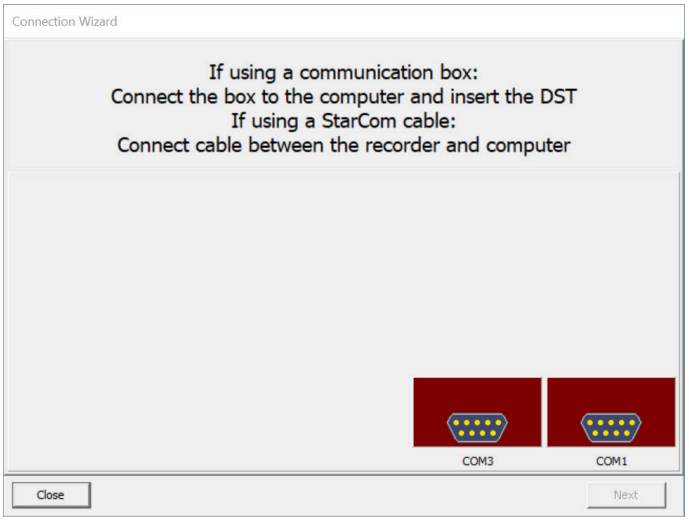


Figure 3.3: Connection Wizard

Connect the Com Box and the selected port will appear in the wizard pop-up window (see figure 3.3).

The serial port can also be defined manually in the following way:

1. Select **Settings** > **Communication** > **Serial Ports**. The **Communication definition** dialog box appears.
2. Select a serial port for communications.
3. Choose the **OK** button.

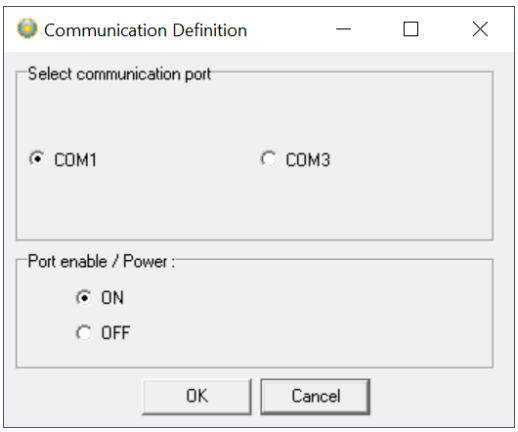


Figure 3.4: Communication Port Configuration

After you plug in the Com Box, you will see a new communication port in your device manager, called **USB Serial Port**. Make sure that the port is enabled and select the appropriate port in SeaStar.

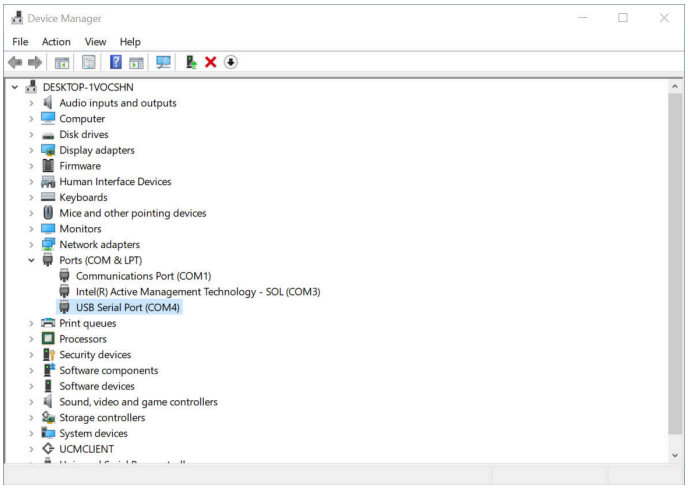


Figure 3.5: USB Communication Port in Device Manager

Using the Serial Port

To check which communication ports are available on your computer, open your Device Manager. On Windows 10 you can do the following: **Control Panel** > **Hardware and Sound** > **Device Manager**, or go to **Search** and type **Device Manager**.

Under **Ports** you can view all available ports. Ensure that the port you intend to use is enabled: right-click on the appropriate port and select properties. Under **Device status** it should state **"This device is working properly"**.

4 Magnetic & Tilt

4.1 General description

4.1.1 Magnetic

The DST magnetic measures additionally to temperature and depth, compass heading of the DST (referenced to the magnetic north), and tilt in 3-D three directions (referenced the Earth gravity). The tilt range is +/-90° for each of the three axes 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 reasonable tilt compensation on a 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°).

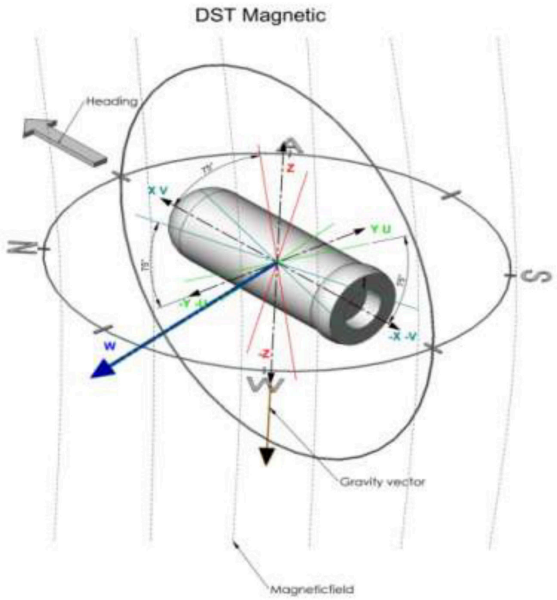


Figure 4.1: DST Magnetic

The performance of the DST magnetic is optimal when it is placed in the horizontal plane. The more magnetic pitches and/or rolls from the horizontal plane, the more significant the error reading becomes.

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. 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**.

Select **View** > **Data Trend and Table** > **Magnetic** to view the magnetic axis and the magnetic vector in nT (nanotesla).

4.1.2 Tilt

The DST Magnetic measures tilt in 3-D three directions (with reference to the earth's gravity). The diagram below shows the three axes; X, Y, and Z.

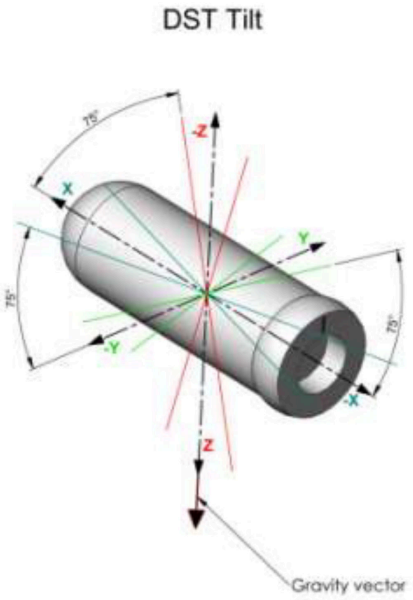


Figure 4.2: Tilt (3D)

Because of the three axes, the DST tilt can be placed horizontally or vertically. The DST has a mark on the end. When sitting horizontally on a flat plane, and with the mark on the DST pointing straight up, the axis should give:

- X = 0°
- Y = 0°
- Z = 90°

The tilt accuracy is better than +/-3° and applies to a tilt range of +/-90° for each axis. The optimal accuracy for the X and Y-axis is when the recorder is mounted horizontally but optimal for the Z-axis when placed vertically.

When the recorder is placed horizontally on a plane or the tag holder, and holes at the nose have equal distance from the plane, both the Pitch axis and the Roll axis are centered at ca. 0° angle while Z shows ca. 90°. The 'DST Magnetic' text or other custom-defined text on the housing should face up when placed horizontally. When used for fish tagging, the tag holder is required. When specially designed Adjustable Housing is used, the recorder is fixed inside the housing with a clamp, and the mark on the housing face directly up if placed horizontally. An 8 mm socket wrench should be used for tightening the clamp against the DST.

The tilt angles are referenced to the local horizontal plane, i.e., the plane perpendicular to the earth's gravitational vector.

Pitch is defined as the angle between the recorder's longitudinal axis and the local horizontal plane (positive for nose up). Roll is defined as the angle about the longitudinal axis between the local horizontal plane and the actual recorder orientation (positive for right-wing down).

In case the recorder is placed horizontally, the following applies:
If the recorder is rolled to the port side, i.e., to the left (seen from the end where the pressure sensor and reference mark is) of the recorder, the Roll measurements are negative down to -90°. If rolled to the starboard (to the right), the Roll measurements become positive up to +90℃.

The Pitch axis rises positively when the recorder's round end tilts up but declines negatively when tilting down.

It should be emphasized that the pitch and roll angles that are calculated in SeaStar are references to the horizontal plane and will thus not show the actual body rotation of the logger unless transferred to the PatternFinder (free download from staroddi.com) where you can see the rotation of the logger in animated form.

One thing that should also be considered is that the tilt sensor is fundamentally an accelerometer, and fast movements can give rise to erroneous tilt measurements.

4.2 Hands-on Description

Before putting the recorder in an actual situation, it is recommended that the user do a short test on different angles to understand better how the tilt sensors operate. For that purpose, please synchronize your clock with the PC computer's clock to see in which angles the recorder is placed at each time. It is recommended to let the recorder take measurements in its initial position on the subject to have the reference from the starting point.

4.3 Acceleration Limit

Acceleration limit is an attempt to minimize the effect of acceleration exceeding the earth's gravitation.

The Tilt sensors are accelerometers, and the tilt values are derived from the acceleration measurements. Thus if the sensor experiences acceleration beyond the gravitational acceleration, it can lead to extreme/erroneous tilt values. Sudden jerky movements, knocks and bumps, and much vibration can have this effect.

The nominal acceleration vector is used for comparison. For better readability, the nominal vector is displayed with a milli prefix as an integer. The acceleration limit values are delta values 0-999. The default value is 100, i.e., 10% of earth's nominal gravitation. Thus using the default value, if the acceleration vector exceeds +/-1100, then X, Y, and Z acceleration values are exchanged with previously measured values.

4.3.1 External Acceleration Limit (EAL) parameter

The EAL (External Acceleration Limit) is a parameter in the DAT and graphs. A EAL parameter has two values, 0 if g_n is under the limit and a value of 1 if g_n is over the limit.

The External Acceleration Limit (EAL) (default limit is 100mg) can be useful when using the tilt data to know when external acceleration was affecting the logger and therefore generating more error in the measurements than during no external acceleration.

5 Communication Box

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

5.1 Communication Box

The DST Communication Box is a USB-compatible communication interface specially designed to communicate with DST recorders wirelessly via inductive RF (radio frequency). A USB serial converter plug can optionally be used with the older models that have an RS232 connector. Since 2017 all communication boxes are only equipped with a USB connector.

The Com Box comes in four different sizes, each with a hole that fits our DST sizes; centi, milli, micro, and nano. Each DST size requires its own Com Box.

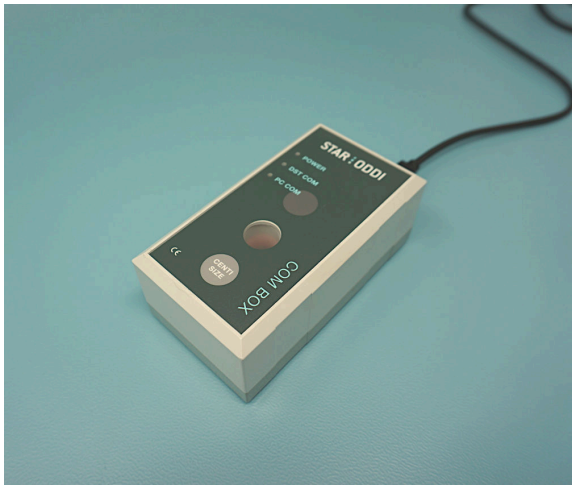


Figure 5.1: Communication Box

The Communication Box has three diodes:

1. **POWER** (red diode) shows that power is fed from the USB to the Communication Box.
2. **DST COM** (green diode) shows that recorder is in correct position and can communicate with the **SeaStar** software.
3. **PC COM** (yellow diode) shows that **SeaStar** has made a connection with the box and that the correct COM port has been selected.

For USB communication boxes:
The Communication Box is powered by USB. Connect the USB cable between the box and your computer. After the power supply/or USB cable has been connected to the Communication Box, the POWER (red) light should be on. After SeaStar has been started, the PC COM (yellow) light should be on (if the correct COM port is selected).
When the logger is placed inside the box, the DST COM (green) light will turn on. The Com Box will power the recorder while communicating with the PC. If the battery is dead, the PC and interface can still connect to the recorder and retrieve data.

For communication box with an RS-232 and an external power supply:
If using a Communication Box with RS-232C connection, connect the serial cable between the serial port of the computer and the Communication Box. Plug the power supply connected 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 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.

5.2 Inserting the Recorder

To establish a connection between the recorder and the SeaStar software, the POWER (red) and PC COM (yellow) lights should be on. The recorder is inserted into the hole of the box as shown in the figure below:

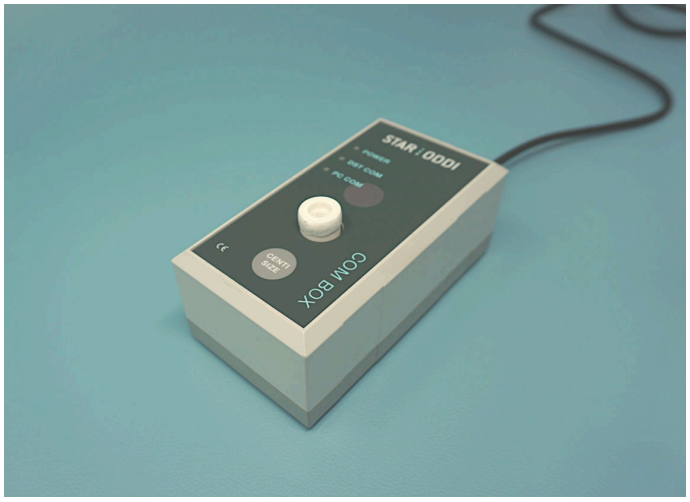


Figure 5.2: Recorder inserted into the Communication Box

If the recorder is wet/damp, please wipe it dry before inserting it into the box. The spherical end of the recorder with the suture hole faces down, and the less oval or transparent part (micro/nano) end faces up.

When the DST COM (green) light is on, communication can be established with the software.

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

5.3 COM Connection

Choose **Settings** > **Communication** > **Serial Ports** to display available ports (see figure 5.3).

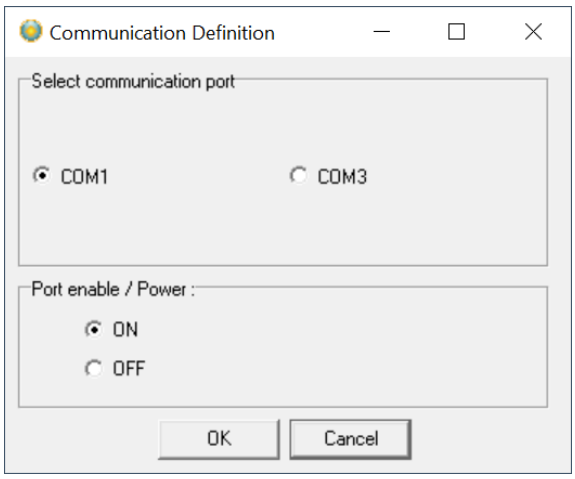


Figure 5.3: Communication Port Configuration

5.4 Connection Wizard

Choose **Wizards** > **Connection Wizard**. Connect the USB cable and the selected port will appear in the wizard pop-up window (see figure 5.4).

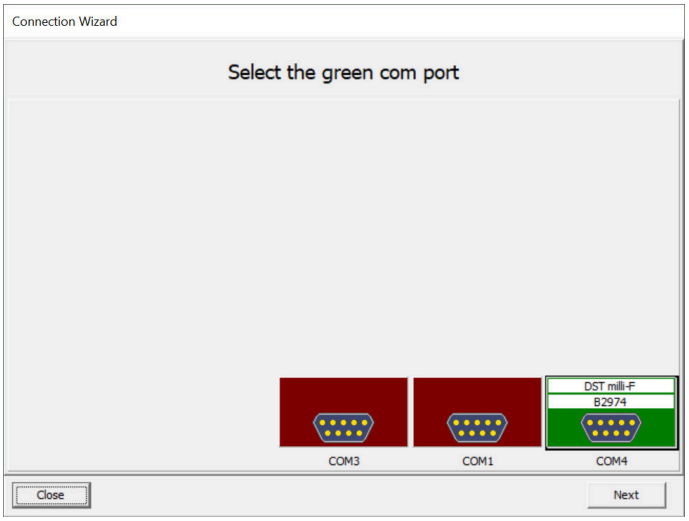


Figure 5.4: Connection Wizard, showing available COM ports. The correct COM port (green) shows the type of DST recorder connected and its serial number.

6 Settings

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

6.1 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:

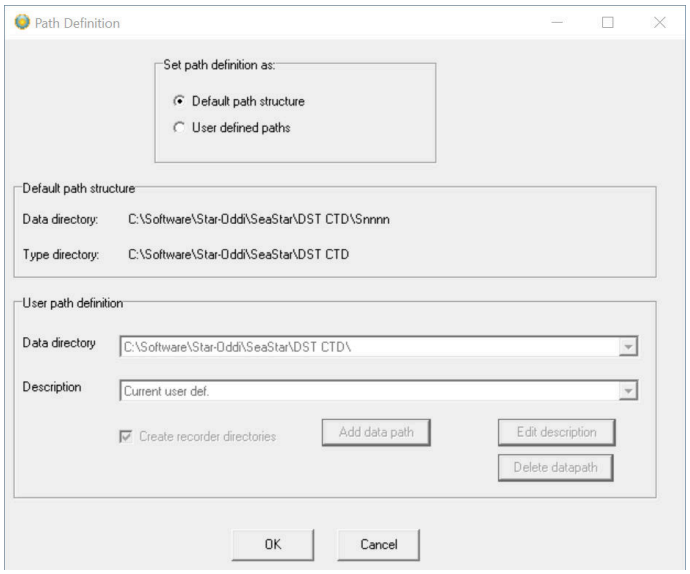


Figure 6.1: Directory Path Definitions

6.1.1 Default SeaStar Path Structure

By choosing a DST recorder type, **SeaStar** automatically creates a DST type directory in the 'SeaStar' directory that was created when the software was installed on the computer. Upon connection with DST, another directory is automatically created under the type directory, named after the recorder's serial number. All data files and other files related to that recorder are stored in this 'serial number' directory. Each DST recorder has its own data directory.

6.1.2 User Defined Paths

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

6.1.3 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 A.1.

6.1.4 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 the software.

6.2 Preferences

6.2.1 Units

By choosing **Settings** > **Preferences** > **Units**, a dialog box appears:

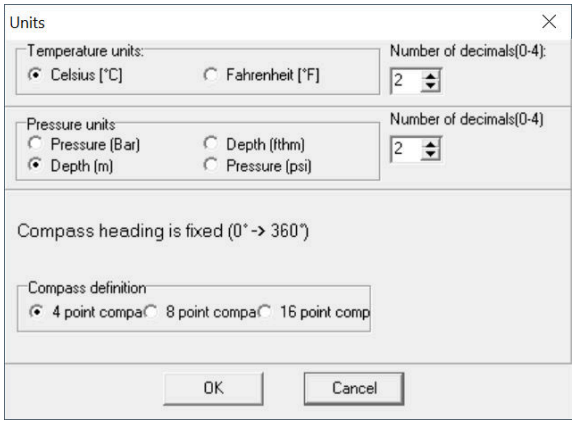


Figure 6.2: Unit Dialog Box

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 all values can be selected.

6.2.2 Data File Format

By choosing **Settings** > **Preferences** > **Data File Format**, a dialog box appears:

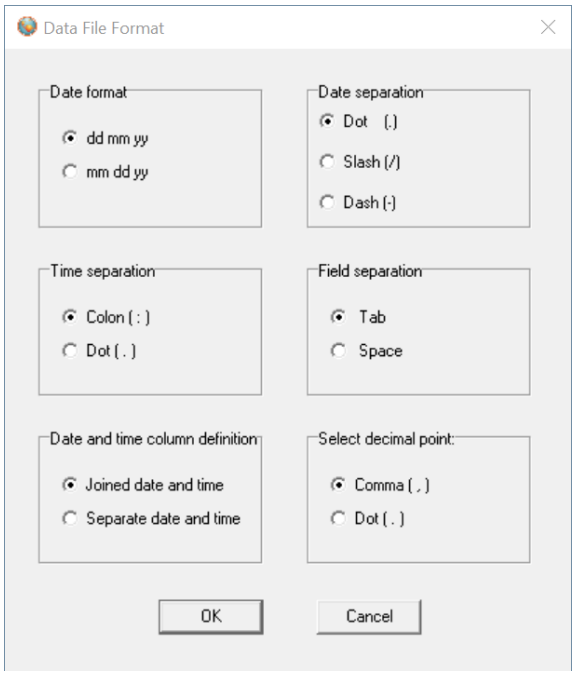


Figure 6.3: Date File Format dialog box

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 Format

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 space should separate the fields.

Date and Time Column Definition

If data is 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 created text files.

6.2.3 NMS Time and Energy calc.

This option is only available before a recorder has been connected to SeaStar. The function allows the user to choose different memory parameters, which are then used when memory, and battery energy usage is predicted upon setting up a New Measurement Sequence.

By choosing **Settings** > **Preferences** > **NMS Time and Energy calc.**, a dialog box appears:

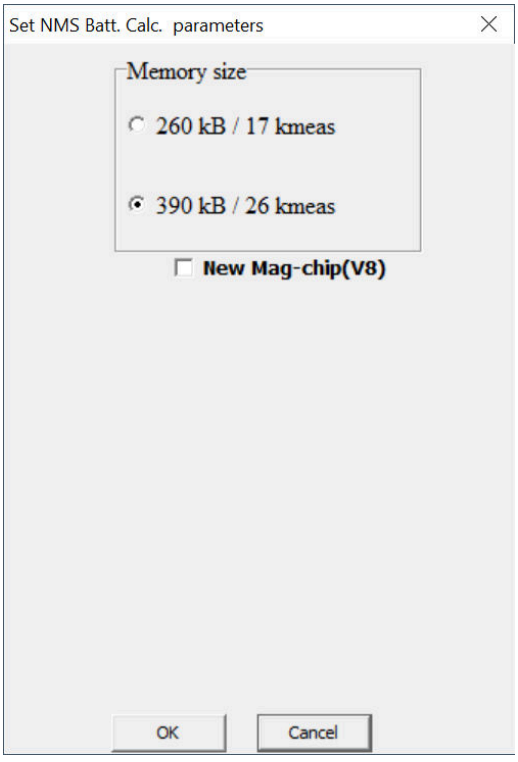


Figure 6.4: Set NMS time and energy calculations

Some recorders (when selected from File > New Recorder Type, see chapter 3.1) also allow for other options, such as skipping certain measurement parameters, which then also affect memory and battery energy usage predictions.

The results are written to a text file bearing the recorder name with an NMS extension. If a recorder has not been selected, the file bears the recorder type name, with the NMS extension. Battery & memory calculator (days) will help design the study since the calculation of battery and memory used during the set number of days will appear at the bottom of the NMS file. The file is placed in the SeaStar\NMS directory.

6.3 Connection

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

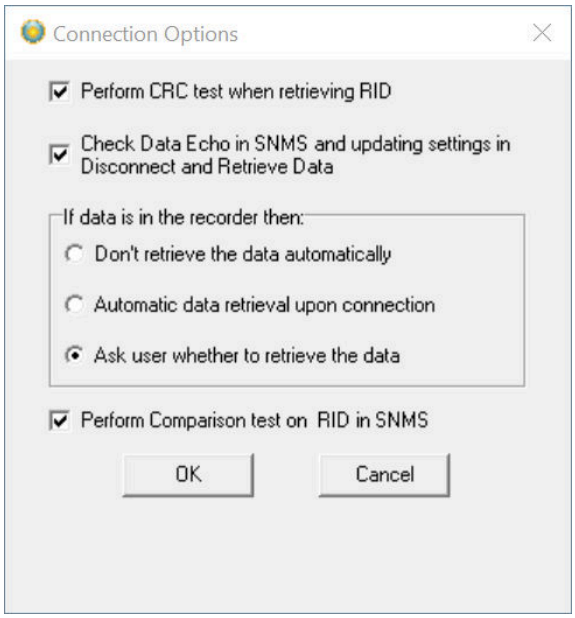


Figure 6.5: Connect and retrieve Data Options

6.3.1 Perform CRC Test when Retrieving RID

The CRC test is a safety check performed by the software when retrieving Recorder Information Data (RID). Suppose the CRC test is not successfully carried out. In that case, some errors have occurred in transferring files or constants between the recorder and the computer. If a CRC test failure occurs, the user is notified. Usually, this option should always be selected.

6.3.2 Check Data Echo in SNMS

Typically, the Check Data Echo in SNMS and updating Disconnect and Retrieve Data settings should be enabled (figure 6.5). In case of communication problems using a USB serial converter, the user can disable this option. It will bypass data echo checks, resulting in less restriction on the communication protocol.

6.3.3 If data is in the recorder:

Don't retrieve the data automatically: If this option is enabled, data retrieval is done manually via the recorder wizard or by choosing the File menu and Retrieve Data command.

Automatic data retrieval upon connection: By enabling this option, the software will automatically check for data in the recorder upon connection and retrieve it.

Ask user whether to retrieve the data: By enabling this option, you will be asked whether you want to retrieve data each time you connect to the logger.

6.3.4 Perform Comparison Test on RID in SNMS

The comparison test takes place when the PC has sent all the settings data to the recorder, and it reads the whole file back and compares it to what was sent. Bad communication can cause errors in the information file when read back. If the data echo check is enabled, it is assured that the information file was transferred correctly to the recorder; therefore, it is OK to disable the comparison test.

6.3.5 Perform Flash-Erase Post Test in SNMS

With loggers that have flash-based memory, the memory is erased before starting the logger. A test to ensure that the memory cells have been erased is performed before. If this test fails, it might indicate a failing battery or a corrupt memory.

6.4 Retrieve Data

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

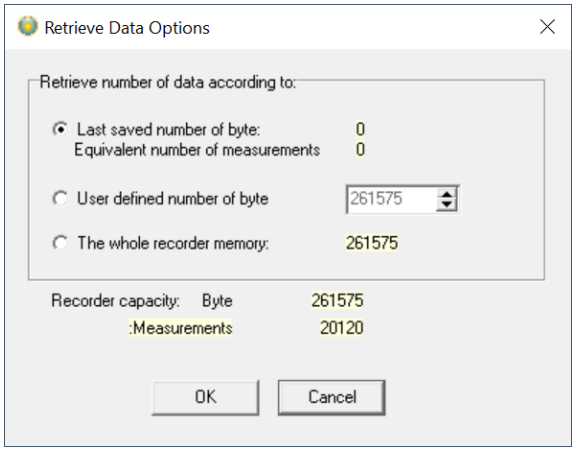


Figure 6.6: Retrieve Data Options

6.4.1 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.

As the complexity of measurement intervals gives incoherence in the calculation from measurement number to the number of data bytes to retrieve, the user can define the number of bytes to retrieve.

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, 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, which 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.

6.5 View Data

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

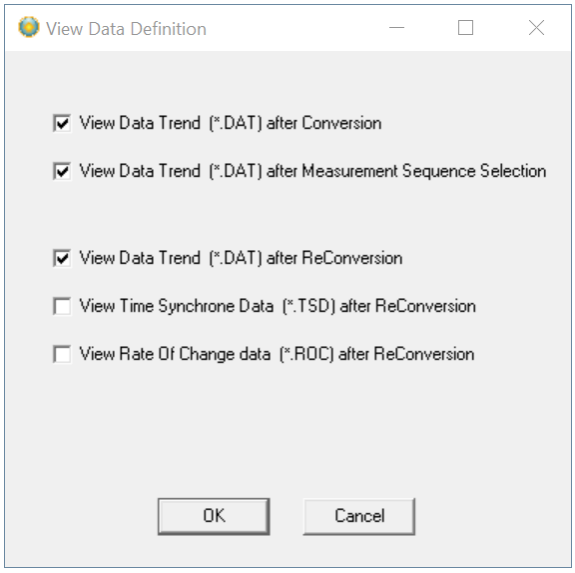


Figure 6.7: View Data definition

Select **View Data Trend after data retrieval/conversion** to view the data right after data retrieval.

Select **View Data Trend after Measurement Sequence Selection** to work with measurement data while offline.

With all the options in SeaStar, the user may want to do a lot of reconverting on data files after defining 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 different files. A backup system of reconverted files has been implemented to ease the task of remembering settings and results and/or renaming and copying files.

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 *5M1024.DAT*, i.e., sequence 5 for *DST milli 1024*, then after the first reconvert, a copy of the DAT is named *1-5M1024.DAT* and the same naming convention is applied to the other files.

Each time data retrieval is performed, a subdirectory, which 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, the reconverted "backup" file is displayed when viewing trended reconverted data, eliminating the need to close the "last" converted trend data window.

6.6 Communication

6.6.1 Serial Ports

Choose **Settings** > **Communication** > **Serial Ports** to display serial ports available for communication (see Figure 6.8).

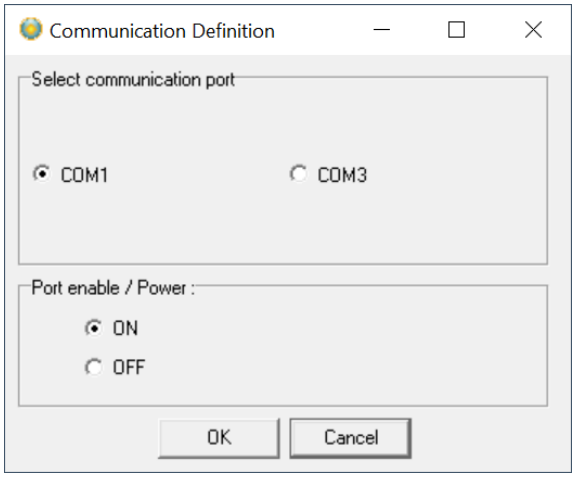


Figure 6.8: Communication Definition

6.7 Out of Range

If measurements are outside the calibrated range, they may seem inaccurate (mainly the depth/salinity). The out-of-range measurements are shown in the OOR file (**View** > **Measurement Data** > **Out Of Range Data**). The min and max calibration points are given in the RID file. In this case, it should be sufficient to go directly to **Edit** > **Reconvert Definition** > **Data Definition**, and choose 'RID values' under 'Out of range decimal values settings'. Data is then reconverted by selecting **File** > **Reconvert Data**. You can find more about reconverting in chapter 9.

The user can also define the ranges. Choose the **Settings** menu, **Out Of Range - UV and DV definition** command. A dialog box appears: Choose the **Settings** menu and the **View Data** command. A dialog box appears:

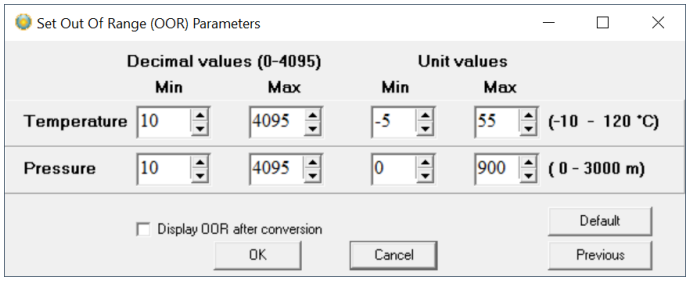


Figure 6.9: Set Out Of Range (OOR) Parameters

6.7.1 Decimal Values

Decimal Values (DV) are raw measurements, sometimes referred to as binary data. The decimal value is often between 0 and 4096, which is the range for the 12 bit A/D 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.

6.7.2 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 temperature. Suppose unit values in the data are outside the measurement calibration range of the recorder. In that case, the user has the option to set a max. and min. range for these unit values. After selecting the unit value in ranges in **Set Out Of Range (OOR) Parameters** and pressing the **OK** button, the following window appears:

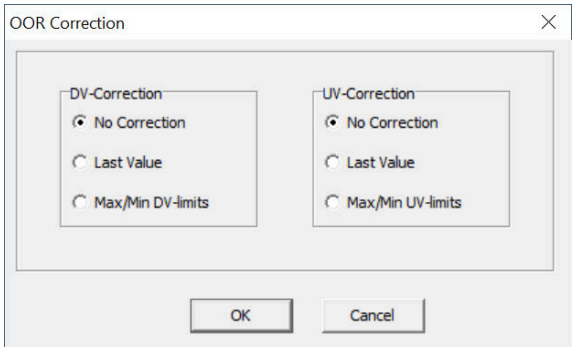


Figure 6.10: Out Of Range (OOR) Correction

If no values have been selected for the Decimal Value (DV), 'No Correction' should be selected. Suppose Unit Values (UV) ranges were specified. In that case, the user can change the out of range measurements to the last value recorded before the out of range measurement was recorded or have it according to the max/min unit value specified earlier. In this case, the software will know if the value is under the minimum or maximum limit. After the correction has been made, the data must be reconverted under **File** > **Reconvert Data**, and data will be changed accordingly.

6.8 Time Synchronize Data (TSD)

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

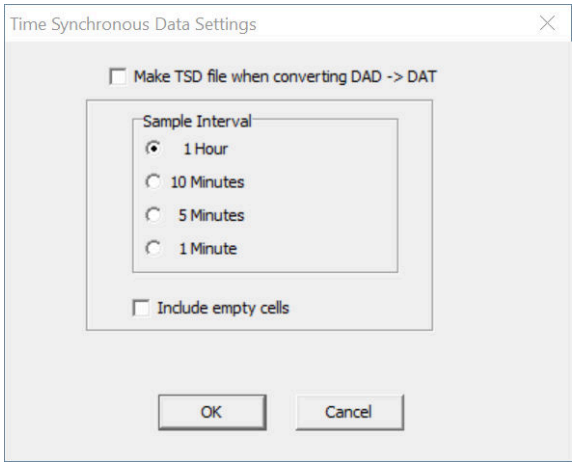


Figure 6.11: Time Synchronic Data (TSD) Settings

If the user wants to time synchronize two or more data files, it is possible to select four options: 1 hour, 10 minutes, 5 minutes, or 1 minute. The restriction is that the chosen sample interval must be greater than the initial interval. 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 synchronizing. If the 'Include empty cells' is enabled, the data tables will be empty for those measurements in the original file that are non-existing.

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**.

6.9 Rate Of Change (ROC)

This 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:

$$ROC = \frac{P_2 - P_1}{t_2 - t_1} \quad (1)$$

Where P is the parameter expressed in a user-defined unit, and t is time (hour, minutes, or seconds).
The way the ROC is set up and viewed is very similar to the TSD. Under **Settings** $>$ **ROC** the ROC options can be set:

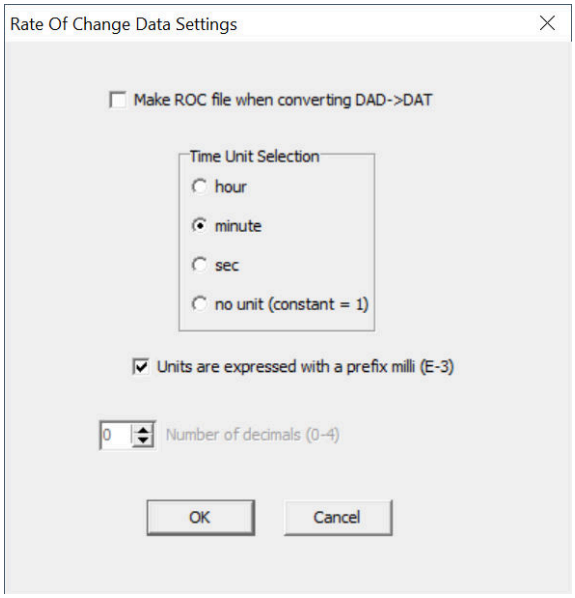


Figure 6.12: Rate Of Change (ROC) Definition

The ROC is only computed when a DAD->DAT conversion is performed and when the user wishes. The time units are selectable as an hour, minute, or seconds. It can be convenient for minor changes to express the ROC as a milli (10^{-3}) unit for small changes. 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 (ROC)**.

6.10 Options

The options menu can be accessed through **Settings** $>$ **Options**, a dialog window appears (see Figure 6.13. The Options menu has four tabs; **Update**, **Startup**, **Conversion**, and **NMS**.

6.10.1 NMS calc.

The **NMS calc.** options regard the SeaStar's *.NMS file generation after defining a new measurement sequence (NMS). The estimated measurement sequence is calculated, and memory and battery energy usage is predicted upon setting up an NMS. The results are written to a text file bearing the recorder name with an NMS extension.

By ticking **Use short presentation in NMS and RDT file** a more concise description of battery and memory calculations is presented in the .NMS and .RDT file. This option can be used, for example, when using multiple interval measurement sequences where the description of battery and memory calculations of NMS can become very long.
When no recorder has been selected, NMS battery predictions are calculated as 100% battery. If a recorder has been selected, battery predictions are calculated based on that particular recorder's battery status (%).
By ticking **When logger selected use 100% Batt. in NMS calc.**, the battery predictions are calculated as 100% rather than the battery status of the recorder.

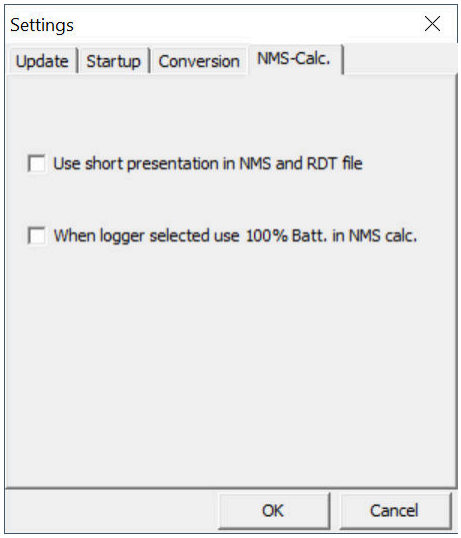


Figure 6.13: Options menu, showing the NMS options tab.

6.10.2 Update

The **Update** options tab lets the user choose whem the **SeaStar** software checks for updates (see Figure 6.14. Three options are available:

- **Manually** - the software does not automatically check for update but the user can manually check for updates via **Help** > **Check for Updates**
- **Every x days** - The software checks for updates every x days, decided by the user. Default value is 30 days.
- **Every time SeaStar is run** - The software checks for updates every time that **SeaStar** is launched (this is the default option).

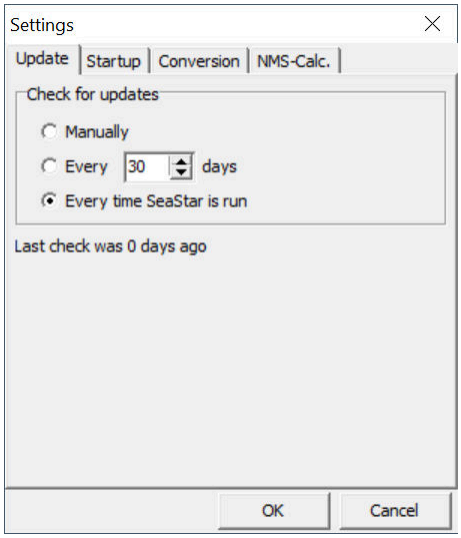


Figure 6.14: Update Options.

Additionally, the tab tells the user when the software last checked for an update was performed.

6.10.3 Startup

The **Startup** options tab (see Figure 6.15 lets the user decide whether the Connection Wizard opens at startup when **SeaStar** is launched, by ticking/unticking the 'Launch connect wizard' option.

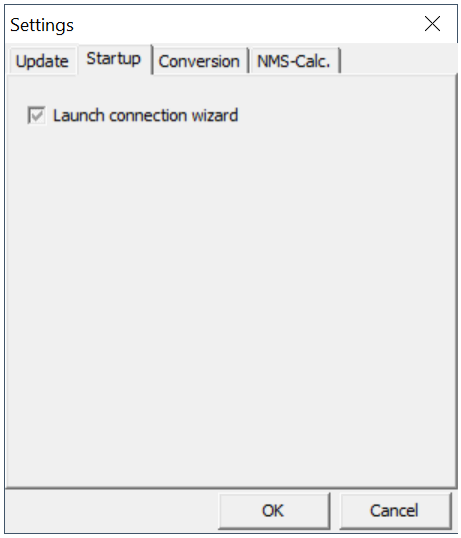


Figure 6.15: Startup Options.

6.10.4 Conversion

The **Conversion** options tab (see Figure 6.16 has one option, 'Set pressure to zero if negative', which sets pressure values are set to zero if, during data conversion, values are negative.

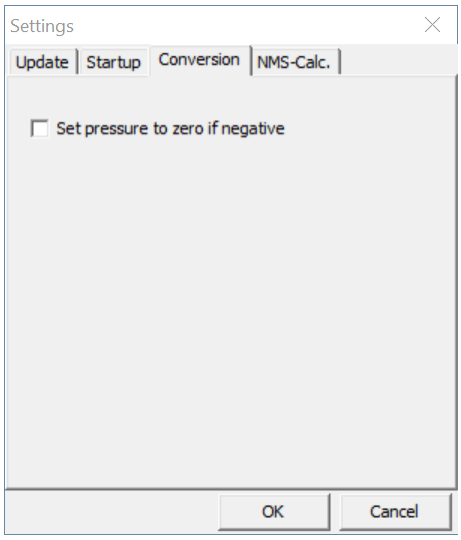


Figure 6.16: Convertion Options.

7 Using DST Magnetic - Tutorial

This chapter guides users in 8 quick steps through the process of utilizing **SeaStar** to set up your **DST Magnetic** before recording and data retrieval.

7.1 SeaStar Setup

Step 1 - Start the Software

Start SeaStar as described in chapter 2. Remember to carry out the software preparation outlined in chapter 3.

Step 2 - Connect the Hardware

Connect the Communication Box as described in chapter 5. Insert the DST recorder into the hole in the box, the DST COM (green) light on the box turns on.

Step 3 - Connect to the Recorder

After inserting the DST recorder into the box, the selected COM port will turn green in the Connection Wizard window.

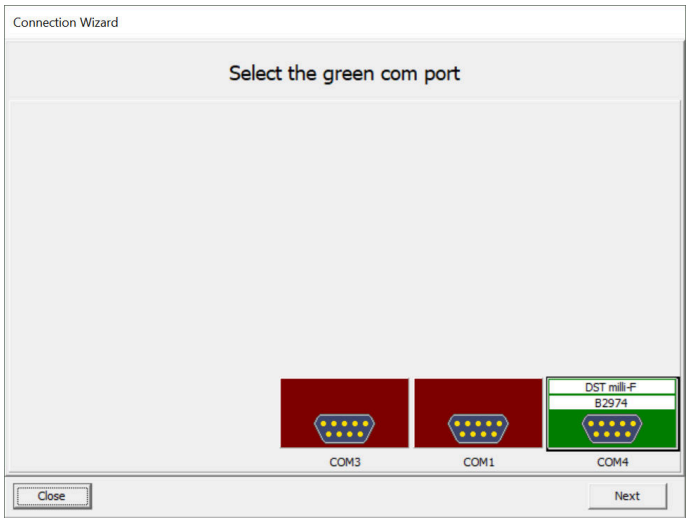


Figure 7.1: Connection Wizard, showing available COM ports. The correct COM port (green) shows the type of DST recorder connected and its serial number.

You can either click once on the selected port and select Next or double-click on the port. If you are not using the Connection Wizard choose **Recorder** > **Connect**.

After connecting, the window in figure 7.2 appears.

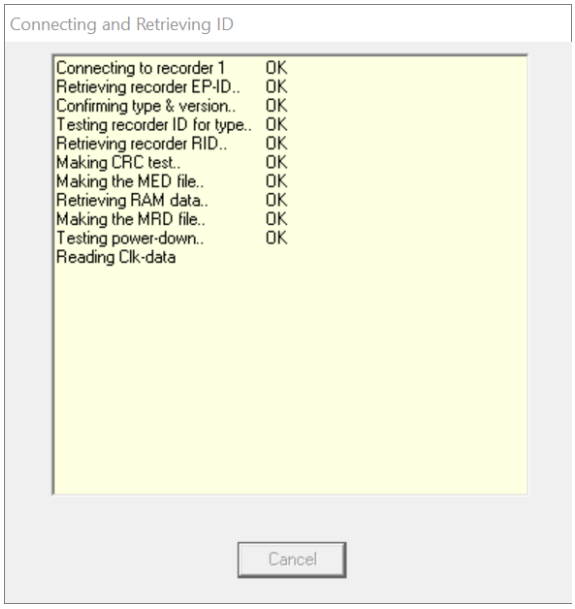


Figure 7.2: Connecting and Retrieving

Once the connection has been established, a window appears with information on the recorder's mode (see figure 7.3).

Figure 7.3: Connecting to the recorder

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

If you have selected to use the **Connection Wizard**, the following window appears:

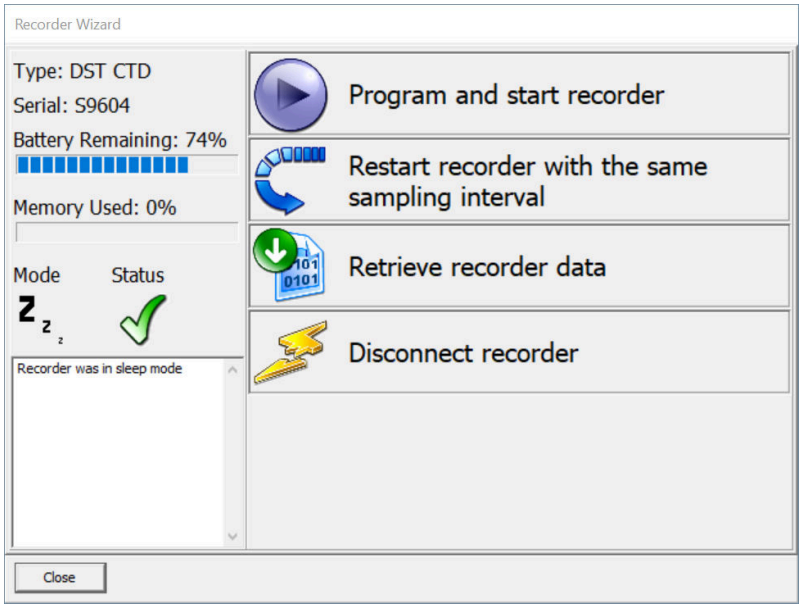


Figure 7.4: Recorder Wizard.

The **Recorder Wizard** allows the user to quickly set up new recordings and retrieve data from previous recordings. Additionally, it shows the recorder's status, battery life, amount of memory used, and recorder mode.

Firmware/Recorder Version

SeaStar checks which firmware/recorder version is in the DST recorder. Suppose the software does not recognize the firmware/recorder version. In that case, the user will be asked to update the **SeaStar** software as there might be a new functionality in the firmware/recorder version, which the software does not support. The firmware/recorder version of the DST recorder can be seen in line 7 of the *.MIT and *.RIT files in **SeaStar**. We encourage users to publish the recorder version number of the logger used.

Connection Time Registration

Each time SeaStar connects to a recorder, the PC connection time is registered to a file with the extension MIT. You can compare the PC connection time in the MIT file to the time of the last measurement to estimate the time shift.

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).

Select **Program and start recorder** in the Wizard and select which interval, **single** or **multiple**, you want to use (see figure 7.5).

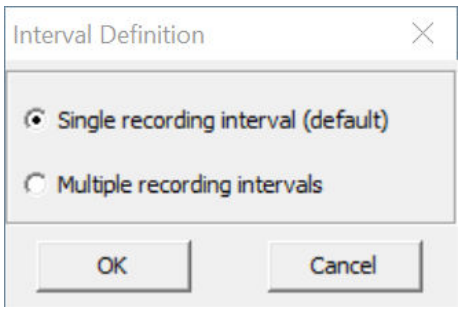


Figure 7.5: Define Intervals

If you are not using the wizard choose the **Edit** menu and the **New Measurement Sequence Definition** command. The following window appears:

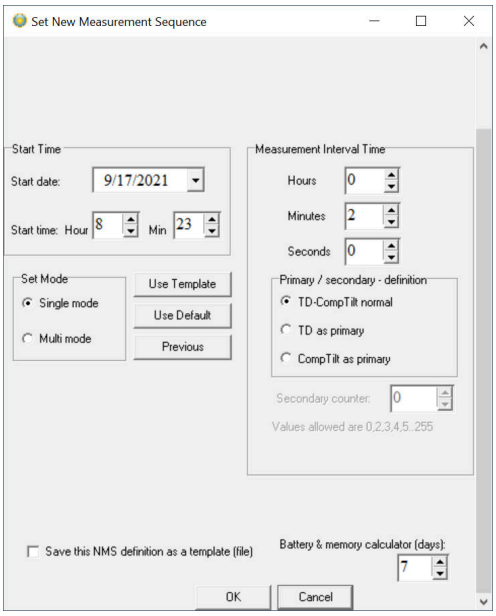


Figure 7.6: Measurement Sequence Definition (Single Recording Interval)

Start time Select the start time of recordings **(date-month-year, hours-minutes)**. The start time of the new measurement sequence must be set at a minimum of three minutes in advance.

Measurement Interval Time Set the measurement sampling interval in **(hours-minutes-seconds)**.

With **TD-CompTilt normal**, temperature (T), depth (d), Compass, and Tilt will be recorded as pairs at each sampling.

If the user selects **TD as primary**, the recorder will take more frequent temperature and temperature and depth measurements.

If the user selects **CompTilt as primary**, the recorder will take more frequent compass and tilt measurements.

The two latter features aim to save memory, increase the recording period, and get more data on the sensor of more interest (primary sensor). In this case, a secondary counter can be defined, which can only be odd numbers. If CompTilt 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 the CompTilt is recorded, and the majority of the memory is used for Tilt recordings. If CompTilt is set as primary and secondary counter to 0, then it is only taking CompTilt recordings, even though the first recording is always a CompTilt-TD measurement.

The three buttons **Use Template**, **Use Default**, and **Previous** can be used to assign previously programmed sequence. 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 is possible to get templates that have been set up in the past. With the **Use Default** button, the settings will return to default New Measurement Settings (NMS). By hitting the **Previous** button, the settings go back to before changes were made.
To read more about templates see chapter 12.

After the desired measurement parameters have been selected, press the **OK** button.

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 optimize memory and battery life. Sampling frequently over a specific period/season and less frequently for other period/season.

Select **Multiple recording intervals** in the wizard or choose **Edit** > **New Measurement Seq. Def.**, dialog box in Figure 7.5 appears, Select **Multiple recording intervals** and the following dialog box appears:

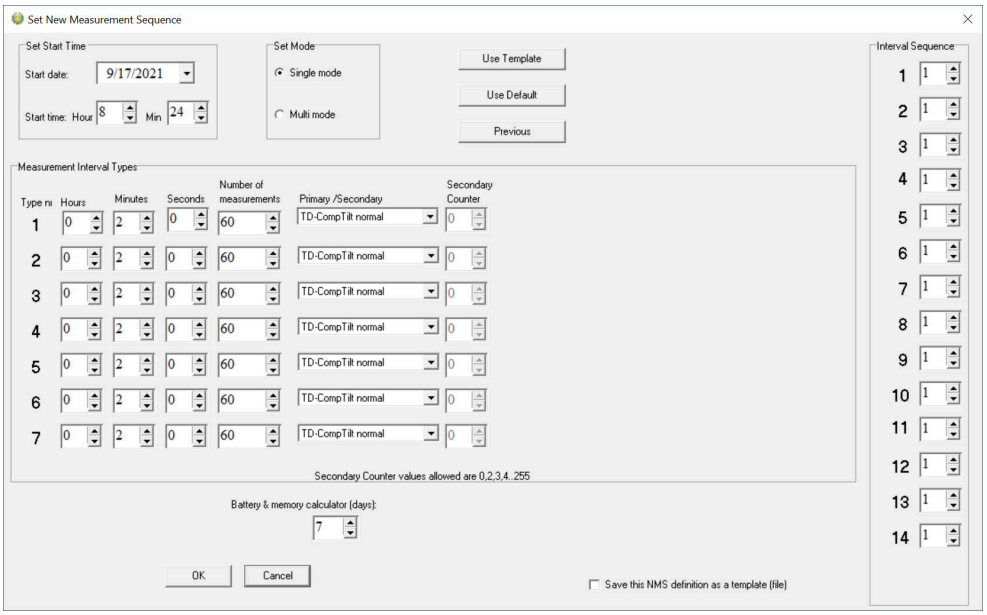


Figure 7.7: Setting new Measurement Sequence (with multiple intervals)

Set Start Time Select the start time of recordings **(date-month-year, hours-minutes)**. The start time of the new measurement sequence must be set at a minimum of three minutes in advance.

Measurement Interval The sampling interval (time between measurements) is defined. It is 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 two intervals are used, then only two intervals need to be filled out. If seconds are used as sampling interval, the multiple of the sampling interval and the number of measurements must be dividable by 60.

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. The sampling intervals and the number of measurements will recycle until memory is full or a connection is made with the recorder through a PC computer.

Interval Sequence 1-14 The interval sequence must be filled out. As shown in figure 7.7, the user selects to use intervals 1-6 for the recordings. Another example: Suppose two of the first sampling intervals are used.

In that case, 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 a connection is made through a PC computer.

Primary/secondary - Definition With **TD-CompTilt normal**, temperature (T), depth (d), Compass, and Tilt will be recorded as pairs at each sampling.

If the user selects **TD as primary**, the recorder will take more frequent temperature and temperature and depth measurements.

If the user selects **CompTilt as primary**, the recorder will take more frequent compass and tilt measurements.

After the desired measurement parameters have been selected, press the **OK** button.

New Measurement Sequence (NMS) Calculation

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

Battery & memory calculator (days) will help design the study since the calculation of battery and memory used during the set number of days will appear at the bottom of the NMS file.

The file is placed in the SeaStar\NMS directory.

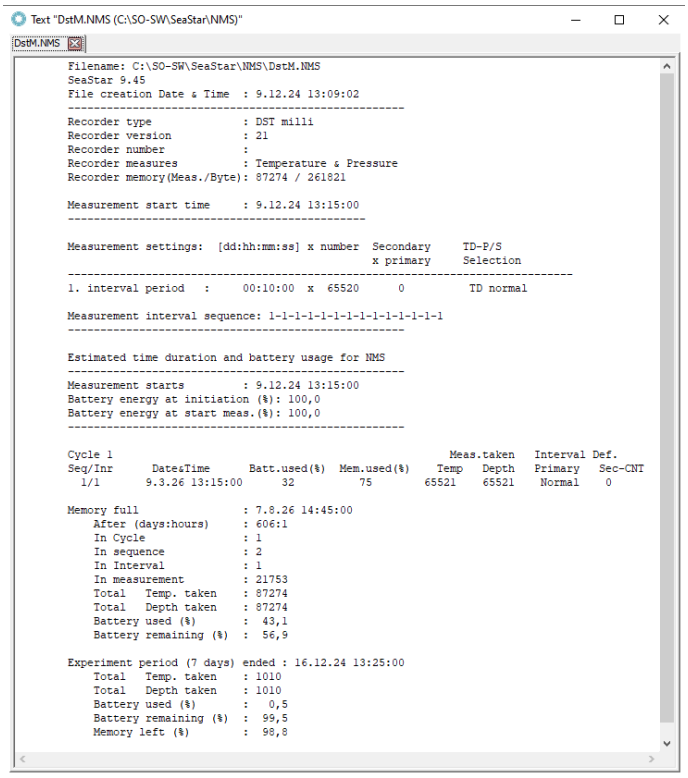


Figure 7.8: Results from NMS Calculation

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).

Multi mode

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. Following the first recorder, the recorders connected automatically get the same settings as the first recorder. This saves time in the programming process. The multi mode can be deactivated by clicking **Cancel** when connecting to the recorder (see figure 7.9).

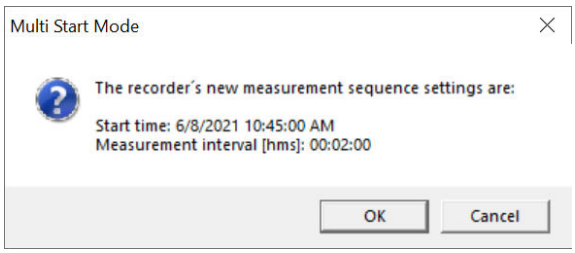


Figure 7.9: Multi start mode

Step 5 - Start a New Measurement Sequence

To set the DST recorder in Measurement Mode (i.e. start recording), choose the **Recorder** menu and **Start New Measurement Sequence** command. The window in figure 7.10 appears, asking to verify the selected settings.

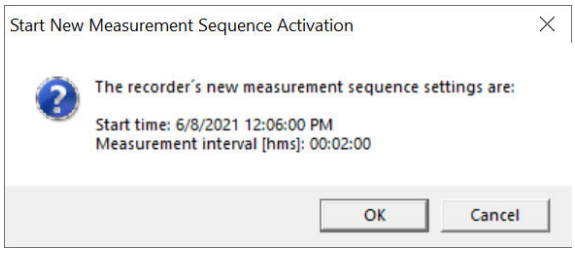


Figure 7.10: Start New Measurement Sequence activation

Press **OK** to verify settings, and the window in figure 7.11 will appear uploading the measurement sequence to the recorder.

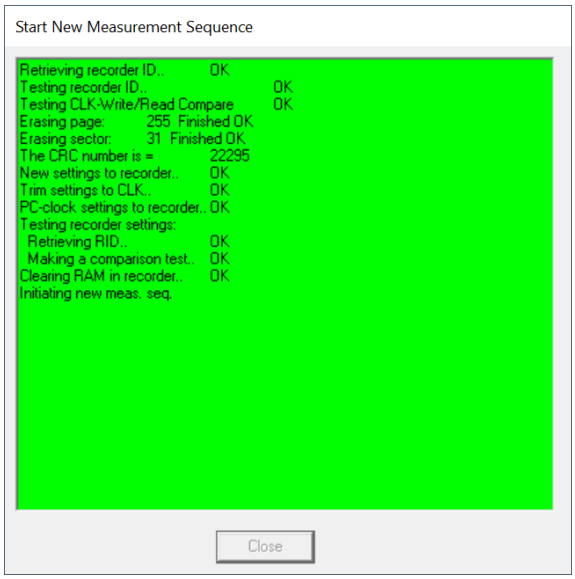


Figure 7.11: Start New Measurement Sequence

Once the New Measurement Sequence has been uploaded to the recorder, a window will appear (see figure 7.12), confirming that the recorder is in measurement mode and asking the user to remove the recorder from the communication box before closing the window.

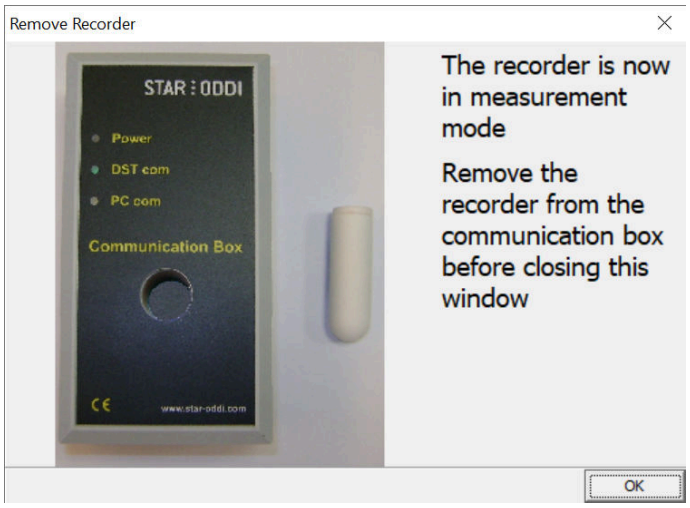


Figure 7.12: Remove Recorder

IMPORTANT: Connecting to the logger again before the measurement sequence has started will **remove** the logger from measurement mode and one will have to program the device again. Connecting to the logger after the measurement sequence has started will also **remove** the logger from measurement mode to retrieve the data.

Step 6 - Retrieve Data

When connecting to a recorder after a measurement period, the following window appears:

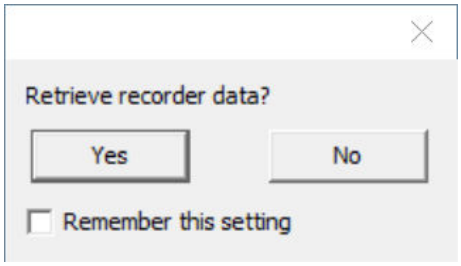


Figure 7.13: Retrieve recorder data

Click **Yes** if you wish to retrieve the data, click **No** if you would like to retrieve it later.

If you want the software to automatically retrieve data upon connection, check the **Remember this setting** option.

Select **Retrieve Recorder Data** in the wizard. If you are not using the wizard choose the **Recorder** menu and the **Retrieve Data** command. The window in figure 7.14 appears, showing the data retrieval progress in bytes, time elapsed and number of packs received.

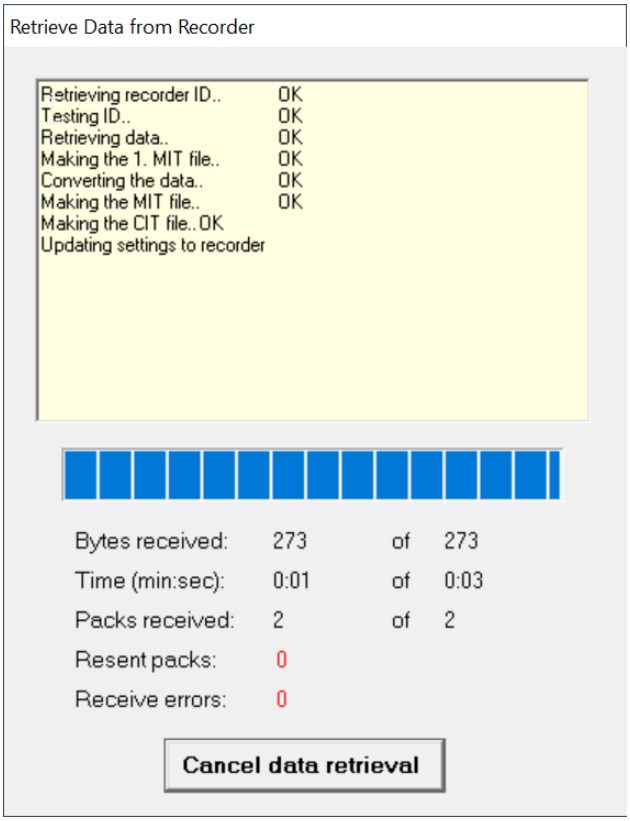


Figure 7.14: Retrieve recorder data

When recording data has been retrieved from the recorder, it is presented in graphical and tabular form. With default settings, SeaStar automatically creates a sub-directory in the SeaStar directory, named after the DST type. A directory named after the recorder's serial number 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 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 that prevents data from being accidentally lost.

If using the **Recorder Wizard** and want to start a new measurement sequence, you can either program the logger with a new measurement sequence by selecting **Program and start recorder** or **Restart recorder with the same sampling interval**.

Step 7 - Disconnect

After the DST recorder has been set up for measuring, it should be removed from the Communication Box. Suppose the recorder is not put in measurement mode. It will automatically go into sleep mode when removed from the box. If you 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 **Disconnect Recorder** in the wizard or **Recorder** > **Disconnect** to go into off-line mode.

Step 8 - View Data

When 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, start by selecting the correct logger type under **File** > **New Recorder Type**. Then choose **File** > **Open**. Select data from the dropdown list or browse for the

RID file corresponding to the chosen logger, followed by the MID file for the latest measurement sequence (experiment). When a data file has been opened, a new window appears, presenting data as a chart and a table. The next chapter will describe in detail how to view and process data.

8 View Data

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

8.1 Open Data

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

1. Choose the **File** menu and the **New Recorder Type** command to select correct recorder type.
2. Then choose **File** > **Open**. Select data from the dropdown list or browse for the RID file corresponding to the chosen logger, followed by the MID file for the latest measurement sequence (experiment).
3. To open another measurement sequence for the same recorder, choose **File** > **Select Measurement**.

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:

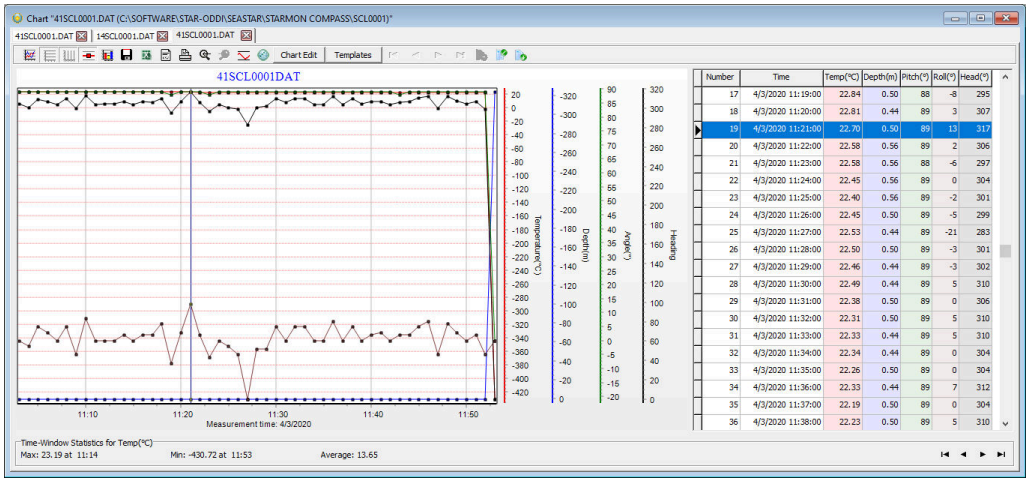


Figure 8.1: Chart and Data Tables of an open File.

Chart Title

To change the title of the chart, click on the title name. A dialog box appears:

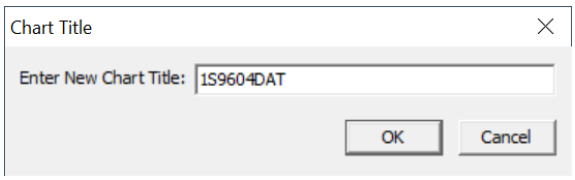


Figure 8.2: Chart Title Dialog Box.

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.

Axis Settings

Time Axis To change the time scale of the chart, click on the X axis. A dialog box appears:

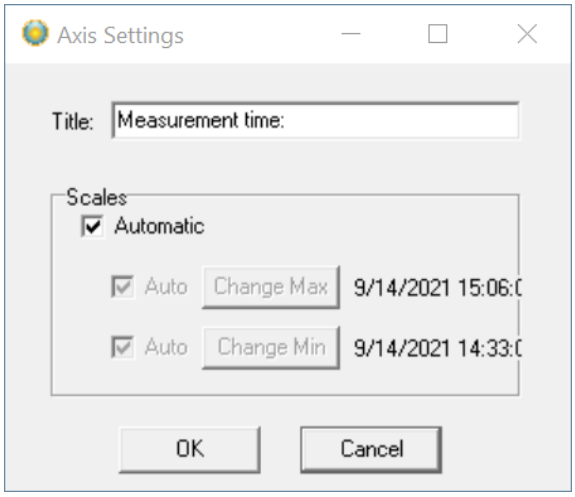


Figure 8.3: X-Axis Settings Dialog Box.

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. By enabling the Automatic option, the measurement time will go back to the initial range.

Value Axis To change the scale settings for the value axis, click on the Y axis scale. A dialog box appears:

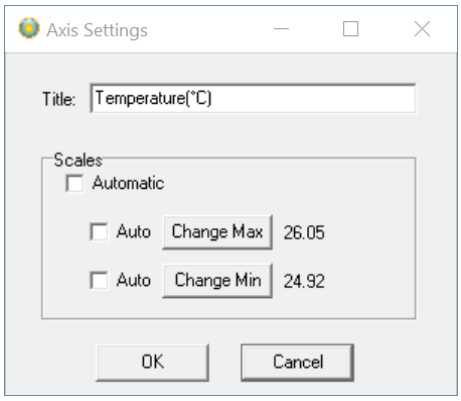


Figure 8.4: Y-Axis Settings Dialog Box.

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 temperature range can be specified. By enabling the Automatic option, the temperature will go back to the initial range.

8.2 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.

8.3 Buttons

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. For example, when working with a chart displaying temperature, depth and salinity

recordings, the user can hide one of the parameter in the graph.. Click the button and the following window appears:

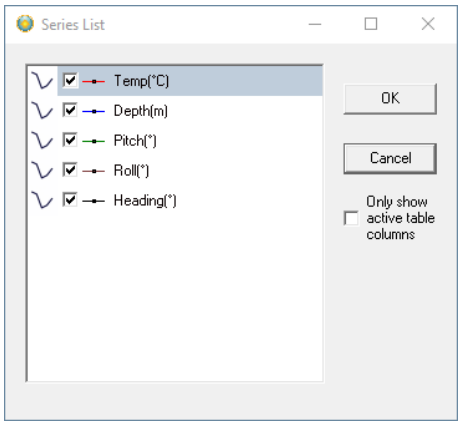


Figure 8.5: Series list

By selecting **Only show active table columns** only the selected series will be displayed in the chart table.

The table columns can also been changed manually by right-clicking on the table (see figure 8.6).

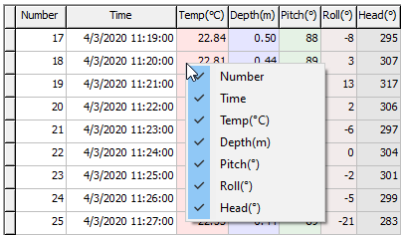
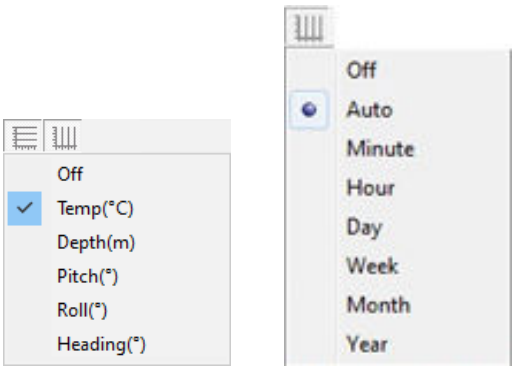


Figure 8.6: Change table columns manually

Horizontal/Vertical Gridlines

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

A drop-down menu appears when clicking the horizontal or vertical gridlines button.



(a) Horizontal gridlines (b) Vertical gridlines

Figure 8.7: Pressing the Horizontal/Vertical gridlines button

Data Point Marker

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

Histogram

The chart can be shown as histogram, displaying the distribution of values by percentage. Click the histogram button and the following window appears:

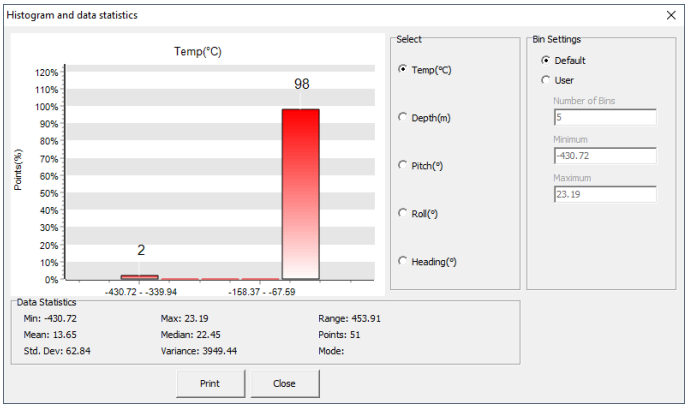


Figure 8.8: Histogram

Under **Bin Settings** there are two options, **Default** and **User**. Choose **User** to select the number of bins and the minimum and maximum values you wish to display.

The Histogram can be printed out by clicking the **Print** button.

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).

Export as Excel Workbook

To export file as Excel Workbook (file extension .xlsx), to view tabular data in Microsoft Excel

Export to CSV file

Export data in window to CSV(comma-separated values) file, a text file that uses a comma to separate values. A CSV file typically stores tabular data (numbers and text) in plain text,

Print Chart

To print the chart. Please see chapter 11 for more details.

Zoom Out

Click this button to zoom out the chart.

Zoom In

Click this button to zoom in on the chart.

Adjust Axis

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

Transfer Data to PatternFinder

Click this button to transfer data to **PatternFinder**. The software can be downloaded from our homepage for free: https://www.star-oddi.com/support/software.

Chart Edit

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 colour of background, borders and gradient can be selected. Under 'Walls - Back' the colours 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, HTML and SVG.

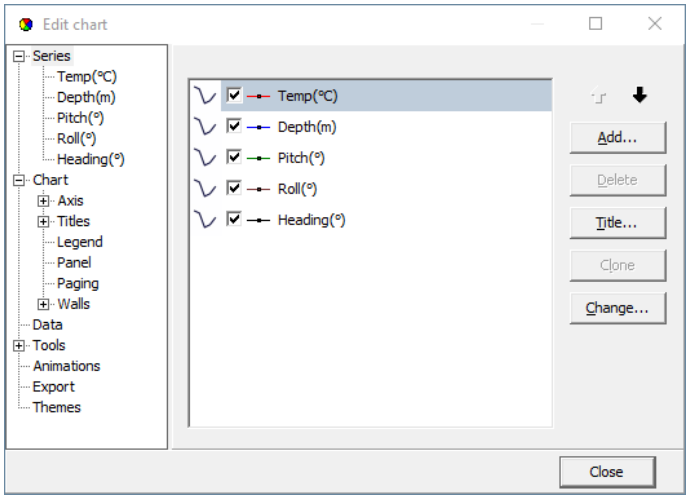


Figure 8.9: Edit Chart

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 (i.e background).

Display table completely

Partial table display

Hide table

8.4 Using the Mouse

8.4.1 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.

8.4.2 Zoom

The chart can be zoomed in on 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.

8.4.3 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.

8.4.4 Change the Axes

By double clicking on the X and Y-axis, the measurement time and parameters value ranges can be changed.

8.4.5 Change the Title

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

8.5 The View Menu

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

8.5.1 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.

8.5.2 Data File (.DAT)

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

8.5.3 Time Synchronous Data (.TSD)

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

You can find more in chapter 6.8 TSD and more about files in the Appendix A.1.

8.5.4 Rate of Change (.ROC)

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

You can find more in chapter 6.9 ROC and more about files in the Appendix A.1.

8.5.5 Decimal (Binary) Data (.DAB)

In the DAB file it is possible to access raw temperature values that originate from the recorders 12 bit (0-4096) 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)**

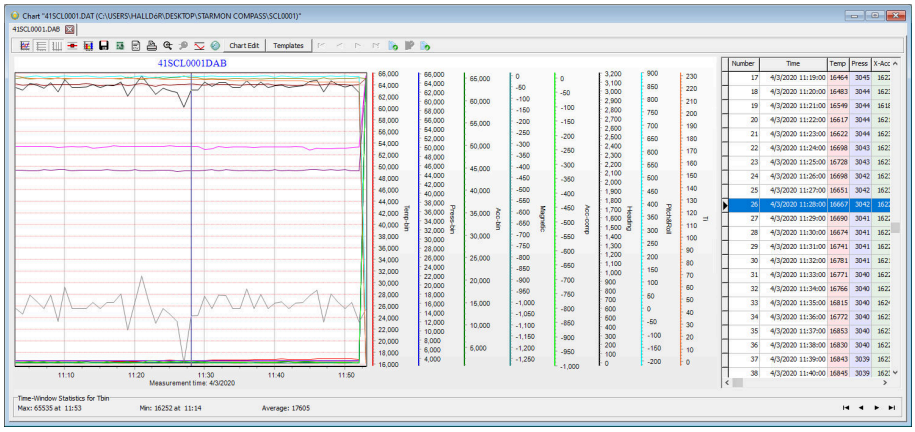


Figure 8.10: DAB Trended

8.5.6 Tilt Normalized Real (.TNR)

The raw 3-axis data before and after calibration can be accessed through **View** > **Data Trend and Table** > **Tilt Normalized Real (TNR)** > **Current**. There you have X_r, Y_r, and Z_r as the real values that the accelerometer in the logger outputs

In the *.TNR file, X_n, Y_n, Z_n and g_n is normalized and static calibrated data for gravitational acceleration in mg. What is important is that g_n is equal to G from the *.ACC file. The only difference is that G is in m/s^2 but g_n is in mg.

8.5.7 Acceleration (.ACC)

Select **View** > **Data Trend and Table** > **Acceleration** > **Current** to view the acceleration. The file format includes [Nr, Time, G, Xacc, Yacc, Zacc].

8.5.8 Pressure Binary Corrected Data (.BPD)

Pressure measurement circuitries are calibrated against measurement errors due to temperature changes. Raw decimal values from the recorder can be seen in the DAB file. The first step in converting decimal values to unit values is the circuitry temperature correction. The result of this first correction can be seen for pressure in *.BPD files. The files files contain the corrected decimal value and the difference between the original value and the corrected one. Can be viewed graphically or as tabulated lists.

8.5.9 3D Tilt 90° (A90)

Select **View** > **Data Trend and Table** > **Tilt 90° (A90)** > **Current** to view the 3D tilt measurements. As mentioned in chapter 4.1.2 these 3D tilt values are only stored in this A90 file (*.A90) file. The X, Y, Z and Sum degree values are converted data output values, but he Xc, Yc and Zc are the corrected and final values where the SumCor(°) is the sum from the corrected three tilt angles that reach the sum of 90°. The file format includes [Nr, Time, X(°), Y(°), Z(°), Xc(°), Yc(°), Zc(°), Sum(°), SumCor(°)].

8.5.10 TD and 3D Tilt (DAX)

Select **View** > **Data Trend and Table** > **TD and 3D-tilt (DAX)** > **Current** to view the 3D tilt measurements together with depth and temperature. The DAX file shows the converted data for the three tilt angles together with temperature and depth. This data file is opened in Star-Oddi's PatternFinder data analysis software to view an animated image of the angles in each measurement. See more on PatternFinder later in this chapter.

8.5.11 Recorder Information (RIT)

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

8.5.12 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).

8.5.13 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.

8.5.14 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 A.1 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.

- **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.

8.5.15 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)** (see Figure 8.12).

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:

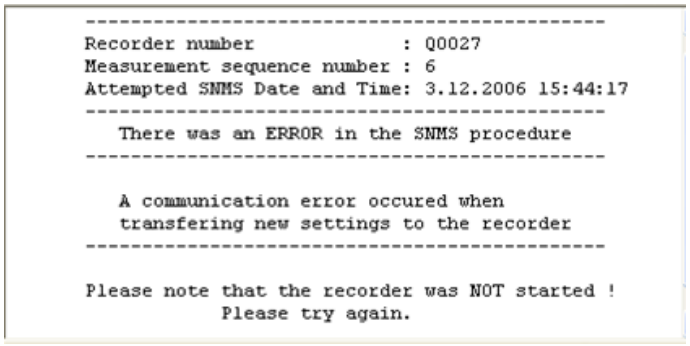


Figure 8.11: The MDD SNMS Error Message

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 (see Figure 8.12).

Filename: C:\SeaStar\DstQ.LOG

Recorder	Seq.Nr.	Date	Time	Result	Description
Q0025	1131	4.10.2006	19:14:23	OK	
Q0001	23	5.10.2006	09:09:47	OK	
Q0001	24	5.10.2006	11:47:18	OK	
Q0001	25	5.10.2006	11:50:14	OK	
Q0025	10	5.10.2006	19:13:45	OK	
Q0027	1	6.10.2006	14:49:24	Error	Communication fault
Q0027	1	6.10.2006	14:50:35	OK	
Q0026	1	6.10.2006	15:06:41	OK	
Q0026	2	7.10.2006	13:51:40	OK	
Q0027	2	7.10.2006	13:52:09	Error	Communication fault
Q0027	2	7.10.2006	13:53:22	OK	
Q0001	26	8.10.2006	11:53:17	Error	Invalid start time
Q0001	26	8.10.2006	11:53:44	OK	
Q0001	27	08.10.06	12:42:28	OK	
Q0026	3	08.10.06	12:46:15	OK	
Q0027	3	08.10.06	12:49:20	OK	
Q0027	4	9.10.2006	09:22:34	OK	
Q0025	11	9.10.2006	09:24:10	OK	
Q0026	4	9.10.2006	09:26:28	OK	
Q0027	5	09.10.06	09:53:48	OK	
Q0025	12	09.10.06	09:54:49	OK	
Q0026	5	09.10.06	10:00:47	OK	

Figure 8.12: Example of a LOG File

8.5.16 Measurement Data

Measurement Download Definition (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. The file can be viewed under **View** > **Measurement Data** > **Conversion Information (CIT)**:

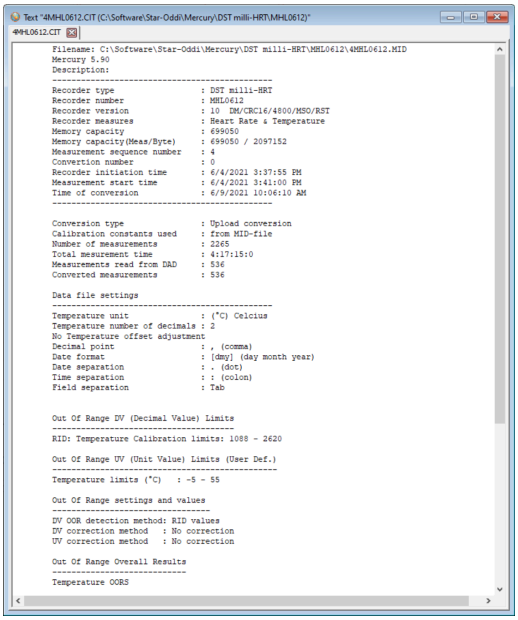


Figure 8.13: CIT file

8.5.17 SeaStar Log

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

- Recorder Connected
- Retrieving data from a recorder
- Uploading a measurment 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.

8.5.18 Screenshots

By pressing the **Print Screen** keyboard button while in the application a screenshot of the desktop is taken and stored in a subfolder, **Screenshots**.

The user can name the screenshot file as can be seen in the following figure.

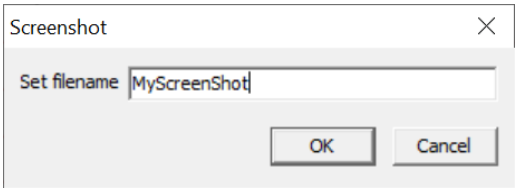


Figure 8.14: Naming screenshot

8.5.19 Chart Title

Click on the chart title in the chart window to change the title of the chart. A dialog box appears (see Figure 8.15).

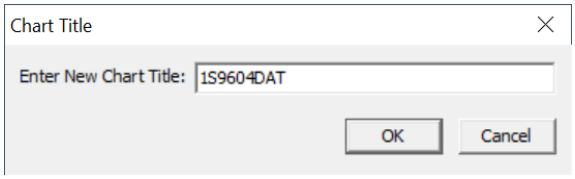


Figure 8.15: Chart Title Dialog Box

To change the chart title, enter a new text string and press the **OK** button.

8.5.20 Time Axis

To change the time scale of the chart, click on the X axis scale. A dialog box appears (see Figure 8.16).

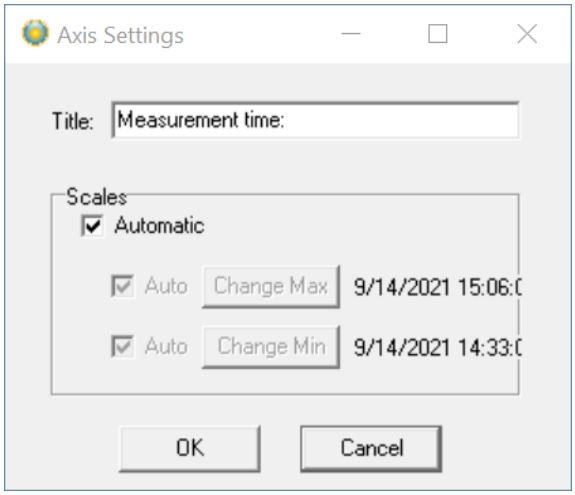


Figure 8.16: X-Axis Settings Dialog Box

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. By enabling the Automatic option, the measurement time will go back to the initial range.

8.5.21 Value Axis

To change the scale settings for the value axis, click on either of the Y axis scale, for temperature. A dialog box appears (see Figure 8.17).

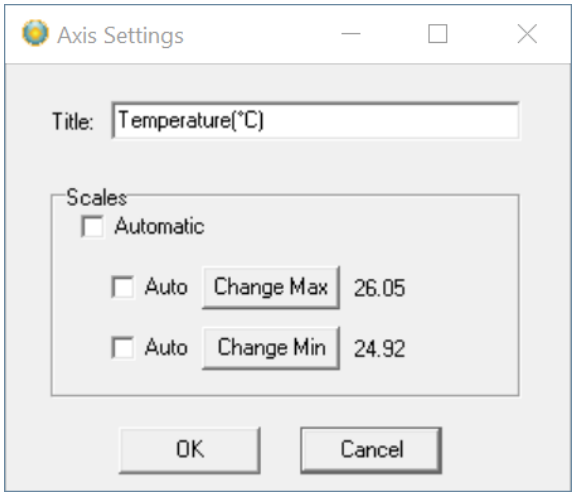


Figure 8.17: Y-Axis Settings Dialog Box

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 temperature range to be shown on the chart can be specified. By enabling the Automatic option, the measurements will go back to the initial range.

8.5.22 Chart Editor

The **Chart Edit** button (on every graph) gives access to the Chart Editor, a multi-option menu with a Tree View interface:

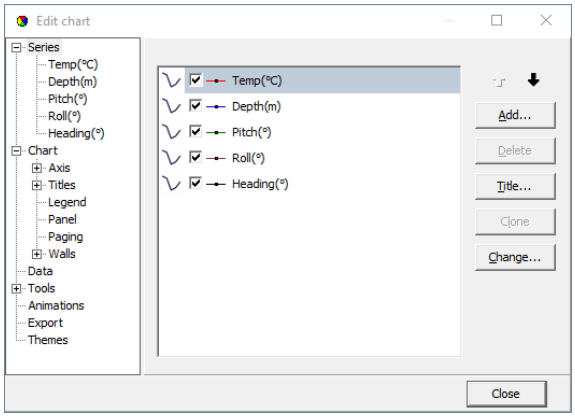


Figure 8.18: Chart Editor

There are five main branches on the tree:

- Series
- Chart
- Data
- Tools
- 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.

Series

The Series window offers the same features as the "Active Series List" button. Series list is shown in Figure 8.19.

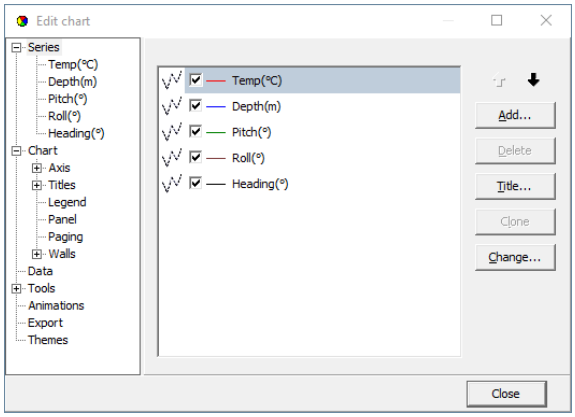


Figure 8.19: Format Series

When a particular series is selected, like the Temperature series, for example, a two tab menu is revealed, as seen in Figure 8.19, 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.

Chart

The chart branch has six sub branches:

- Axis
- Titles
- Legend
- Panel
- Paging
- Walls

Axis The number of axes depends on the recorder type. The ’Custom #’ axes vary for the data that the DST records. For example, for the DST CTD, ’Custom 0’ is ’Temperature’, ’Custom 1’ is ’Depth’, and ’Custom 2’ is ’Salinity’, etc. The ’Bottom Axis’ is time.

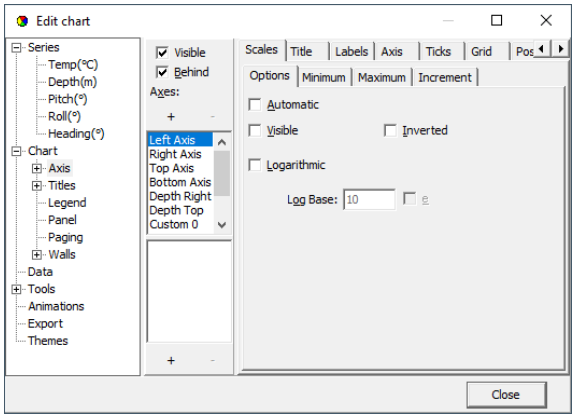


Figure 8.20: Axis Formatting

Figure 8.20 shows a six tab Axis menu. There are numerous options, some of which can drastically change the behaviour 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.

Titles The Titles menu gives access to 4 titles, ’Title’, ’SubTitle, ’SubFoot’, and ’Footer’. Each title is a multi-line text window, which can be positioned anywhere on the chart. There are multiple formatting options, six tabs, for each title.

Legend The Legend menu gives the user an option of showing a series legend. The eight tab menu gives options in styling positioning and formatting the legend.

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

Paging The Paging menu can chop the data series 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 help view distinct periods, one at a time, days or hours, for example. No offset is offered, and sampling periods and start times can limit the usefulness of this option.

Walls The Walls menu gives access to the 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, an image can be imported and placed on the wall. In fact, as the Back Wall lies ”on top” of the panel, a pattern or figure can enhance an image on the panel, or the image on the panel can be seen through the wall with the ’Transparency’ option.

Data

The data menu 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 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.

Tools

Under ’Tools’, you will find several options to customize the cursor setting and the graph’s appearance, 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.

Export

Under the **Export** menu, the user can save and export data as **Picture**, **Native (data)** or **Data (file)**.

Pictures The chart can either be saved as a picture or copied as a picture to the clipboard (see Figure 10.1). There are seven format possibilities:

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

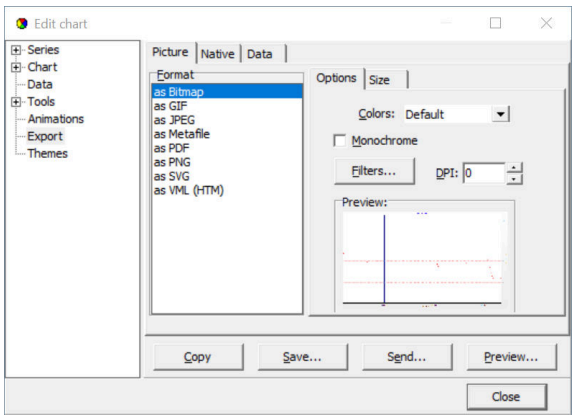


Figure 8.21: Export Menu: Pictures

Native Under the Native menu (see Figure 10.2), the user can save the data as 'Native' *.tee chart files. Import of these files is not supported in SeaStar at the moment.

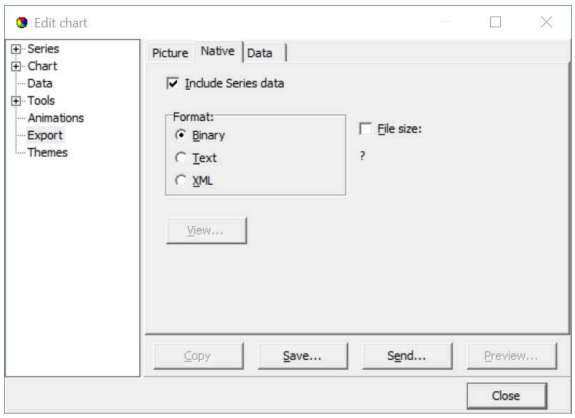


Figure 8.22: Export Menu: Native

Data Data can be exported in four different file formats (see Figure 10.3).

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

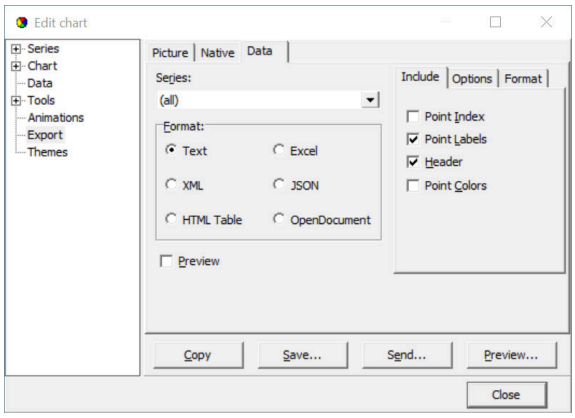


Figure 8.23: Export Menu: Data

In **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 at 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 way of exporting is to use the **Alt+PrintScreen** keyboard buttons to copy an image of the **SeaStar** window to the clipboard and paste it to another Windows application. When a dialog box is open, only that

frame is copied to the clipboard.

To copy a part of a data file, for example, from a DAT file, highlight the part you want to copy and use the **Ctrl+C** keyboard buttons to copy the data snippet to the clipboard.

9 Reconvert Data

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

- 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.
- Shortening the data file, i.e., cut out measurements above water.
- Need for temperature or pressure/depth unit alteration.
- Need for data file format alteration.
- (Settings > Preferences > Data File Format).

9.1 Data Definition

By going to **Edit** > **Reconvert Definition** > **Data Definition**, the following dialog box appears:

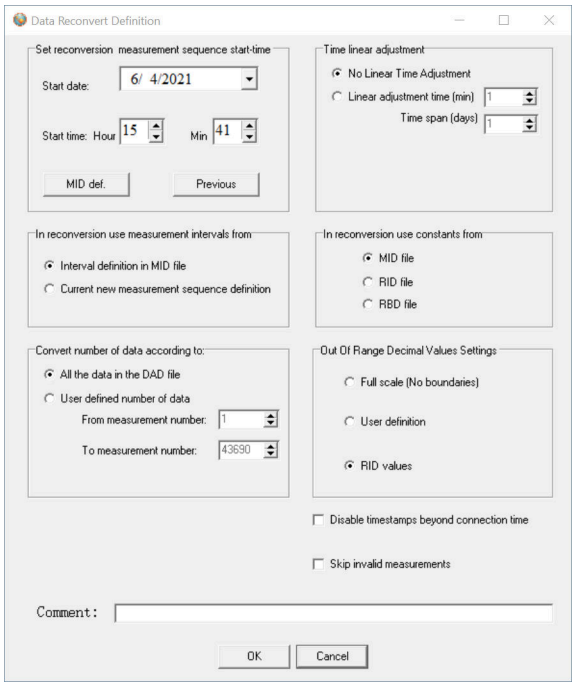


Figure 9.1: Reconvert Data Definition

9.1.1 Set Reconversion Measurement Sequence Start-Time

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

9.1.2 In Reconversion use Measurement Intervals from

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

9.1.3 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 re-calibrated. Suppose it has been re-calibrated and the user wants to use the new constants on older measurements. In that case, the RID option should be selected.
- **RBD file**. This option rarely needs to be selected. If the MID and RID file constants are corrupt, the user should contact Star-Oddi for an RBD file. See Appendix A.3 for instructions on how to transmit the RBD files to the recorder.

9.1.4 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 can define what measurement range should be reconverted (for example, to exclude data points when the recorder was above water).

9.1.5 Time Linear Adjustment

The real-time clock inside the DST Magnetic 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. See more about time drift in section 7.1.

9.1.6 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 reconverting:

- 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.

9.2 Temperature Definition

By going to **Edit** > **Reconvert Definition** > **Temperature Definition**, the following dialog box appears:

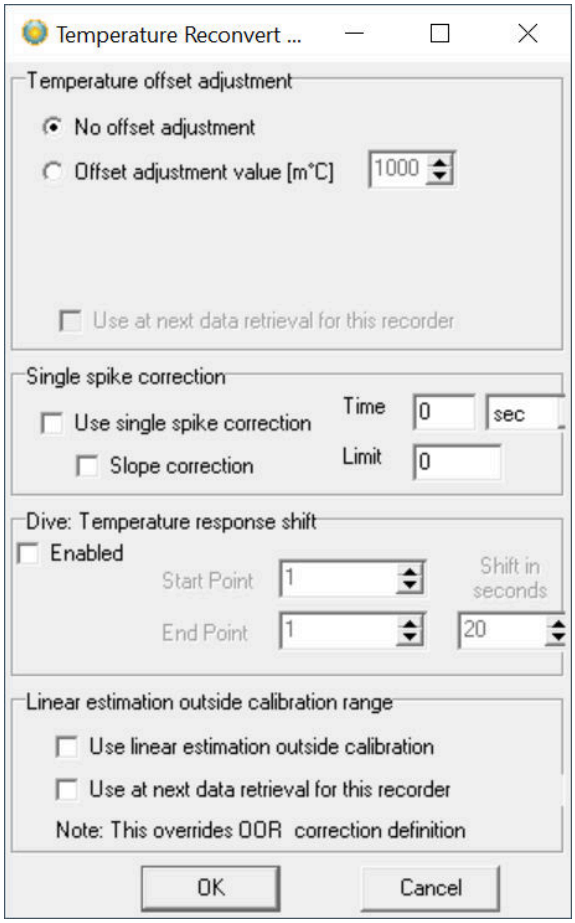


Figure 9.2: Temperature Reconversion menu

9.2.1 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 become apparent that the measurements' error 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℃ (1℃ = 1000 m℃).

9.2.2 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.

9.2.3 Temperature response shift

It is possible to set the desired start/end point to be shifted by X seconds. This shift can only be performed on data with an interval of 1 second. Linear estimation outside the calibration range Check this option to estimate temperature measurements outside of the calibration range linearly.

9.2.4 Linear estimation outside calibration range

Check this option to estimate temperature measurements outside of the calibration range linearly.

9.3 Pressure Definition

Go to **Edit** > **Reconvert Definition** > **Pressure Definition**, and the following dialog box appears:

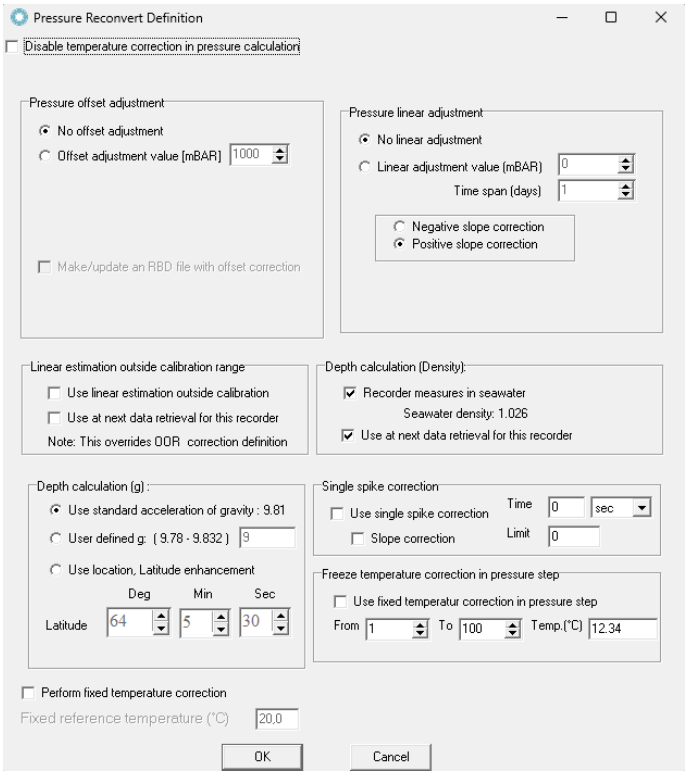


Figure 9.3: Pressure Reconversion menu

9.3.1 Disable Temperature Correction in Pressure Calculation

If the temperature sensor is malfunctioning to indicate very high-temperature values, it will offset the pressure calculation. An automatic temperature correction is set by default in SeaStar. Check the box next to 'Disable temperature correction in pressure calculation' to turn off this feature.

9.3.2 Pressure Offset Adjustment

The recorder's pressure sensor accuracy drifts over time, with the most significant drift occurring in the first six months post-production, as tension is released. The user can improve the accuracy of pressure/depth recordings by finding an offset value, which is the difference between a recorder's depth reading and a reference meter's value. It is recommended to have recordings start above surface before submerged underwater so that in-air measurements can be compared before and after deployment. This is especially important for long-term research.

Methods to Find the Offset Value:

(a) **In-Air Value:** Quick and easy check. Use in-air measurements by logging data for a few minutes above surface. The retrieved data will either be shown as negative or positive values and show the offset. The appr. average in-air value should be used for the pressure sensor offset correction. In-air measurements should be as close to a zero value (0 meters/bar) as possible. High pressure sensors (>800 m) will give a more accurate results with methods below.

(b) **Reference Depth/Pressure Meter:** Place the recorder alongside an accurate reference depth/pressure meter (if having one), preferably at a depth of more than 2 meters (0.2 bar pressure), where a reference point can be taken.

(c) **Known Depth:** Place the recorder at a known depth, preferably greater than 2 meters.

This offset can be applied to correct previous data or downloaded into the recorder for future measurements. The following steps outline both correction methods.

Reconvert Older Data with Offset Adjustments:

1. **Find an offset value:** Select one of the methods above (a, b or c) to find the offset value.
2. **Open the data:** First, choose the recorder type under *File* > *New Recorder Type*, and select the relevant type. Then open the data under *File* > *Open* and either browse or choose from the list.
3. **Set the offset value:** Navigate to *Edit* > *Reconvert Definition* > *Pressure Definition* and enable the 'Offset adjustment value (mbar)'. When using 9.81 as g, the coefficient for converting cm into mbar is 1.019 (100 cm = 101.9 mbar). Enter the offset value and select 'Add the value' if the surface measurement is negative or 'Subtract the value' if positive.
4. **Reconvert the data:** Select *File* > *Reconvert Data* > *Current* to apply the adjustment to the chosen data.

Note: If you know the offset value at both the start and end of the measurement period, consider using the linear adjustment method described in section 9.3.3 for improved accuracy.

Download Pressure Offset Correction to the Recorder:

1. **Find an offset value:** Select one of the methods above (a, b or c) to find the offset value.
2. **Connect to the recorder:** If the recorder is not already connected, use *Wizard* > *Recorder Wizard* or *Recorder* > *Connect*, to establish a connection.
3. **Set the offset value:** Navigate to *Edit* > *Reconvert Definition* > *Pressure Definition* and enable the 'Offset adjustment value (mbar). When using 9.81 as g, the coefficient for converting cm into mbar is 1.019. (100 cm = 101.9 mbar). Enter the offset value and select 'Add the value' if the surface measurement is negative or 'Subtract the value' if positive. Enable 'Make/update an RBD file with offset correction' and press OK to proceed.
4. **Create the RBD file:** After clicking OK, an RBD file is created with the offset correction value, stored in the Seastar\RBD directory on the computer.
5. **Browse for the RBD file:** Choose *File* > *Recorder Backup* and browse for the RBD file corresponding to the recorder's serial number. There is no need to modify the 'Set Sequence Number and Battery Life' window, as the information should already be correct.
6. **Download the RBD file:** Click OK to transfer the correction to the recorder. The calibration coefficient has now been updated inside the recorder (in the RCI file), ensuring future measurements reflect the applied correction.

9.3.3 Pressure Linear Adjustment

The aging of the pressure sensor can result in a drift, i.e. a gradual change in the measured pressure values, that can be seen as an offset at any time. To correct these offset values, it is possible to select a linear pressure adjustment. The best approach is to find the offset values both before and after the deployment, for example, by using the average of in-air values.

If you don't have in-air values at the beginning or at the end of the measurement period, you can proceed like this:

- **In-air value missing before deployment** (at the beginning of the measurement): If you are looking at data from sequence 1, you can assume that there is no offset at the beginning of the measurement. If you are correcting sequence 2 or older, you could open the previous sequence and see if there are in-air values in that measurement and estimate from those values.
- **In-air value missing after deployment** (at the end of the measurement): A short in-air measurement can then be performed to see the offset as it is now.

If an offset in the data is detected at the beginning of the measurement, it is recommended to perform an offset adjustment first, followed by a linear adjustment. The recommended steps are as follows:

1. **Offset adjustment:** Find the offset value before deployment by taking an average of in-air values. If there is an offset, perform pressure offset adjustment as described in section 9.3.2, with the determined offset value. If there is no offset at the beginning of the measurement, you can go straight to linear adjustments.
2. **Linear Adjustment:** Find the offset value after deployment by taking an average of in-air values. After determining the offset value, enter it in the Pressure linear adjustment window, shown in Figure 9.3. Input the duration of the measurement period in the 'Time span (days)'. The offset will then be adjusted linearly over this period.
    a) If the recorder shows negative depth values (m) at the end of the deployment, check 'Positive slope correction.'
    b) If the recorder shows positive depth values (m), check 'Negative slope correction.'
3. Once the details are filled in, both the offset and linear adjustments, click OK. Then, navigate to **File** > **Reconvert Data** to apply the adjustments to the recorded data.

9.3.4 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, more adjusted values are received. 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.

9.3.5 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.

9.3.6 Step Correction

The **Step Correction** option is mainly intended for those users who are doing research on fishing gear such as long lines and trawl doors, although it might benefit other users as well.

When the recorder has been on deck for a long time, there is a significant temperature change when it hits the water, and as a result, the standard temperature corrector might not function correctly. In order to avoid inaccurate measurements, the user has the option of using a fixed value in the temperature correction.

In the **From** field (see Figure 9.3), enter the measurement number when the sensor hit the water, and in the **To** field, enter the number of the measurement when the temperature became stabilized. The temperature value of the latter measurement is entered in the **Temp** field. This fixed value is then used to correct the pressure value.

Freeze temperature correction in pressure step

This option would rarely be used as the Starmon compass has a fast response temperature probe. It is intended for logger models with much slower temperature responses.

When the logger has been on the deck for some time, there is usually a significant temperature change when hitting the water. As the pressure/depth sensor is temperature compensated, those measurements could be less accurate, especially when great temperature variation goes from air to sea. For some sensors, types have not adjusted to the water temperature in the water column. This option makes it possible to put a fixed

value in the temperature correction for a defined measurement number range. As seen in the retrieved data, the temperature correction value input is when temperature sensor stability is reached.

Enable **Use fixed temperature correction in pressure step**. In the **From** field (see Figure 9.3), enter the measurement number when the sensor hit the water, and in the To field, enter the number of the measurement when the temperature became stabilized. In the **Temp** field, enter the temperature value of the last measurement. This fixed value is then used to correct the pressure value when data is reconverted.

9.4 Tilt Reconvert Definition

To reconvert Tilt data, select **Edit** > **Reconvert Definition** > **3D Tilt Definition** and the following dialog box appears:

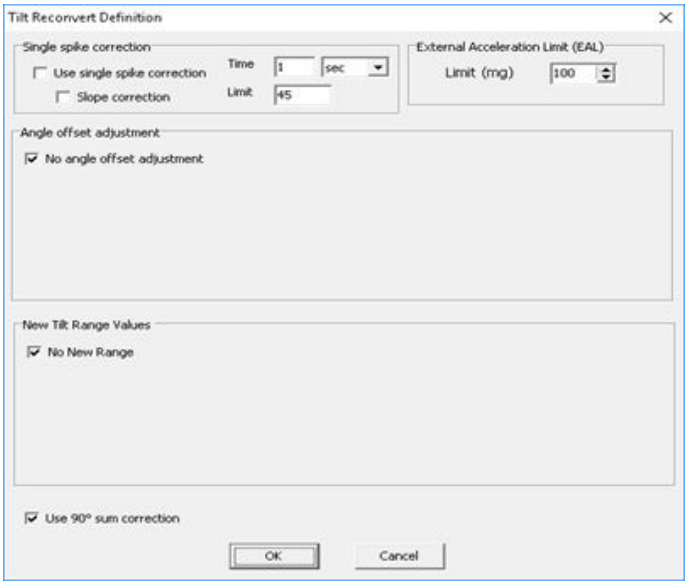


Figure 9.4: Tilt Reconvert Definition

9.4.1 Single spike correction

Single spike correction works with nocks and bumps, sudden spikes that can clog up the picture, also “large” jumps over the 90° boundary line.

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.

9.4.2 Angle Offset Adjustment

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.

9.4.3 New Tilt Range Values

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.

9.4.4 Use 90° sum correction

This is a software correction filter for the 3D tilt. All axis, i.e., the X, Y, and Z, are measured as acceleration. Tilt is a derived calculated value with the assumption that only the earth's gravitational acceleration is in play. That is, the logger itself is not accelerating in any direction. Thus, all three axes refer to the gravitational vector that is perpendicular to the earth's surface. This leads to the "rule" that the absolute tilt value of each axis added together will give 90°.

Many things contribute to askew axis measurements, like measurement noise and temperature dependency. This filter, called **A90**, averages out the tilt angle on each axis to achieve a 90° sum.

The **A90** filter is defaulted on, but the user can disable this filter when reconverting tilt data.

9.4.5 Use Quiescent 2° level correction

This is a software correction filter for the 3D tilt. Like the A90 filter described above, the **Quiescent** filter also improves the overall tilt angle values. The **Quiescent** filter targets specific errors resulting from inheriting errors in sensor chips and askew PCB printed circuit boards inside the housing.

It aligns the tilt values of Y=Z=0 when X is within ±2° from 90° or -90°, and also aligns X=Y=0° and Z=90° when the X and Y are both within ±2° from zero. The ±2° limit comes from the tilt accuracy definition.

The **Quiescent** filter is defaulted on, but when reconverting tilt data, the user can disable this filter.

9.5 Compass Reconvert Definition

Select **Edit** > **Reconvert Definition** > **Compass** and the following dialog box appears:

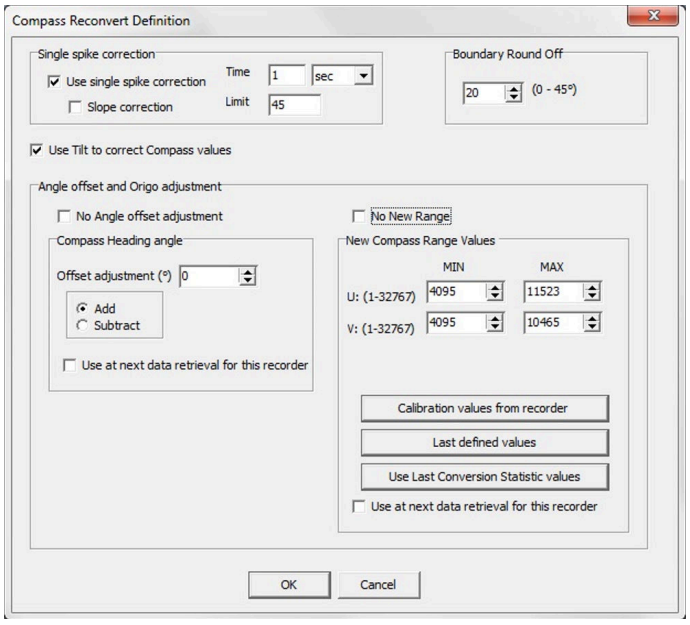


Figure 9.5: Compass Reconvert Definition

9.5.1 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.

9.5.2 Boundary Round Off

Boundary Round Off is aimed at minimizing shifts over the 0°/360°border, as the 0° and 360° are the same point. Small changes in heading values around the 0°/360° line are filtered out. The limit values are in 0-45°. The default value is 20° , i.e. values within 20° and 240° give 0° or 360°, depending on previous value.

9.5.3 Compass Offset Adjustment

As the 'No angle offset adjustment' and 'No new range' is disabled by default. 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/calcIGRFWMM. 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 a0°C horizontal position it is possible to put in an approximate offset value based on the tilting of the DST housing.

9.6 Reconvert Data

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

9.7 View Previous Conversions

Each time a reconversion is performed, a numbered file is created in the sequence folder. To view previous conversions select a file under **View** and choose **Previous** as can be seen in figure 9.6.

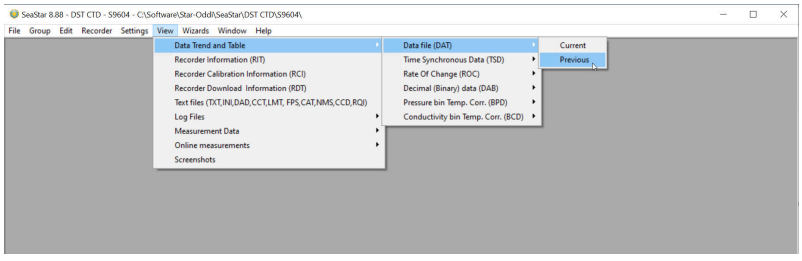


Figure 9.6: Previous Conversions

The window in Figure 9.7 appears. Select a numbered file from the drop-down list and press **OK**,

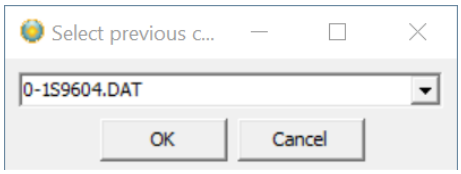


Figure 9.7: Select Previous Conversions

9.8 Reconvert Previously Retrieved Data

If data from the same sequence is retrieved more than once, a bookmarked data sequence file (DAD) is created. These files can be accessed and reconverted by choosing **File** > **Reconvert data** > **Previous** as can be seen in figure 9.8.

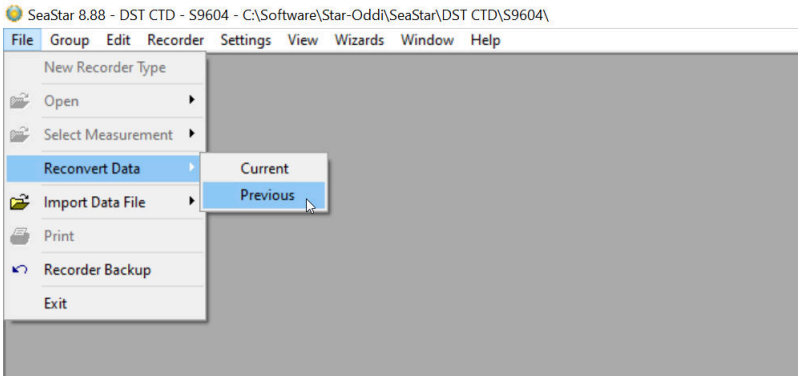


Figure 9.8: Reconvert Previously Retrieved Data

10 Export

10.1 Opening Data in Excel

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

10.1.1 Joined Date and Time

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. Open Excel
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.

10.1.2 Separate Date and Time

On the other hand if you have selected **Separate Date and Time**, under the **Settings** menu, **Preferences** > **Data File Format**, the following is performed:

1. Open Excel.
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. Insert a new column between C and D. A new empty column (D) has now been inserted between the time (C) and measurement values (now E).
5. Left click the mouse on the D column, so that the whole D column is selected. Go to 'Format/Cells', then 'Number' and choose 'Number'. Press the OK button.
6. Go to cell D1.
7. Type the following in D1: =CONCATENATE (B1;" ";C1). Now you have the date and time combined in one column.
8. D1 (the formula in D1) is copied down the D column. The D column can now be used with column E and F, to create the graph.

10.2 Export as Excel Workbook

By pressing the **Excel button** in when viewing charts from **View** > **Data trend and table** (see chapter 8.3 - Export as Excel Workbook), files can be exported as Excel Workbook (file extension .xlsx), to view tabular data in Microsoft Excel.

10.3 Export to CSV file

Export data in window to CSV(comma-separated values) file, a text file that uses a comma to separate values. A CSV file typically stores tabular data (numbers and text) in plain text. This can be done by pressing the **CSV button** in when viewing charts from **View** > **Data trend and table**.

Date and Time separation is as defined in **Settings** > **Preferences** > **Data File Formats**.

10.4 Export from Chart Editor

The **Chart Edit** button (on every graph) gives access to the Chart Editor, a multi-option menu with a Tree View interface. Under the **Export** menu, the user can save and export data as **Picture**, **Native** or **Data (file)**.

10.4.1 Pictures

The chart can either be saved as a picture or copied as a picture to the clipboard (see Figure 10.1). There are seven format possibilities:

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

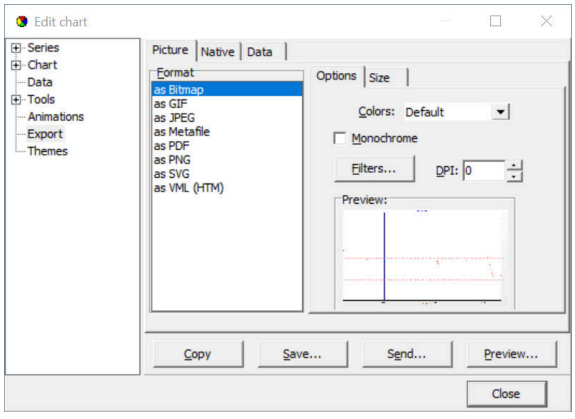


Figure 10.1: Export Menu: Pictures

10.4.2 Native

Under the **Native** menu (see Figure 10.2), the user can save the data as 'Native' *.tee chart files. Import of these files is not supported in SeaStar at the moment.

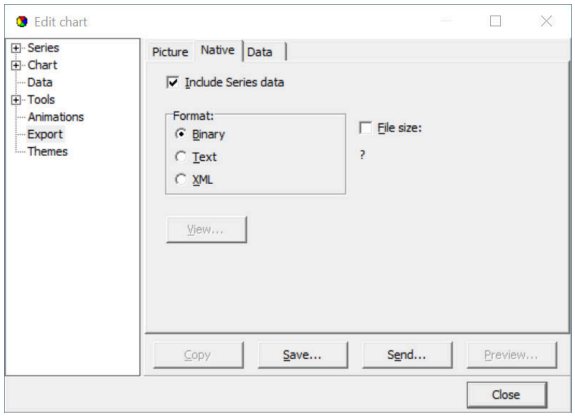


Figure 10.2: Export Menu: Native

10.4.3 Data

Data can be exported in four different file formats (see Figure 10.3):

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

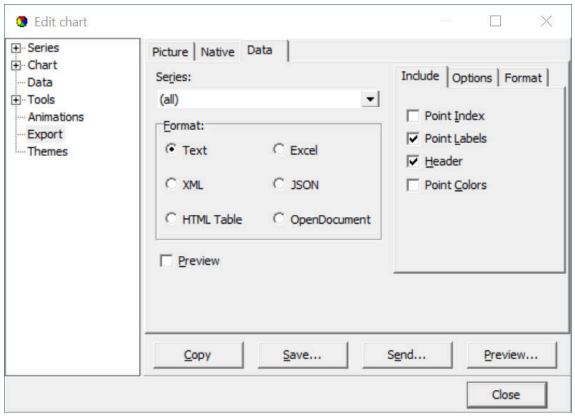


Figure 10.3: Export Menu: Data

In **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 at 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 way of exporting is to use the **Alt+PrintScreen** keyboard buttons to copy an image of the **SeaStar** window to the clipboard and paste it to another Windows application. When a dialog box is open, only that frame is copied to the clipboard.

To copy a part of a data file, for example, from a DAT file, highlight the part you want to copy and use the **Ctrl+C** keyboard buttons to copy the data snippet to the clipboard.

11 Printing

All charts and text files can be printed from the **SeaStar** software.

11.1 Charts

Open the chart you want to print out and select **File** > **Print** on the menu bar. The following window appears:

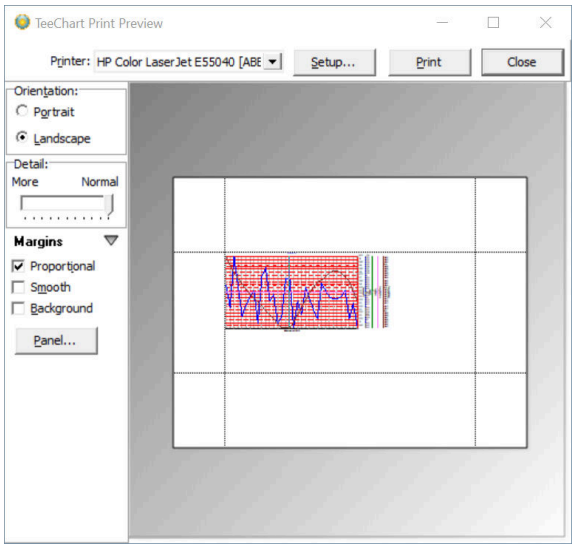


Figure 11.1: Print Preview

It is possible to print the chart to PDF or any type of printer available.

11.1.1 Orientation

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

11.1.2 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.

11.1.3 Move

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

11.1.4 Details

The size of horizontal and vertical gridlines and 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.

Another way of printing out a chart is opening the chart you want to print out and clicking the **Print Chart** button on the chart bar.

11.2 Histogram

To print out a histogram, open the chart which histogram you want to print out and click on the **Histogram** button on the chart bar. From there a window appears (see Figure 8.8), press the **Print** button and the following window appears:

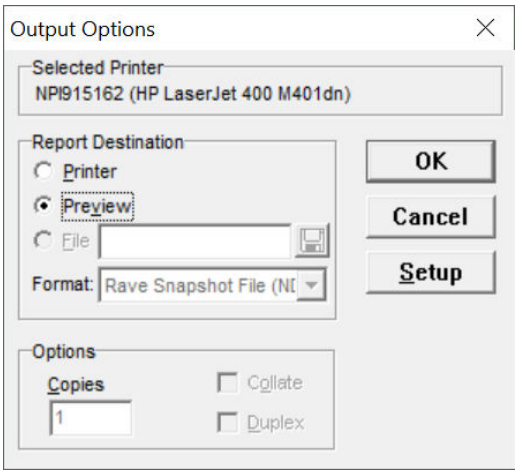


Figure 11.2: Histogram print output options

To change the selected printer, click **Setup** and select another printer.

To see a preview of the print out, select **Preview** under **Report Destination** and click **OK** (see Figures 11.2 and 11.3).

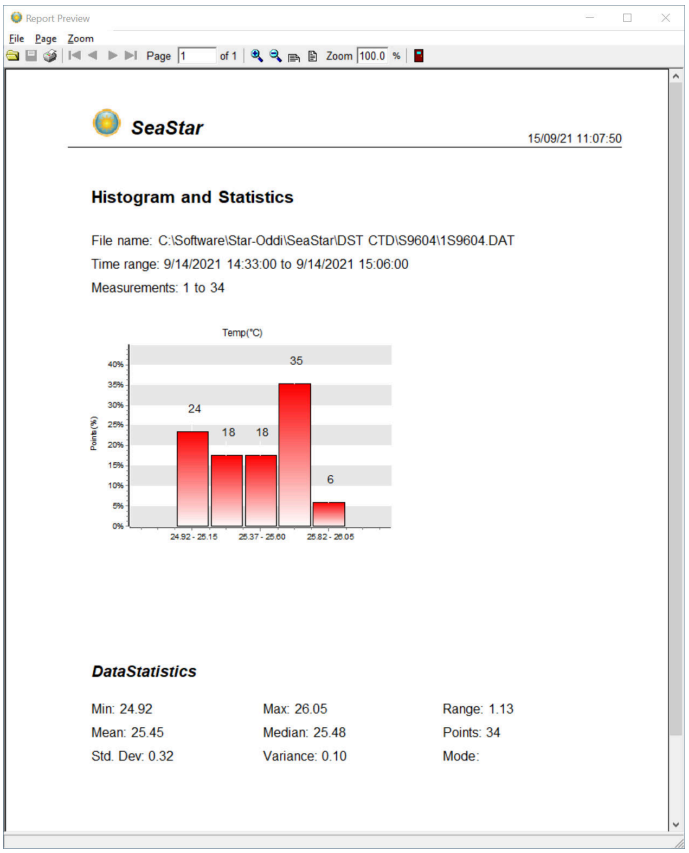


Figure 11.3: Histogram print preview

11.3 Files

To print text files, activate the file you want to print out and select **File** > **Print**. The same window appears as in Figure 11.2.

Note that as some of the files are very large, it is recommended to highlight the data you want to print out before printing. Figure 11.4 shows an example of a report preview of .DAT file (from View > Measurement Data > Converted Data (DAT)).

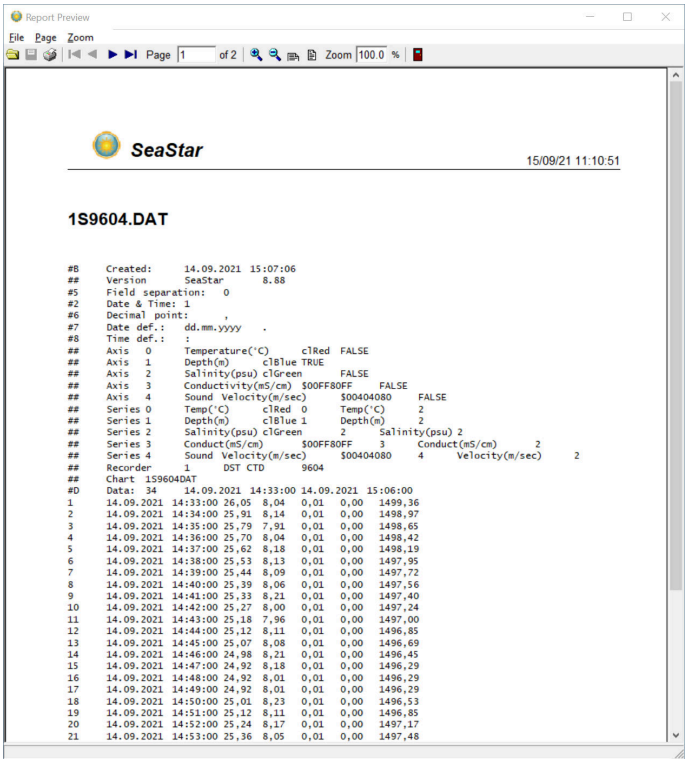


Figure 11.4: Report preview of .DAT file

12 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. 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.

12.1 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 Figure 12.1), before acknowledging OK from the Edit NMS menu. Having selected this option and the NMS are OK, the user can write a description for the template (see fig. 12.2). 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

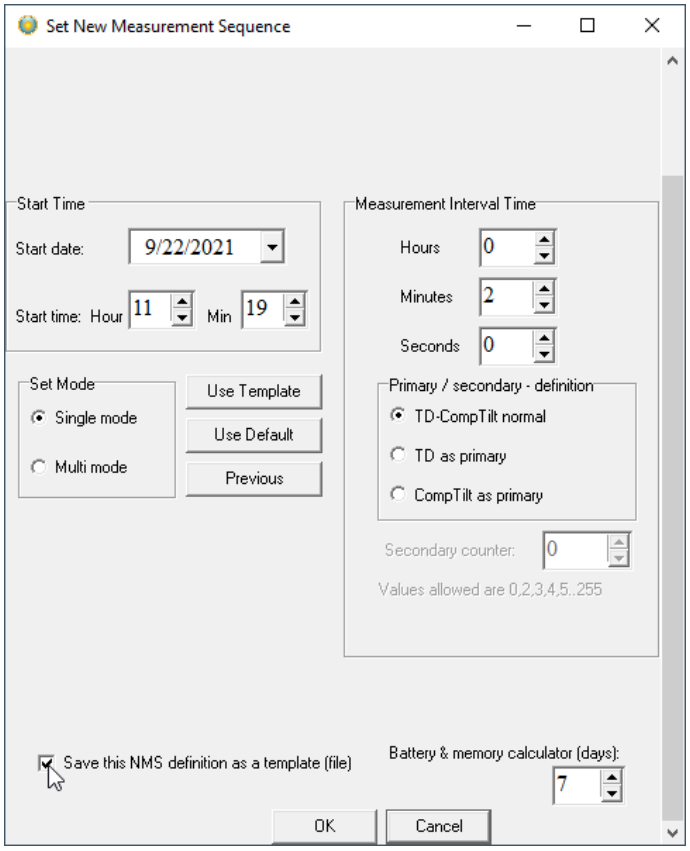


Figure 12.1: Template Options in **Edit** > **New Measurement Sequence**

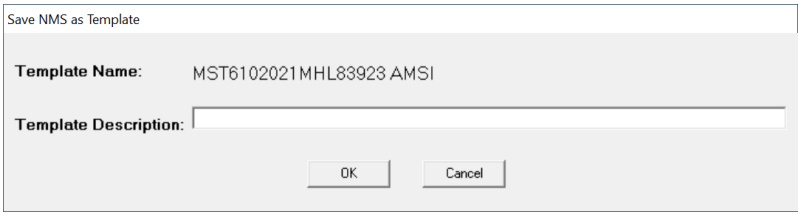


Figure 12.2: Saving NMS as a Template

12.2 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 Figure 12.1 there are three buttons in the Edit NMS window, the **Use Template** button is used for retrieving a template. Templates are selected via template name or description (seen in Figure 12.3) . Parallel to choosing 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.

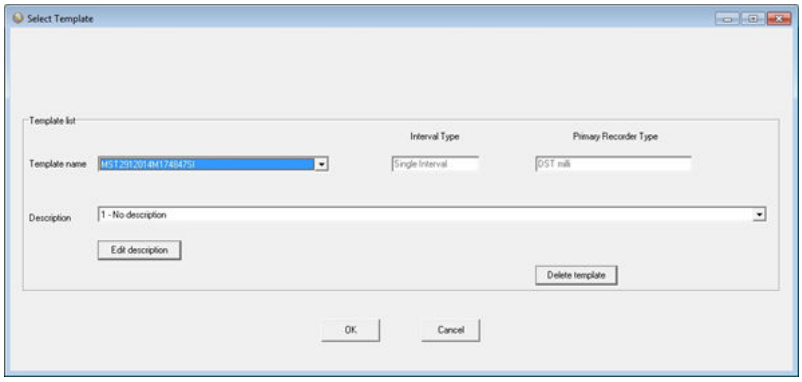


Figure 12.3: Template Options in **Edit** > **New Measurement Sequence**

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.

The user is returned to the edit window after selecting a template. If the selection is not as what the user expected, the **Previous** button would return the previous setting.

The user has one more option to set up the NMS quickly. The button in Figure 12.1, marked **Use Default**, will return default NMS settings. The button can have four descriptions and return four different settings depending on the status of the 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.

13 Recorder Modes

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

13.1 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 connected, the recorder is powered by the PC and not taking energy from the battery inside the recorder.

13.2 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.

13.3 Measurement Mode

The recorder is put into Measurement Mode by selecting **Recorder** $>$ **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, it stops recording and is put into PC Mode.

14 Memory and Battery

14.1 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:

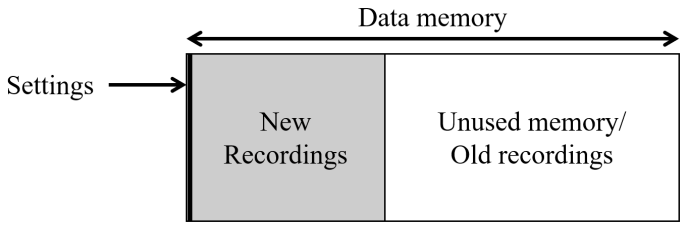


Figure 14.1: Data Memory Organization

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:

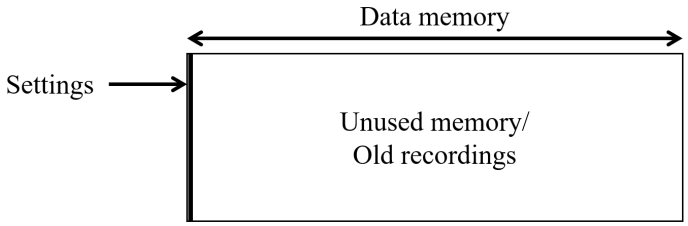


Figure 14.2: Data Memory with new Settings

14.2 Battery Calculations

The voltage characteristics of the batteries used in our recorders make it almost impossible to measure the energy available in the batteries; therefore, we estimate the energy consumption by calculation. All the recorder's energy-consuming functions, like sleep, decay, running (microprocessor awake), measurements, and saving data, are measured beforehand and used in our calculations. The calculations are performed by the application software, SeaStar, Mercury, and FoodStar. The recorders themselves do not perform any energy calculations. However, to start the recorder in one computer and retrieve data in another while still having the battery energy information, they carry the percentage of remaining energy with them in a register file (in the RID). When the recorder is in production (when the battery is new), the energy number is set to 100%.

Each time the recorder is started up in a new measurement sequence, the energy consumption, since the last sequence-start, is calculated and subtracted from the energy number retrieved from the recorder, and this new energy-left number is downloaded into the recorder.

The energy-left register in the recorder can be corrupted for reasons such as:

- The CRC check is turned off when connecting to the recorder and a communication error occurs.
- When a write error occurs when starting up a new sequence or updating status to the recorder and reconnection is performed instead of operating again.
- Energy estimation calculations are not in accordance with actual energy consumption.

15 Group

Creating a group is a way to gather multiple measurement sequences that are part of the same research project. In a group, the user can track when the logger was started, the data retrieved and the data converted/reconverted. Groups can be transferred to **PatternFinder** for further data analysis.

15.1 New Group

Select **Group** > **New Group** to create a new group. The following window appears:

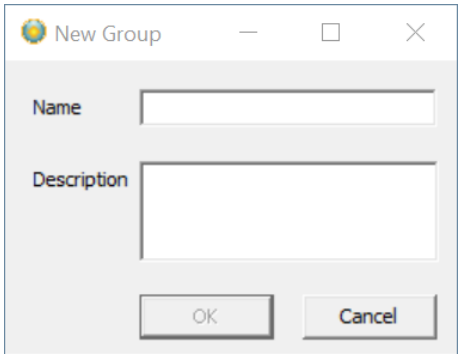


Figure 15.1: New Group

Name the group and enter a description. The group file will be saved under the directory: C:\SeaStar\Groups. Each group has its subfolder where data files from each sequence in the group are stored. This way, the data can be accessed by Star-Oddi's other software **PatternFinder** and **Gná**.

Once a group has been created, the group view pane appears:

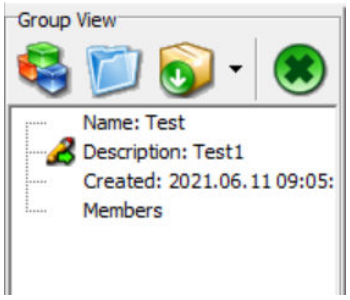


Figure 15.2: Group View

The buttons in the group view pane are as follows:

New Group

Open Group

Send Group to

Close Group

15.2 Open Group

Select **Group** > **Open Group** to open the group directory, or press the Open Group icon in the group view pane. A File Explorer windows appears, asking the user to select an existing group (groups have the extension .GRP).

When a group has been selected, the group view pane appears (see Figure 15.2, if not already open. It is also possible to open the directory by clicking the Open Group button in the group view pane.

15.2.1 Adding sequences to group

To add a sequence to the group connect to a logger and define and start a new measurement sequence (**Recorder** > **Start New Measurement Sequence**). When starting the new sequence the following window appears:

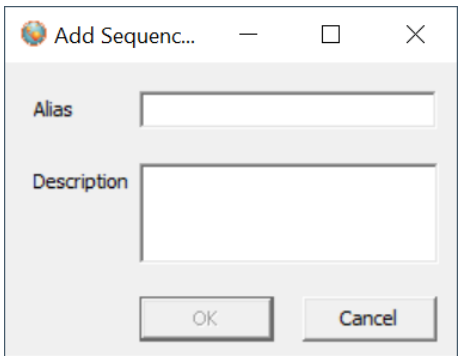


Figure 15.3: Add Sequence to Group

Set an alias for the sequence and enter a description. Click **OK** and the sequence will be added to the group (see Figure 15.4).

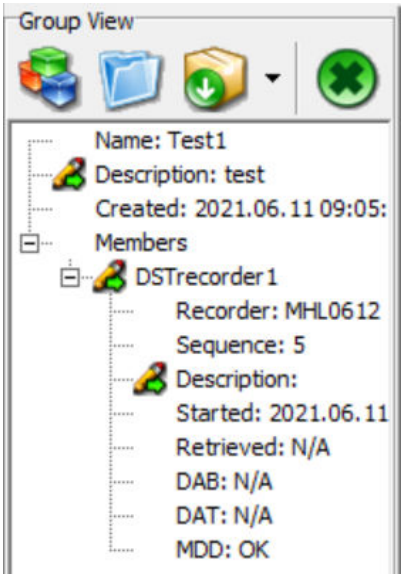


Figure 15.4: Group view pane

If a group is open when starting up a recorder, the new measurement sequence will automatically register in the group. If no group is open, the sequence will not be registered in any group.

15.2.2 Retrieving data

When retrieving data from a logger and the sequence is already in a group, the group's data retrieval time is registered. Also, when the data is converted/reconverted, a copy of the *.DAT file is stored in the group folder.

15.3 Send Group To

Select **Group** > **Send Group To**, or select the '**Send Group to**' button in the group view pane, to transfer a group to another Star-Oddi software.

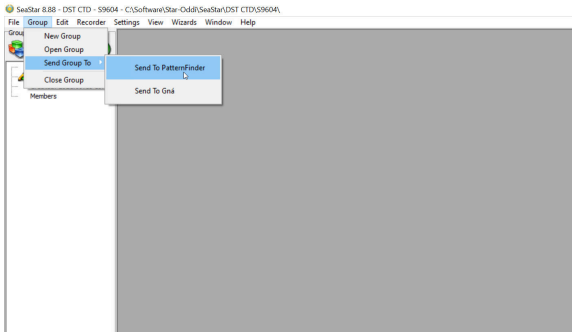


Figure 15.5: Send Group

15.4 Close Group

To close an open group, select **Group** > **Close Group**, or press the '**Close Group**' button in the group view pane. Select **Close Group** to close an open group.

16 Wizards

For DST Magnetic, there are five wizards in SeaStar:
Connection/Recorder Wizard, ComBox Connection, Start Recorder, Retrieve and View Data, and Retrieve and Restart Recorder.

16.1 Connection Wizard

If your recorder is not yet connected to **SeaStar**, you can enter the Connection Wizard by selecting **Wizards** > **Connection Wizard**. The wizard will help you find the correct COM port and establish a connection between the software and the DST recorder.

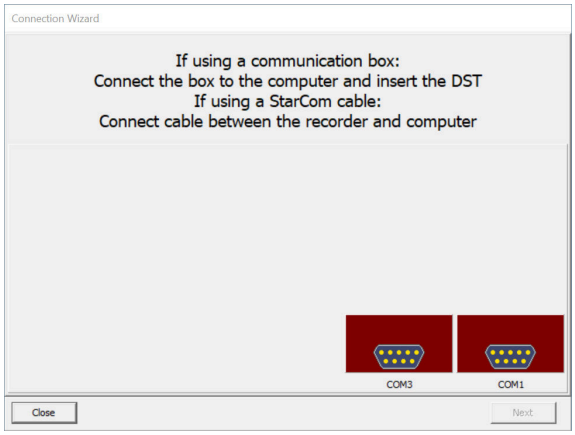


Figure 16.1: Connection Wizard

The Connection Wizard (Figure 16.1) shows available COM ports. The correct COM port (green) shows the type of DST recorder connected and its serial number. You can either click once on the selected port and select Next or double-click on the port.

After connecting, the Recorder Wizard is opened (see Figure 16.2).

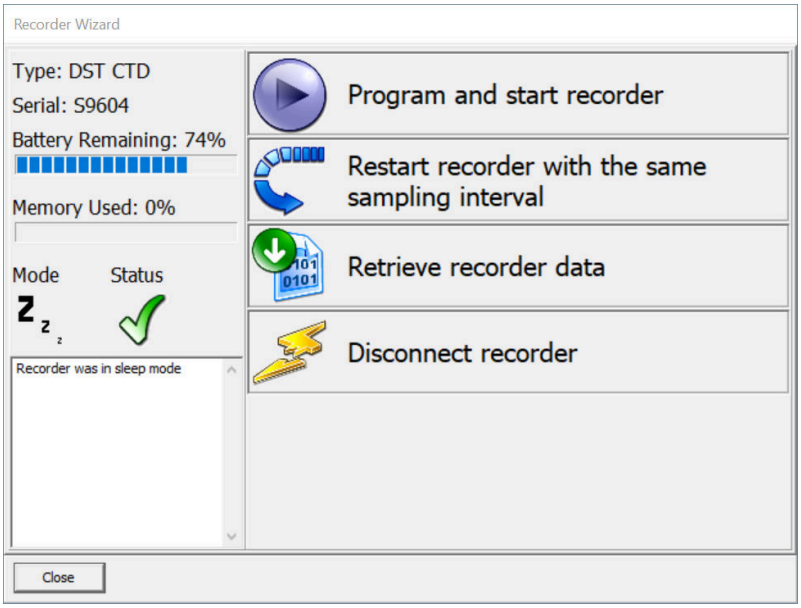


Figure 16.2: Recorder Wizard

16.2 Com Box Connection

Choose the **Wizards** > **Com Box Connection** to enter the Com Port wizard (see Figure 16.3).

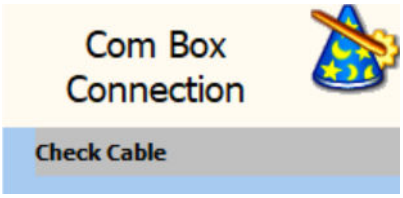


Figure 16.3: Com Port Wizard

The wizard goes through available ports and activates them one at a time, and asks the user to confirm if the communication box displays a yellow light (see Figure 16.4).

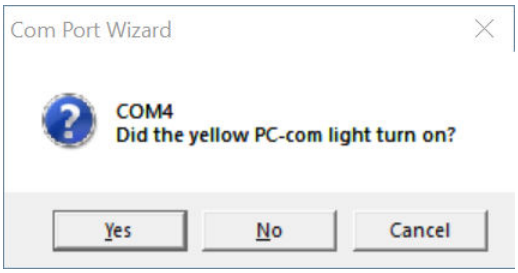


Figure 16.4: Com Port Wizard

16.3 Start Recorder

Choose **Wizards** > **Start Recorder** to enter the wizard (see Figure 16.5). If a connection has already been established, the wizard directly goes to start new measurement sequence.

Figure 16.5: Start Recorder Wizard

If the DST recorder and Com Box connection have not been established, the wizard asks the user to define the DST recorder type, then asks if the user can insert the DST recorder in the Communication Box. After insertion, make sure that the DST COM (green) light on the Communication Box is on. The wizard then starts the recorder with a new user-defined measurement sequence. If a connection has already been established, the wizard directly goes to start a new measurement sequence.

16.4 Retrieve and View Data

To enter the wizard, choose **Wizards** > **Retrieve and View Data** (see Figure 16.6).

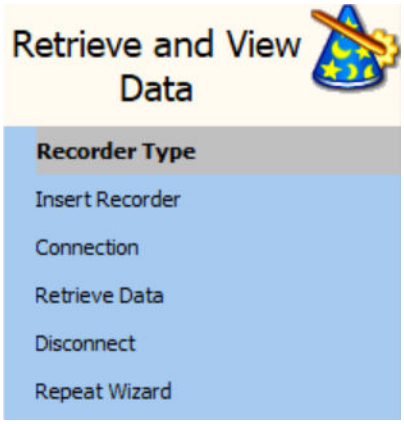


Figure 16.6: Retrieve Data Wizard

This wizard retrieves data from the recorder and offers the user to start it again with a new measurement sequence.

16.5 Quick Retrieve and Restart Recorder

Select **Wizards** > **Quick Retrieve** to enter the wizard (see Figure 16.7).

Figure 16.7: Quick Retrieve Wizard

This wizard retrieves data from the recorder without graphically displaying it and offers the user to start it again with a new measurement sequence.

17 Help Menu

This chapter describes options under the **Help** menu.

17.1 User Manual

Select **Help** > **User Manual** to open the SeaStar/DST Magnetic user manual.

17.2 Troubleshooting

Select **Help** > **Troubleshooting** to open the TroubleShooter.

17.3 Check for Updates

Select **Help** > **Check for Updates** to manually update the latest version of **SeaStar**, User Manuals, and Trouble-Shooter. The following window appears:

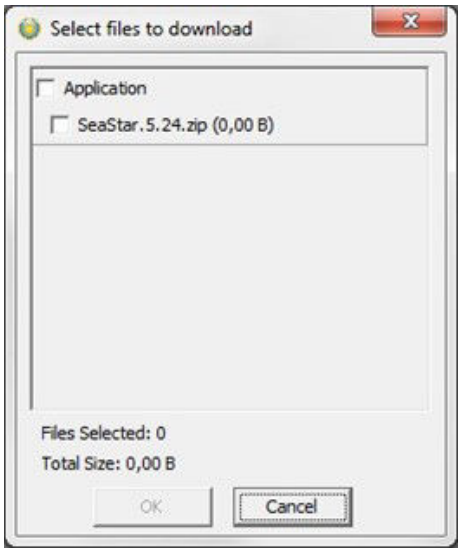


Figure 17.1: Update SeaStar - Select files to download.

Select the files you want to download and click **OK**. The program downloads and installs the latest updates to the software. Please note that this can only be done when the program is offline, i.e., when no recorder is connected to the program.

By selecting **Settings**> **Options** > **Update** you can now choose whether you want to update **SeaStar** manually, every X number of days or every time **SeaStar** is run (see Figure 17.2). The Uptate options menu is explained more thoroughly in chapter 6.10.

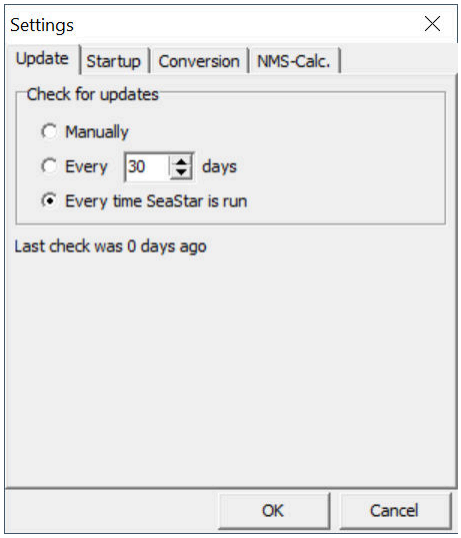


Figure 17.2: Update Settings

17.3.1 Release Notes

Release Notes are available on our website via: https://www.star-oddi.com/support/software, select **Change Log** next to the **SeaStar** installation link.

They feature the description of the latest features added to **SeaStar**, the date when they were added, and a reference to the chapter number of each manual where the additions can be found.

17.4 Submit Ticket

Tickets can now be sent directly from the application to our support department by selecting **Help** > **Submit Ticket**. A shortcut key, **F1**, can also be used at any time while in the application and is especially useful when the menu bar is disabled.

In the ticket form (see Figure 17.3), you can add your name and e-mail. Select a category that best describes your problem and write a subject and description. If you like, you can select **Images (screenshots)** and browse for images in the screenshots folder and send them with the ticket. By selecting **Other files** you can also add files to the ticket. To automatically add recorder data, use the **Include Recorder Data** option. By default, the following files are included: screenshot, system information, logs, and settings. These can be excluded with options in **Other files**.

To receive a response, we require that you include a valid e-mail address. Tickets can also be created by e-mailing support@star-oddi.com with the problem description and files attached.

If you want to add more information to a previously created ticket you can reply to the support response.

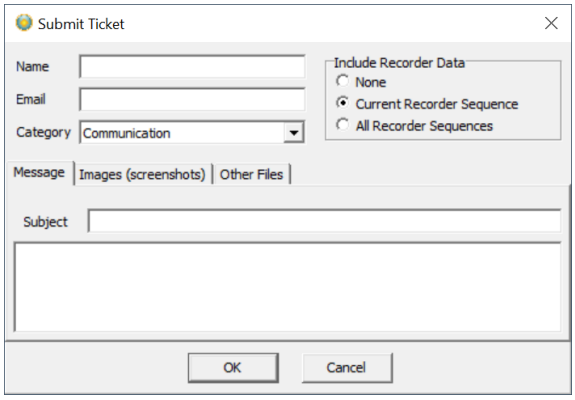


Figure 17.3: Submit Ticket

17.5 About

Select **Help** > **About** for general information about SeaStar.

A Appendix

A.1 Directories and Files

Directory Structure

The user can choose between **SeaStar**'s default data directory structure (path) or define his 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 CTD 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 CTD is:

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

C:\SeaStar\DST CTD The type directory for DST CTD

C:\SeaStar\DST CTD\S9001 The directory for the S9001 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:

The type-INI files (for example DstJ.ini for DST Magnetic).
The information type files are all in the installation directory, they contain information on specific settings for each type. Example of the type-INI files are:

StarmonT.ini	Starmon mini
DSTM.ini	DST milli
DSTU.ini	DST micro
DSTC.ini	DST centi/centi ex
DSTS.ini	DST CTD
DSTK.ini	DST Logic CTD
DSTG.ini	DST GPS
DSTH.ini	DST tilt

Table A.1: Star-Oddi DST recorders' INI files.

The recorder-INI files For example, C2018.ini contains settings information and data file positioning for the C2018 recorder. The recorder-INI files are located in the appropriate type directory, i.e., all the Cxxxx.INI files are in the 'DST centi' directory.

File 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 CTD\S9001\ is a directory for the S9001 recorder and all files belonging to S9001 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\S9001 for the S9001 recorder. The S9001.ini file (located in the C:\SeaStar\DST CTD) contains the path to the C:\Data\S9001\ directory, and all files related to the C2018 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: **Cxxxx**: 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

Table A.2: Recorder related files.

*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: **mmmSxxxx**: 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

Table A.3: Measurement Related Files.

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.

***.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 is two data files, the *.DAB and the *.DAT.

***.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.

***.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 the setup. The following column(s) contain the converted measured parameters with units and decimals according to set-up. The number of parameters can range from 1-3, and the number of columns 3-6 accordingly.

Data Header

The *.DAT file contains a data header, 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), some header bookmarks are followed by a number while other are followed by another bookmark (#). Then follows a description of the header item, and then 1-5 directives, all separated by tabs.

The file can be split into four segments (as seen in table A.1). The following is a description of the directives contained in the data header.

Section	Item	Description	Number of directives
1	#B	**Created:** The date and time of that particular *.DAT file creation.	1
	##	**Version SeaStar** SeaStar application software version X.X	1
	#5	**Field separation:** Separation between columns (0,1) 0: Tab 1: Space	1
	#2	**Date & Time:**: Data and time column definition (0,1) 0: Joined date and time 1: Separate date and time	1
	#6	**Decimal point:** Decimal separation: Comma (,) / Dot (.)	1
	#7	**Date def:** Date format: dd.mm.yyyy/mm.dd.yyyy Date separation: Dot (.) / Slash (/) / Dash (-)	2
	#8	**Time def:** Time separation: Colon (:) / Dot(.)	1
2*	##	**Axis X:** Set as right axis. The three directives are: Axis header, unit: Text Axis color: Text Axis inversion: (TRUE,FALSE)	3
	##	**Series Y:** Series List. The five directives are: Series List header, unit: Text Series color: Text Variable number: (0-3) Chart header, unit: Text Number of decimals: (0-3)	5
3**	##	**Recorder:** Recorder sequence number: Text Recorder type: Text Recorder serial number: Text	3
	##	**Chart:** The DAT file name Used as a graph header.	1
4	#D	**Data:** Number of measurements: Integer Start of measurements: Date & time End of measurements: Date & time.	3
	Meas. nr.	Rest of file contains data lines Date - Time - Measurement variables Y	3

Table A.4: Measurement related files.

*Number of items in section 2 depends on number of measurement variables Y of specific DST recorder.
**Can contain more items, e.g., ECG sampling frequency for HR recorders and histogram settings.

Older recorders might generate measurement related files as described in table A.5, and some files use this format for all recorders (e.g., .HAT & .HAS files for ECG records).

Item	Description	Number of directives
#B	**Date - time:** The date and time of that particular *.DAT file creation.	1
#1	**Recorder:** The recorder and sequence number, f. example 12M1023 Used for confirmation and as a graph header..	1
#2	**File type**: Describes file column structure, mainly if Date and Time are joined (0-3) 0: Result file Number Date Time Channels 1-3 1: Result file Number Date & Time Channels 1-3 2: Binary file Number Binary Channels 1-3	1
#3	**Columns:** Total number of columns (3-6).	1
#4	**Channels:** Number of measurement parameters (1-3).	1
#5	**Field separation:** Separation between columns (0,1) 0: Tab 1: Space	1
#6	**Decimal point:** Decimal separation (0,1) 0: Comma 1: Dot	1
#7	**Date def:** Date format (0,1) 0: dd.mm.yyyy 1: mm.dd.yyyy) Date separation (0-2) 0: Comma (,) 1: Slash (/) 2: Dash (-)	2
#8	**Time def:** Time separation (0,1) 0: Colon (:) 1: Dot (.)	1
#9	**Channel 1:** Set as left axis, normally temperature. The four directives are: Axis header, unit: Text Column header, unit: Text Number of decimals: (0-3) Axis direction (1,2), 1: Ascending, 2: Descending	4
#10	**Channel 2:** Set as right axis. The four directives are: Axis header, unit: Text Column header, unit: Text Number of decimals: (0-3) Axis direction (1,2), 1: Ascending, 2: Descending	4
#11	**Reconversion:** Definition on conversion / Extra header in graph (0,1) 0: Original conversion 1: Reconverted	1
#D	**Data:** Number of measurements: Integer Start of measurements: Date & time End of measurements: Date & time.	3
Meas. nr.	Rest of file contains data lines Date - Time - Measurement variables Y	3

Table A.5: Measurement related files type 2.

A.2 Pressure Offset Adjustments, Step-by-Step Instructions

1. **Choose Recorder Type:**
   Go to *File* > *New Recorder Type* and select the relevant type.

2. **Open the Data for the Chosen Recorder:**
   File > *Open* and either browse or choose from the list.

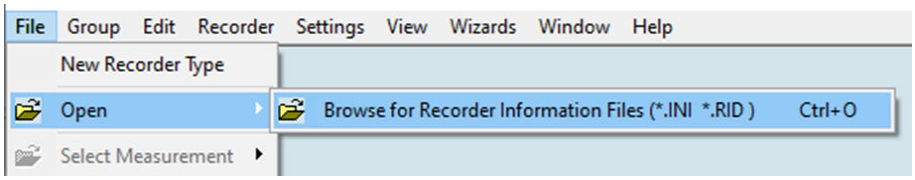


Figure A.1: Browse for Recorder Information Files (*.INI *.RID)

Open the RID file. Then, the MID file for the chosen measurement sequence.

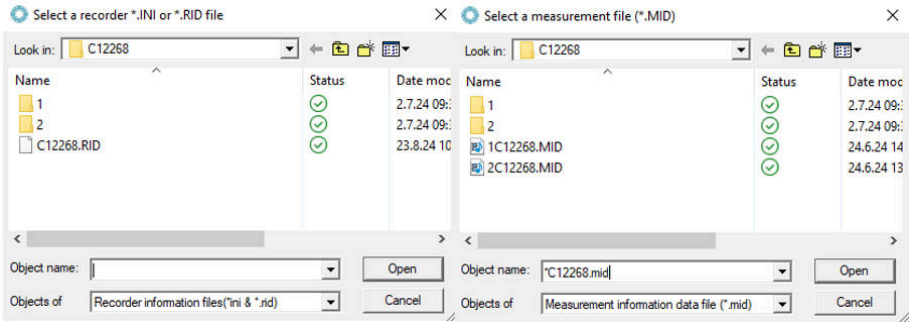


Figure A.2: Select a recorder and measurement files

3. **Change the Pressure Unit to Pressure (Bar):**
   Go to *Settings* > *Preferences* > *Units* and select Pressure (Bar).

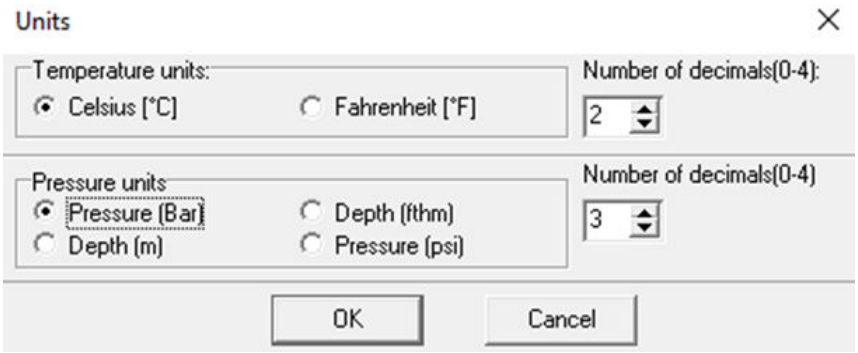


Figure A.3: Pressure units to Pressure (Bar)

4. **Reconvert:**
   Press *File* > *Reconvert Data* to reconvert the graph and table with Pressure (Bar).

5. **Find the Offset Value (By Using the In-Air Value Method):**
   If using the in-air value for offset adjustments, you have two options.

   a) More precise (recommended):
   Highlight the portion where the logger is measuring in air and use the average Press(Bar) value.

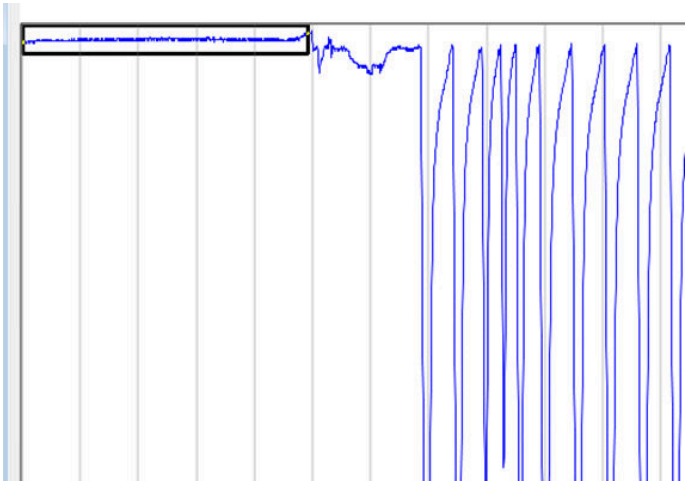


Figure A.4: Average in-air value

   b) Less precise:
   Open the Histogram in the DAT file and select Press(Bar). Use the minimum value as your offset. In this example, the minimum value is -0.29 Bar (in-air measurement).

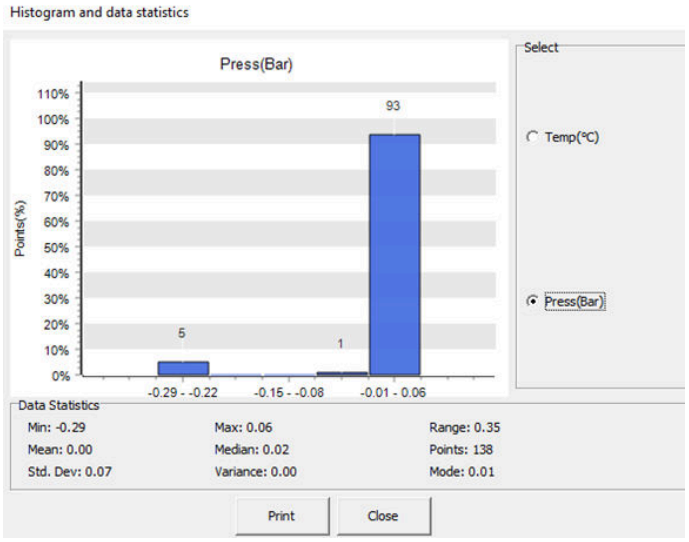


Figure A.5: Minimum in-air value

6. **Set Pressure Offset Adjustment:**
   Go to *Edit* > *Reconvert Definitions* > *Pressure Definitions*

   Enter the in-air value as the offset adjustment in mBar. The value can either be subtracted from or added to the pressure readings.

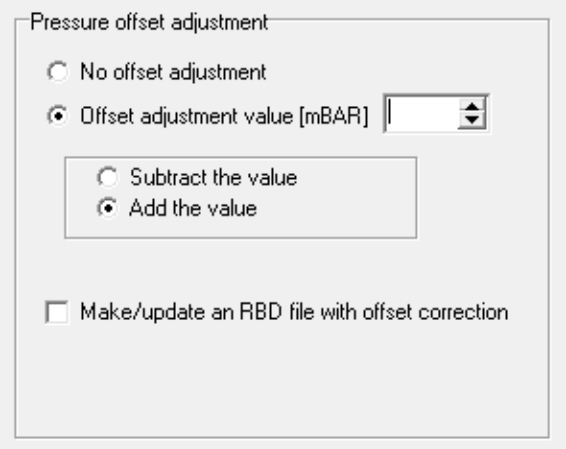


Figure A.6: Pressure offset adjustment

   To save the offset adjustments for the next measurements you have to be connected to the recorder, then select 'Make/update an RBD file with offset correction' and press OK. The adjustment is then saved in the RBD file (backup file). You must perform a backup to save the adjustment in the recorder.

7. **Re-define Parameters If Needed:**
   Settings > *Preferences* > *Units*

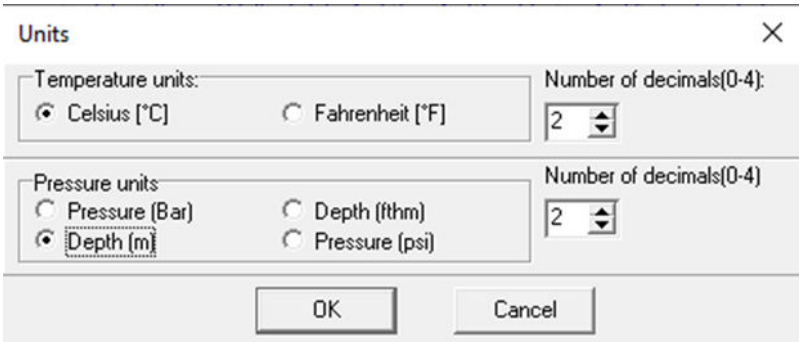


Figure A.7: Pressure units to Depth(m)

8. **Reconvert the Data:**
   Go to *File* > *Reconvert Data* to apply the offset adjustment to the graph and table.

9. **Backup the Recorder if 'Make/update an RBD file with offset correction' was Selected:**
   If you selected 'Make/update an RBD file with offset correction', an RBD file (backup file) was made and stored in the RBD folder within the SeaStar directory.

   To back up a logger, you need:

   a) The RBD file
   b) Battery remaining (%)
   c) Next measurement sequence number

   Connect to the logger and note the **Battery Remaining (%)** shown in the Recorder Wizard.

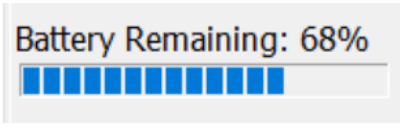


Figure A.8: Battery Remaining in the Wizard

   Go to *File* > *Recorder Backup* and select the relevant RBD file. Then, define the remaining battery (%) and the next sequence number. If you are not sure of the next sequence number, choose a high number to avoid overwriting any data on the computer.

   Now, the offset adjustments are saved in the recorder, allowing you to continue using it with increased accuracy.

A.3 Recorder Backup

As mentioned in chapter 9, if the constants from the MID and RID file are corrupt, the user should contact Star-Oddi for an RBD file and transmit it to the recorder. The name of the backup file is Txxxx.RBD (serial no. of the recorder plus the .RBD ending).

Downloading the backup file:

1. Copy the backup files (RBD) into the SeaStar RBD directory.

2. Open the **SeaStar** software.

3. Plug a Com Box and DST recorder to the PC computer.

4. Select **File** > **Recorder backup** and the following window appears:

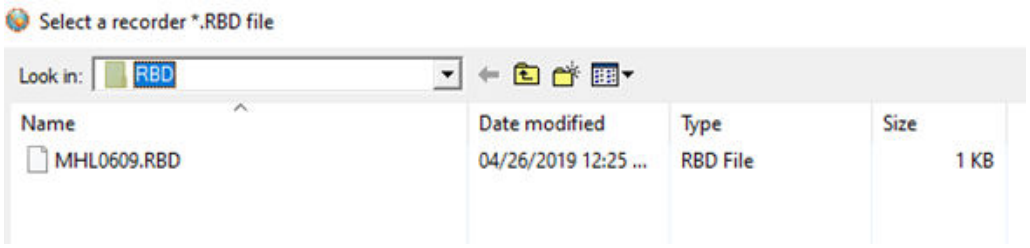


Figure A.9: Select recorder backup file (*.RBD file)

Browse for the correct RBD file on the computer and click **OK**.

5. Insert the sequence number and remaining battery life (see Figure A.10). Note that if the sequence number is set too low, data will be overwritten.

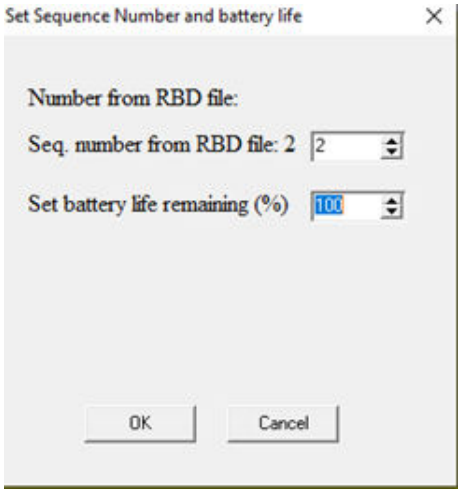


Figure A.10: Set Sequence Number.

6. The **SeaStar** software downloads the RBD file into the recorder and the window in Figure A.10 appears. Click **OK**.

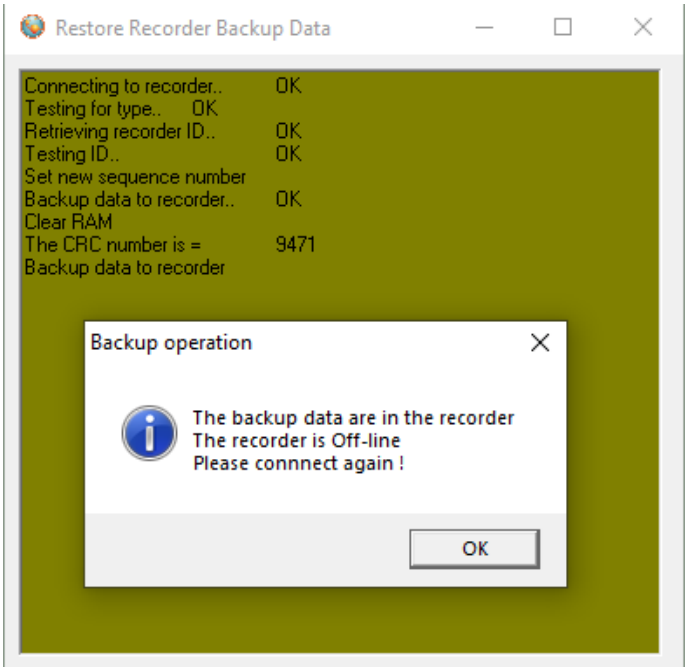


Figure A.11: Backup Operation

A.4 Specifications for DST Magnetic

Sensors	Magn. field strength (3D), tilt (3D), temp, depth*
Size (Diameter x Length)	15mm x 46mm
Housing Material	Alumina (Ceramic)
Weight (in air/in water)	19g/12g
Data Resolution	12 bits for temp/depth, 12 bits for magnetic field strength (compass) and tilt
Compass Resolution	1°
Compass Accuracy	+/-15° heading with tilt correction on compass, up to +/-45° from horizontal plane
Magnetic Field Strength Range	0 to 2 gauss
Magnetic Field Strength Resolution	100nT
Magnetic Field Strength Accuracy	+/-300nT
Tilt Range	+/-90° (180° span)
Tilt Resolution	0.05°
Tilt Accuracy	+/-3°
Temperature Range	-1℃ to +40℃ (30℉ to 104℉)
Temperature Resolution	0.032℃ (0.058℉)
Temperature Accuracy	+/-0.1℃ (0.18℉)
Temperature Response Time	Time constant (63%) reached in 20 sec.
Standard Depth Ranges	0.1m-50m, 0.1m-100m, 1m-270m, 5m-800m, 5m-1500m, 10m-3000m
Depth Resolution	0.03% of selected range
Depth Accuracy	+/-0.6% of selected range
Depth Response Time	Immediate
Memory Type	Non-volatile EEPROM
Memory Capacity	104,634 measurements**
Memory Capacity Bytes	392,379 bytes / temperature-pressure 3 bytes, compass (MFS)-tilt 12 bytes
Measurement Interval	User specified in second(s) minute(s), or hour(s)
Minimum Measurement Interval	1 second
Multiple Intervals Option	Up to 7 different intervals
Measurement Options (Primary/Secondary)	Temp/depth as primary, CompTilt as primary
Data Retention	25 years
Clock	Real time clock. Accuracy +/-1 min/month.
Communications	Communication Box, wirelss transmission when DST sits in the box. Connection to PC: USB cable.
Attachment Hole	0.9 mm (diameter)
Battery Life	3 years**

Table A.6: DST Magnetic Specifications

*Pressure & temperature sensors optional.
**Divided between the number of sensors
*** For sampling interval of 10 minutes; MFS-tilt, and temp-pressure recorded simultaneously.
Warranty: 12 months.
Specifications may change without notice.

