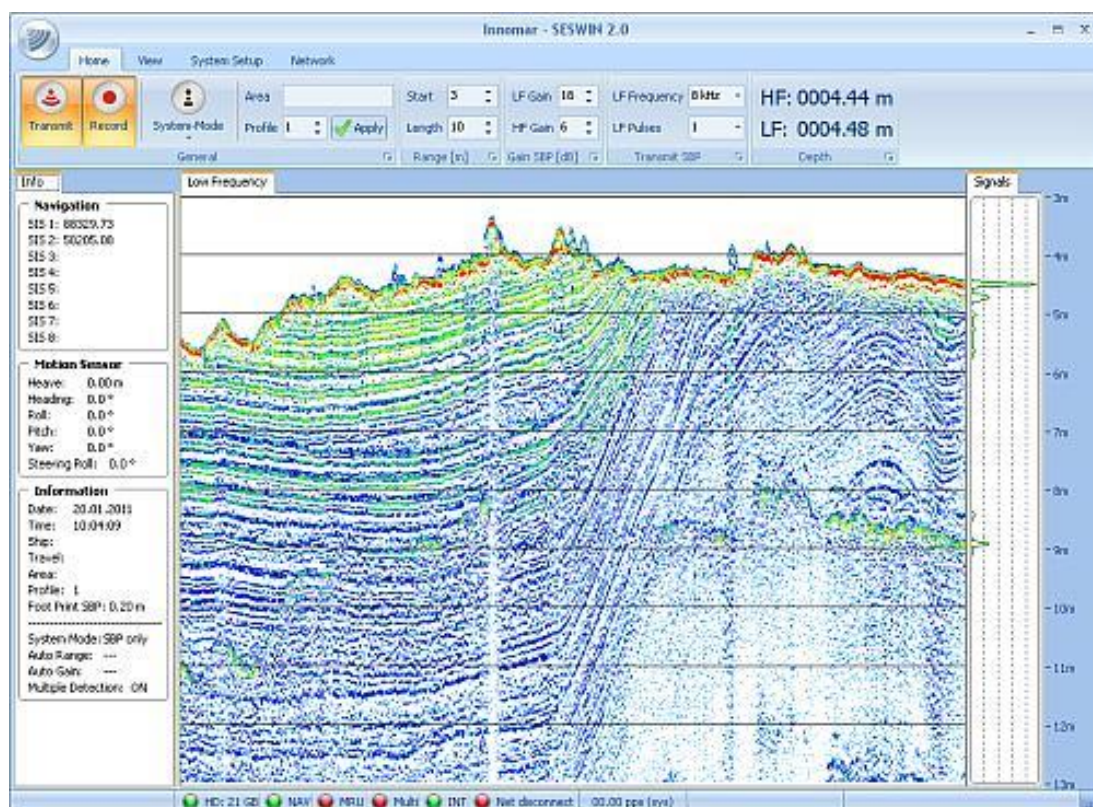


Narrow-Beam Parametric Sub-Bottom Profiler

Quick Start Guide for Innomar SES-2000 medium on RV "Heincke"



Quelle: Innomar Website

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History

Version / Date	Description
1.0 / 21.03.2010	First version
1.1 / 15.04.2013	Added Chapter 3: Synchronisation with EM710
1.2 / 14.01.2014	Function "HF Signal Damping" added
1.3 / 17.02.2017	Trimble-GPS lever arm updated; added chapter 5.1 Service Report

1 SES-2000 medium Hardware configuration

1.1 Sensor equipment

The following sensors are installed on the RV “Heincke”:

Table 1: Sensor specification

Sensor	Model	Details from Manufacturer
Inertial Navigation System (INS)	IXSea Phins	Heading accuracy: 0.05 deg (without aiding) Roll, Pitch accuracy: 0.01 deg Heave accuracy: 5 cm or 5%
Primary Positioning Unit	Trimble SP461	Primary Positioning system DGPS 0.5 – 3 m accuracy
Backup Positioning Sensor	SAAB R5	Backup Positioning system DGPS GPS: 3m, DGPS: 1m (2D RMS)

1.2 Sensor structure

Figure 1 shows the sensor structure of the sub-bottom profiler hardware. The processing unit is the main unit which controls the transducer and receives position information from the Trimble DGPS receiver as well as attitude data (heading, roll, pitch, heave) from the Ixsea PHINS III inertial navigation system (INS).

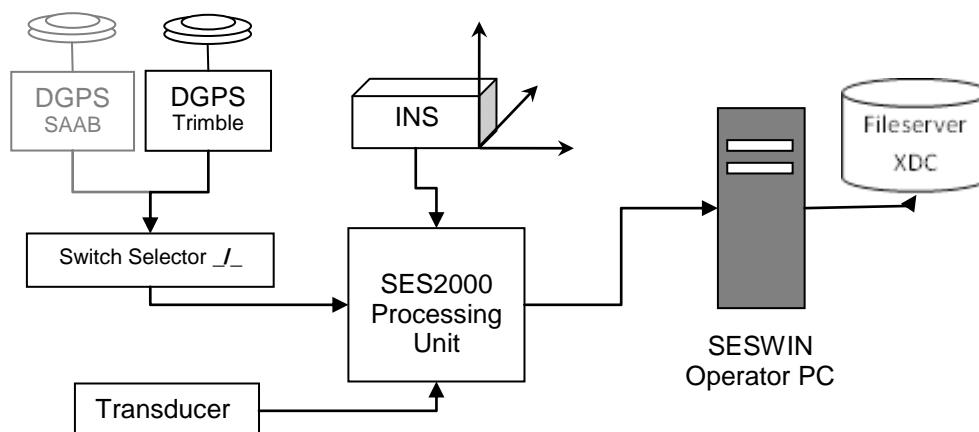


Figure 1: Sensor dependencies

2 SESWIN System Software

We strongly recommend reading the **SES-2000 medium Quick Start Manual** as it already gives a good overview of the system's software and guides the operator to get good results. This manual is construed for the specific use of the SES-2000 medium on RV "Heincke" and focuses on the most important parameters to be looked after during data acquisition.

2.1 Start SES-2000 medium

- Power up the sounder unit (**by captain**)
- Power up the SESWIN Operator Station (**by captain**) and switch on the monitor on the bridge. **For the dongle, username and password please ask the captain.**
- Click the SESWIN icon on the desktop, the following window will show up (Figure 2).

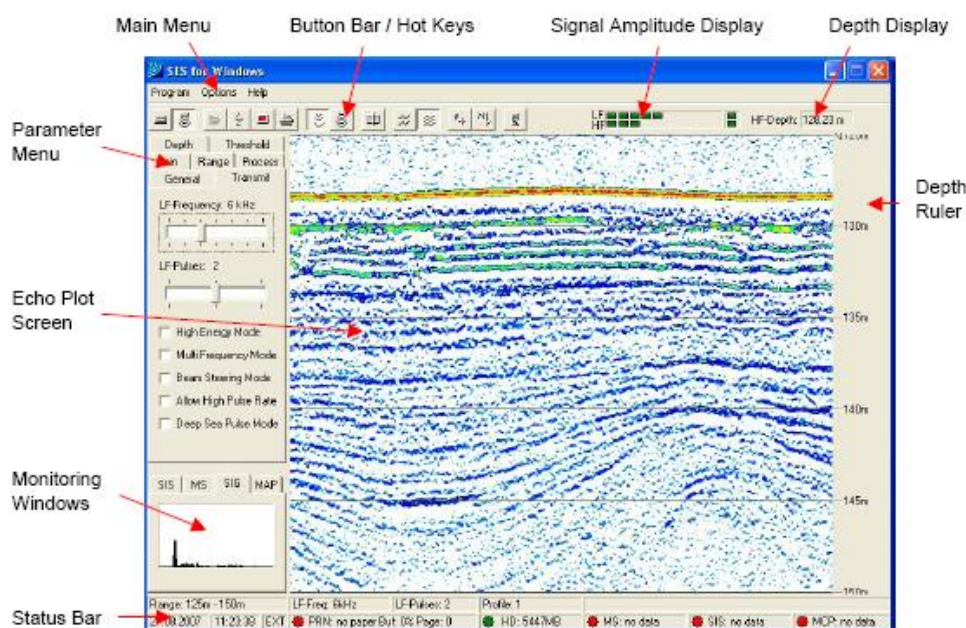


Figure 2: The SESWIN screen

Main menu	System configuration, interface configuration, help
Button bar/Hotkeys	Setting of most important features for system mode
Level display	Displays signal amplitude of low frequency (LF) and high frequency (HF) channel
Echo plot display	Online output of calculated echogram
Depth display	Display of water depth measured by HF
Parameter menu	Setting of hardware parameters (e.g. choosing frequency and pulse length, setting the amplifiers)

Monitoring Windows SIS: Display of navigation data, MS: Display of motion sensor data, SIG: Display of echo envelope, MAP: Display of track plot channel

2.2 Main Menu / System Settings

Before the survey starts following parameters need to be checked (**Main Menu/Options/System settings**):

- **Sound Velocity in Water:** The measured or estimated sound speed is used for all depth calculations and has to be set properly (Figure 3). A value of 1500 m/s is adequate.
- **Record Path:** On board of RV “Heincke” the data will be stored under **C:\ses...ldata\cruise**. File names are generated automatically, based on the File Options (Figure 4).

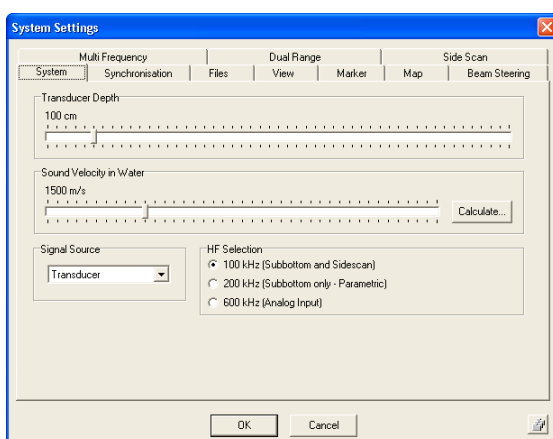


Figure 3: Set the sound velocity

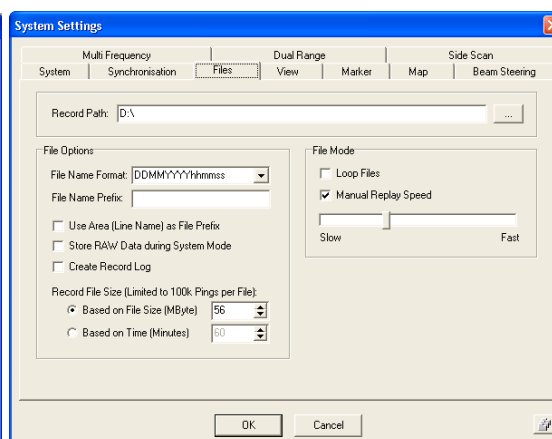


Figure 4: Set file options

The following **File Options** shall be set:

File Name Format:

Select the pattern **YYYYMMDDhhmmss**.

Store RAW Data:

Should always be checked. Additionally to the normal SES envelope data (file extension: ***.ses**) the received signal will be recorded as SES full waveform data (file extension: ***.raw**).

Create Record Log:

Should always be activated. A log file **sesrec.log** will be created and every data record start/stop will be logged with date, time, profile number, area, LF-frequency (kHz), LF-pulses, range start, range length. The data format is of ASCII type.



Record File Size: **Based on File Size [Mbyte]: 56.** If a data file reaches the limit, a new data file is automatically started.

2.3 Button Bar / Hot Keys

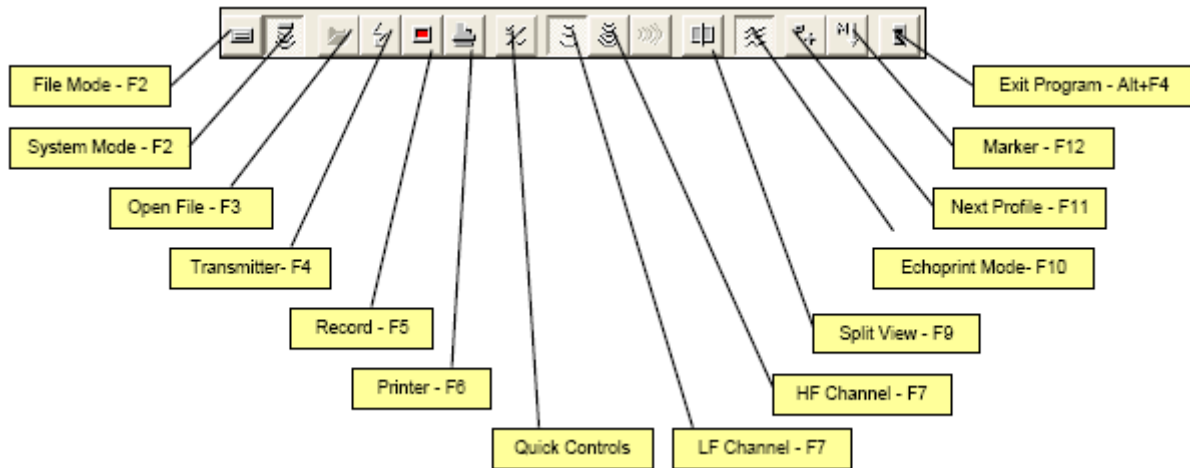


Figure 5: The SESWIN button bar

The most important hotkeys during data acquisition are marked bold.

<i>File Mode</i>	For replay only
System Mode	For data acquisition
<i>Open File</i>	To load files for replay only (disabled during system mode)
Transmitter	Start/Stop sound ping
Record	Start/Stop recording data
<i>Printer</i>	Start/Stop online printing
Quick Controls	Switch on/off reduced Parameter Menu (“Quick Controls”)
LF Channel	Display echoprint of low frequency (LF) data
HF Channel	Display echoprint of high frequency (HF) data
<i>Split View</i>	Display echoprints of both low and high frequency data simultaneously
<i>Echoprint Mode</i>	There are two modes for echoprints: “Amplitude” and “High Resolution”
<i>Next Profile</i>	Increase profile counter by 1 and restart data logging, if active
<i>Marker</i>	Manual event marker (with annotated number).
<i>Exit Program</i>	Press to exit program.



2.4 Level Display

The **Level Display** shows the signal amplitude of LF- and HF-channels. A correctly amplified signal should use the entire range available, just occasionally reaching the upper range (Red flickering occasionally). The two single LEDs on the right side are indicating an amplifier overload. The “Overload” LED on the right should not turn red (Figure 6).



Figure 6: Level display

2.5 Depth Display

The online calculated water depth from the HF channel is displayed in the upper right corner of the SESWIN window. The depth calculation is based on the transducer depth and sound velocity and can be adjusted to the actual conditions of the measurement via **Parameter Menu/Depth**.

2.6 Parameter Menu

Options, parameters and values set in the parameter menu directly control the quality of the data collected and displayed. During data acquisition emphasis should be placed on acquiring good data by adjusting the **range, frequency, pulse length** and **gains** properly (Figure 7), as these parameters **affect the recorded data** and can not be changed during playback.

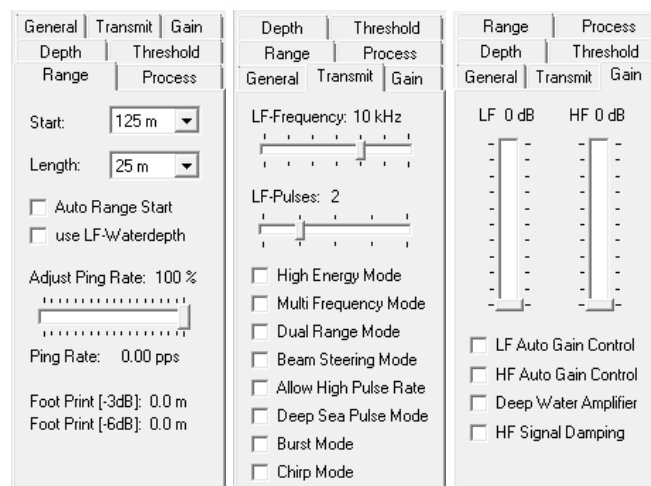


Figure 7: Parameters that directly affect the recorded data and cannot be changed during playback



Range: This defines the starting point and length of data to be recorded and strongly affects the recorded data: **Any data outside of the specified window will not be recorded.**

- **Start** defines the start depth of the displayed and recorded data. This can be changed at any time.
- **Length** sets the (depth) range of the shown and recorded data. This cannot be changed while recording data.
- The **Adjust Ping Rate** slider can be used to reduce the ping rate. This can be useful to shift multiples coming from previous pings or to reduce reverberation in very shallow water.

Transmit: This tab sheet is used to set the **frequency** and **pulse length** of the LF channel.

- The **HF frequency** is fixed to 100kHz. The HF pulse length is same as set in this menu for the LF pulse length.
- The **LF Frequency** (range: 4–15kHz) has to be chosen depending on the survey task.
 - Lower frequencies will achieve greater penetration than higher frequencies, but with reduced resolution.
 - Higher frequencies will achieve better resolution, but with reduced penetration. Usually higher frequencies are used due to better efficiency, better signal to noise ratio and better resolution.
- **LF-Pulses** represent the number of cycles of the LF frequency that are transmitted.
 - The energy of the transmitted signal is increased if the number of pulses is increased. That improves the signal-to noise ratio but decreases the resolution.
 - The number of pulses should be as small as possible, if the detection of small reflectors is of high priority.

NOTE: Frequency and pulse length chosen during data acquisition are final; they affect the recorded data directly!

Gain: This is to manually set or adjust the gains on the LF and HF channels. Gains employed during data acquisition are final. They are set by the hardware and cannot be changed during playback. The Level Display can be used to adjust the amplifier settings. The chosen gain is okay if the red LEDs of the HF- and LF-channel flash only occasionally (Figure 6:). To avoid HF-override in shallow waters, the checkbox “HF Signal Damping” should be chosen. It reduces the receive level of the HF at the input amplifier. Make sure this option is deselected in deeper water areas to ensure an automatic depth tracking.



All other parameters (Figure 8) affect the displayed data and can be changed during playback.

Figure 8: Parameters that mainly affect the data displayed

General: Enter the header information for a survey, i.e. vessel name (**Ship**), survey area (**Travel**) and run-line (**Area**). This information is stored within the data files, displayed on playback and also on the printed record.

Depth: This affects the on-line depth calculation. Usually the default settings can be used:

- LF/HF Detection Sensitivity: 40% / 40%
- LF/HF Bottom Averaging: 5 – 7

Threshold: The threshold settings affect the colours of the echogram; the recorded data will not be affected. Based on the parameters defined by the user, the colour table for displaying the echogram is computed automatically.

Process: All processing carried out from this menu is by software only and **does not affect the recorded data**. Changes will only affect the data display and the printed record.

- **Stacking** is used to improve the signal to noise ratio and to reduce the amount of data to be displayed and printed.
- **Smoothing** calculates a moving average of consecutive pings to improve the signal to noise ratio.
- **Reduce Noise:** If checked a digital filter is used to remove noise. This is a very strong filter and weak layer signals may also be removed, so this filter should be used with care.



2.7 Record Data

System check / preparing survey start:

- Activate the button **System Mode**. The SES-2000 hardware is ready to record echoes.
- Switch on the **Transmitter**.
 - Please note that the transmitter is not switched on/off automatically when recording is switched on/off. The transmitter has to be switched on separately before starting data logging.
- Switch to “split view” to display both data channels.
- Find the seabed and optimize the range settings (**Control parameters/Range**).
- Optimize the gain settings for both channels (**Control parameters/Gain**).
- Optimize frequency and pulse length (**Control parameters/Transmitter**).
- Check and optimize the signal processing settings (**Control parameters/Process**)
- Start data recording (**Record**).
- Adjust range and gain settings according to changes of water depth and signal strength.
- To finish data recording, depress **Record**.

2.8 Replay Data

In general the ISE Post Processing Software should be used for displaying recorded SES data, but it is possible to use the SESWIN software as well.

- Switch to **File Mode**
- Click **Open File**
- Select a SES data file to be displayed.

2.9 Stop SES-2000 medium

- Stop recording and transmitting
- Close SESWIN

3 Synchronisation with Multibeam Echosounder EM710

The SES200 and the EM710 are two independent echosounders with their own signal output. On the RV Heincke it is possible to synchronise the SES2000 and the EM710 over a trigger unit to avoid interferences. To use the synchronisation some changes have to be



performed in the SES200- and the EM710 Software. The trigger system is arranged that the SES2000 can handle as the master triggering unit. In the SES2000 Software go to Options – System Settings – Synchronisation (Figure 9): Switch from Internal Trigger to Alternating Trigger (using the synchronisation, sending the trigger to another device).

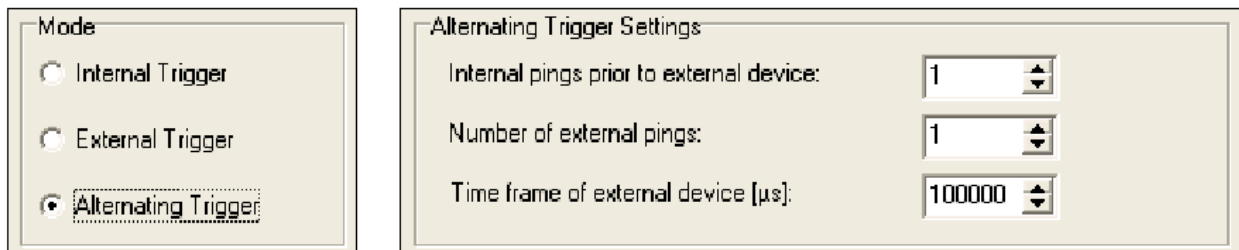


Figure 9 - SES2000 Trigger Settings

The „Internal pings prior to external device“ value describes the amount of pings which the SES2000 shall perform. The Number of external pings is the number of pings of the EM710. The time frame of external devices in microseconds should be adapted to water depth. A formula is given in the software. To activate the external triggering in the EM710 SIS Software you have to click the checkbox “External Trigger” on Installation and Test in the SIS dropdown list – PU Communication Setup – Input Setup (Figure 10). Caution: If this checkbox is checked without running SES2000 and its activated trigger, no pinging with EM710 will be possible!

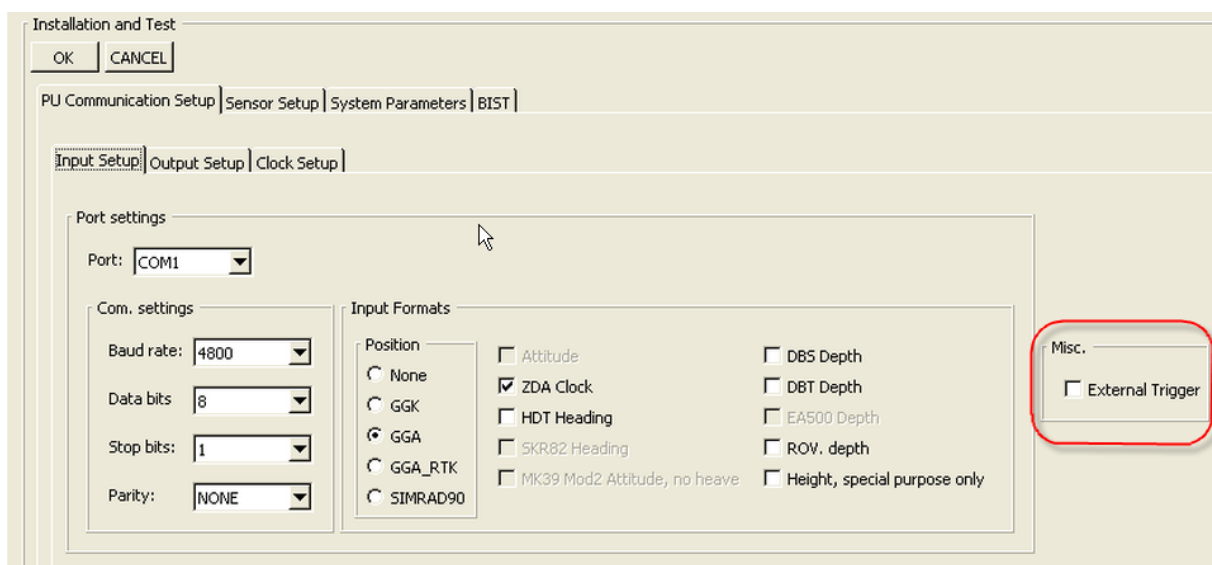


Figure 10 - EM710 Trigger Settings



4 Post Processing Software (ISE)

ISE 2.9.2 Post Processing Software for the Parametric Sediment Echo Sounder SES-96 and SES-2000 is installed on the computer *xpc3* and *xpc4* (**Username:** sbpadmin, **password:** please ask the captain). Data files are stored on the Netstorage Server xdc under the record path (see section 2.2).

The **File Menu** allows you to select files to open, save layer files, save pictures, export data files and print data files. The following menu commands are accessible:

Command	Description
Directory Browser	Starts the Directory Browser which is a dialog for an extended overview of the data files in a directory. You can select files to open them with a time orientated view and have easy access to files of the same date, the same profile or the same area.
Load Echo Data	Starts the dialog for open data files.
Open Layer File	Opens a layer file into the active data window.
Close File	Closes the active window.
Open Layer Definition	Opens a definition file for the layers which are attached to the active data window.
Save Layer File	Saves the actual layer information in the file which was previously loaded into the data window.
Save Layer File As	Saves the actual layer information in a new file where you can give a name to it.
Save Layer Definition	Saves the definition of the layers of the active data window into a file.
Export Graphic	Exports the actual window contents (annotated echo plot) into a graphic file.
Export DAR File	Exports the data of the actual window into a file which contains only the processed data and the position data.
Export Layer Data	Exports the layer information of the active window into ASCII files for easy import into other software packages, e.g. GIS or volume calculation tools.
Export Layer as CODA File	Exports the layer information of the active window into ASCII files in CODA format based on layer segments.
Export Layer as PIPE File	Exports the layer information of the active window into ASCII files in PIPE format based on layer segments.
Export Layer as SVG File	Exports the layer information of the active window into SVG files (Scalable Vector Graphics) based on layer segments.
Export Signal Traces	Exports the data from signal traces within a marked block into ASCII files.
Export Window	Captures the application window into a graphic file.
Print	Prints the data of the active window.
Setup Printer	Configures the printer attached to your PC.
Exit	Closes all open data files and exits from the application.

5 Appendix

5.1 Latest Service Report from HE476 (08.-09.02.2017)

German only!

5.1.1 Übersicht

Die Reise HE476 der FS „Heincke“ wurde unter anderem als Erprobungsfahrt für durch Fa. FIELAX betreute Systeme genutzt. Die durchgeführten Arbeiten und Ergebnisse werden in diesem Bericht zusammengefasst.

Teilnehmer: Usbeck, Rößler, Albrecht, Krockner (AWI), Gerchow (AWI),

Zeitraum: 08.-09.02.2017

Ziel: Nordsee, Region Helgoland

Wetter: Bedeckt, ~0 °C, Windstärke 3-4 Bft, Seegang 1-1,5m

Fahrtprotokoll:

Datum	Zeit (UTC)	Aktion	Comment
08.02.2017	07:00	Auslaufen BHV	
		Transit gen Helgoland mit Profilmfahrten für Värtsilä	
	17:00	Einlaufen Helgoland	
09.02.2017	08:00	Auslaufen Helgoland und Transit zum EM710 Kalibriergebiet	
	08:20	Soundvelocity-Profil	
	09:00	Multibeam Kalibration	Südlich Helgoland, 9 Profile
	11:25	GAPS-Gerätetest	
	13:00	Transit gen Bremerhaven	
	17:30	Ankunft Fischkai	

5.1.2 Umbau des Trimble DGPS

Die Antenne des DGPS-Sensor „Trimble“ wurde während der Werftliegezeit seitens Reederei/Werft von der Steuerbordreling auf eine Position nahe dem Einbauort der Antenne des DGPS-Sensors „SAAB R5“ (ehemals DEBEG) versetzt. Die neue Antennenposition wurde durch Fa. Overath & Sand Surveyors neu eingemessen und ist ab Vermessungsbericht „2017-02-07_Heincke_Revision4.pdf“ dokumentiert (aktuellste Fassung ist „2017-02-13_Heincke_Revision5.pdf“). Die neuen Werte aus dem Bericht sind wie folgt:

	Overath (aQua)			
	X+ (bow)	Y+ (PS)	Z+ (up)	
DGPS Trimble	39,600	-2,129	16,433	neue Position in 2017
DPGS Saab R5	38,938	-2,110	16,356	checked in 2017
PHINS III	25,952	0,847	5,027	

Abbildung 1: Neue Antennenpositionen gemäß Vermessungsbericht (Overath & Sand Rev. 4/5)

Aufgrund dieses Umbaus wurde an folgenden Geräten eine Anpassung der Konfiguration vorgenommen: Motionssensor PHINS III, Fächerlot EM710, Subbottomlot SES2000. Eine Anpassung des Multifrequenzlotes ER80/ER60 ist noch durch den Geräteverantwortlichen durchzuführen.

5.1.3 Subbottom-Echolot Innomar SES2000

Generelle Arbeiten:

- ✓ Testbetrieb während des Transits
- ✓ Datenaufzeichnung mit Seswin
- ✓ Aufräumen des Operator-PC (alte Reisen auf xdc verschoben und lokal gelöscht)
- ✓ Aktualisierung des FIELAX Startup Manuals und Upload in die AWI-Geräteakte

Konfiguration der neuen Trimble-Position

Die neue Position der Trimble-Antenne wurde in das SES2000 konfiguriert. Die hier eingetragene Position ist relativ zur Position des Sekundärhebels A des PHINS III gerechnet. Die Achsen X und Y sind im Gegensatz zum von Overath verwendeten Koordinatensystem vertauscht, und die X-Achse zeigt positiv nach steuerbord statt nach Backbord.

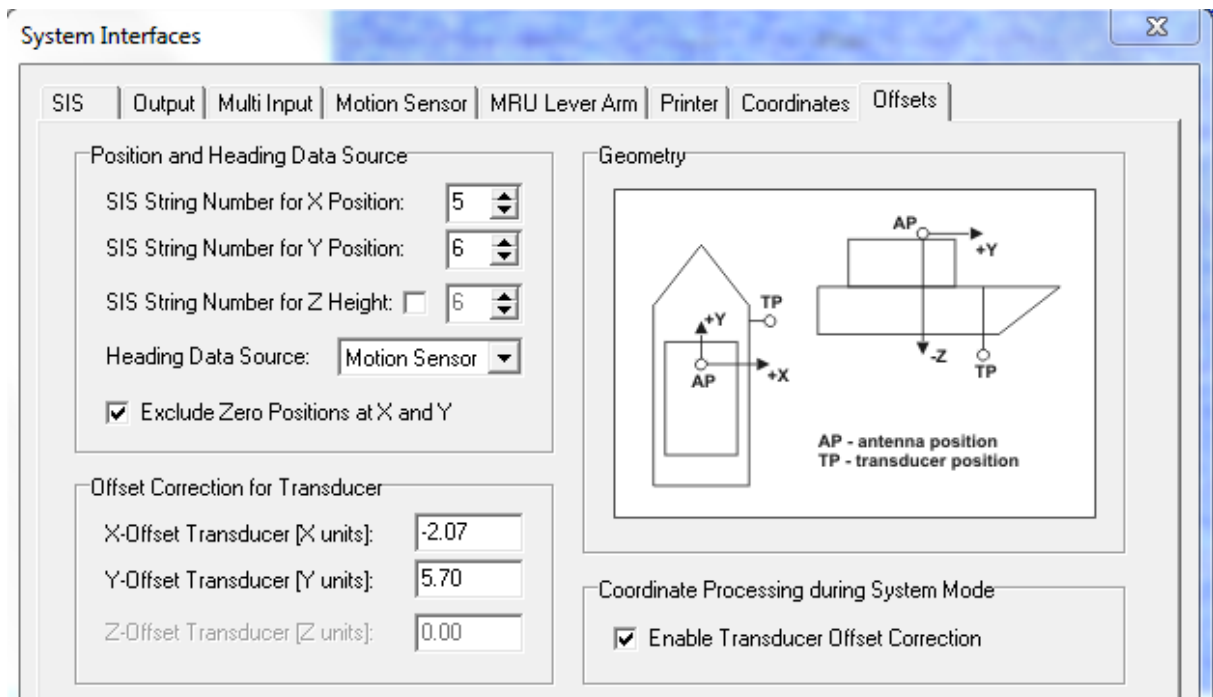


Abbildung 2: Neue Offsets zwischen versetzter Trimble-GPS-Antenne und Transducer-Position in der SES2000-Operator-Software Seswin