

TD 262a OPERATING MANUAL

SEAGUARD® Platform



1st Edition 26 October 2006
2nd Edition 05 March 2007
3^{de} Edition 30 September 2007
4th Edition 05 November 2007
5th Edition 23 January 2008
6th Edition 15 September 2008
7th Edition 21 November 2008

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INTRODUCTION

Purpose and scope

This Operating Manual describes the SEAGUARD® Instrument: configuration of the SEAGUARD® Instrument with sensors, Operating Instructions and Maintenance. Further it gives you an introduction to SEAGUARD Studio - how to import and visualise your measured data.

SEAGUARD® is the latest of our oceanographic instruments. It can be used both in the sea and in fresh water. 3 versions are available: SEAGUARD® Light Weight with depth rating of 300m, SEAGUARD® Intermediate Water with a depth rating of 2000m, and finally the 6000m depth version.

The SEAGUARD® instrument consists of a platform with sensors attached to it. AADI sensors are all smart sensors, which are

automatically detected and recognised by the platform when the instrument powers up. Up to 4 analog sensors can be used with the instrument. The SEAGUARD® Platform is adding a correct configuration dialog for the attached sensors.

The most common ways of deploying the instrument is in an ordinary string mooring, in a bottom frame, or mounted underneath a buoy.

SEAGUARD® is a self-recording instrument; data is stored on a Secure Digital card, SD card, for later post-processing and analysis.

Data can be output Real-Time in a non-pollled mode.

Applicable Documents

D366	SEAGUARD® Platform Data Sheet
B150	SEAGUARD® Concept Brochure
Form 135	Instrument Service Order
TN262b	SEAGUARD® RCM Operating Manual
TD 208	Operating Manual for Data Reading Program 5059
TD 267	AADI Real-Time Output Protocol
TD 268	AADI Real-Time Data Collector

Abbreviations

ADC	Analog to Digital Converter
AiCaP	Automated idle lined CANbus based Protocol
ASCII	American Standard Code for Information Interchange
CAN	Controller Area Network - sometimes referred to as CANbus
DSP	Digital Signal Processor
EPROM	Erasable Programmable Read Only Memory

GMT	Greenwich Mean Time
GPRS	General Packet Radio Service
HUB	Connection Point for Network Devices
LCD	Liquid Crystal Display
RAM	Random Access Memory
ROM	Read-Only Memory
RTC	Real Time Clock
SD card	Secure Digital (Memory) card
SR10	This signal corresponds to the digital signal obtained when the contents of a 10-bit shift register are clocked out in serial format. This signal is used when the parameter to be measured is digital, e.g. a frequency or a number of pulses.
UART	Universal Asynchronous Transmitter and Receiver
UNESCO	The United Nations Educational, Scientific and Cultural Organization
USB	Universal Serial Bus

Front view of the SEAGUARD®

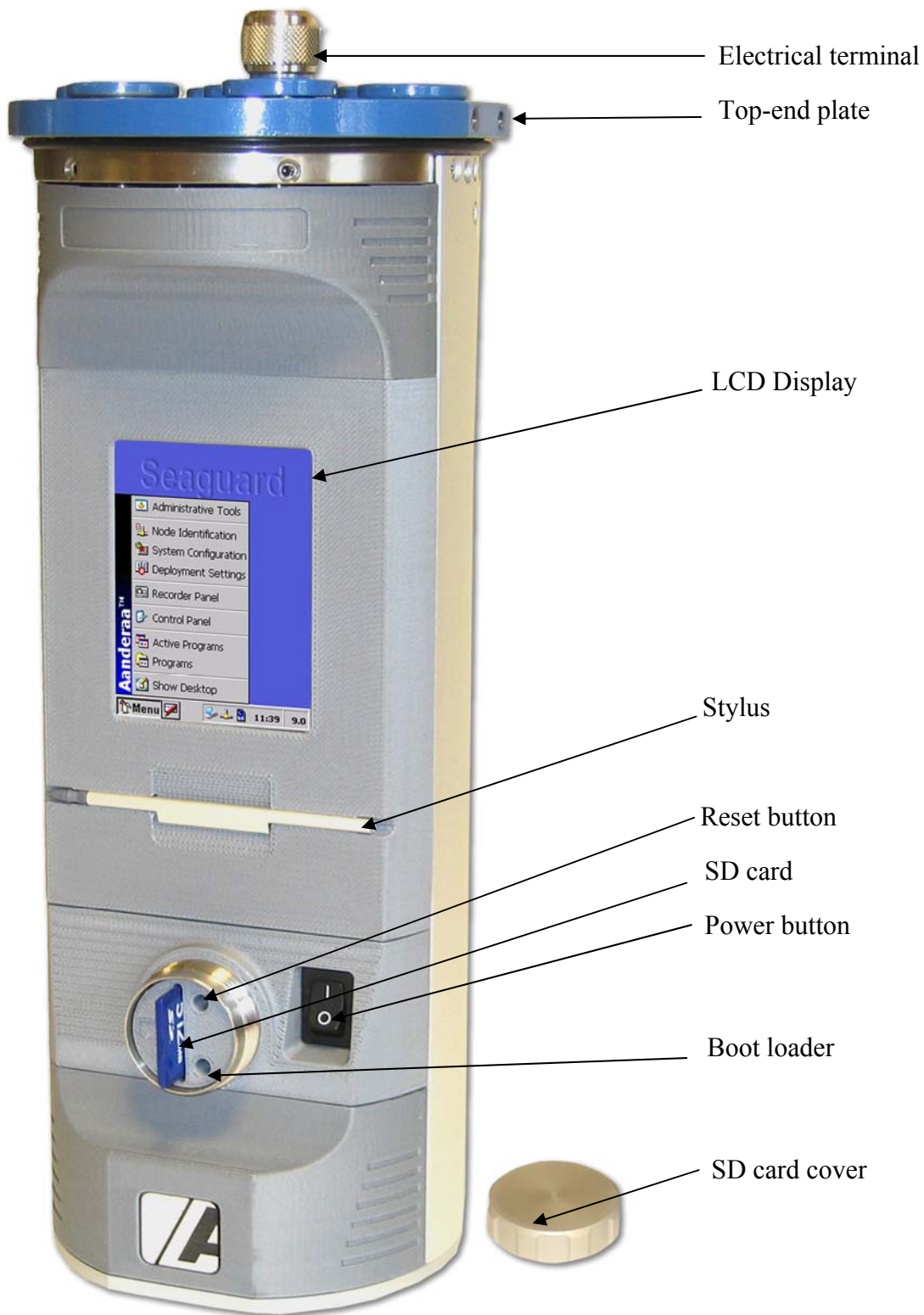


Figure 0 - 1 Front view of the SEAGUARD® Instrument

Side/Rear view of the SEAGUARD®

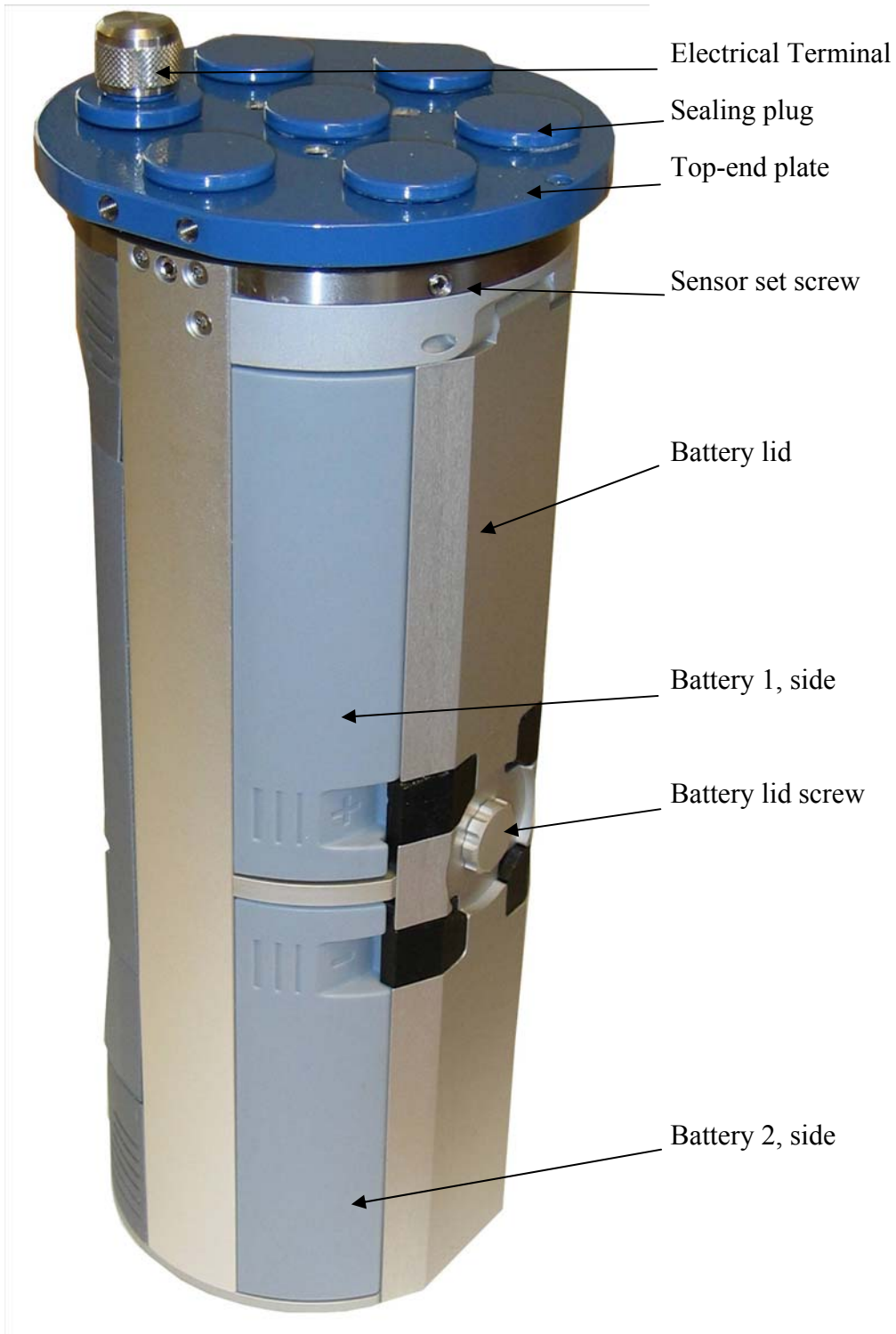


Figure 0 - 1 Side/Rear view of the SEAGUARD® Instrument

CHAPTER 1 Description

The SEAGUARD® Instrument

The AADI SEAGUARD® is a module based concept. It consists of a platform with datalogger and communication protocol. Sensors can be attached to the Top-end plate. The platform is highly flexible.

The SEAGUARD® Platform is configured from the factory to optimize the recording situation in which the instrument is to be used: either as a SEAGUARD® RCM or a SEAGUARD® CTD.

The SEAGUARD® design and technology is new and modern. Among the advantages of the SEAGUARD® product family are their ease of handling and deployment, and that they have no moving parts. The instruments are highly robust and produce high quality data. The instruments are equipped with a watertight receptacle that enables external triggering and testing of a fully assembled instrument. Connect standard cable 4299 between the SEAGUARD® receptacle and your PC to access the installed SD card (on shore only). The SEAGUARD® Platform used together with AADI AiCaP sensors shows low system noise.

The SEAGUARD® is a self recording instrument with storage on a small SD card.

Measurement data can be sent Real-Time in non-pollled mode.

A CANbus based protocol, AiCaP, has been chosen as a two way communication bus between the datalogger module and the nodes. AiCaP ensures low power drain, short sampling intervals, and fast response time.



Figure 1-1 An example of the SEAGUARD® Platform with a selection of sensors mounted to the Top-end plate

6 sensors can be fitted to the SEAGUARD® Platform Top-end plate. AADI sensors to go with the SEAGUARD® are all smart sensors; based on the smart sensor technology with high accuracy and low response time. 4 of the sensors can be analog sensors (0-5V).

Smart sensors are connected to a hub underneath the Top-end plate: just plug the sensor onto the Top-end plate, fasten a set screw, start the instrument, and the sensor is automatically detected and recognized.



Figure 1-2 An example of the SEAGUARD® Platform configured as a CTD instrument.

Sensors can be connected to the Top-end plate via a cable. Maximum cable length for AiCaP sensors is 6m and the maximum cable length is 5m for analog sensors.

Adaptive software is automatically adding a correct configuration dialog for the new sensor. The SEAGUARD® Platform responsibilities are to collect data from the sensors/nodes.

In the core of the SEAGUARD® is a new data logger based on the Intel PXA 255 embedded ARM processor and the real time operating system Windows CE 5.0. This system topology is not compatible with AADI positive ground based SR10, VR22 and PDC4 format.

A modern Windows based post processing system for PC, SEAGUARD Studio, comes with the SEAGUARD®. SEAGUARD Studio holds the deployment configuration and measurement data lists. SEAGUARD Studio also arranges for export of data and visualisation of the measurements in customised graphs.

Real-Time Output (Licensed Feature)

The SEAGUARD® Instrument can output Real-Time data in XML-format over an RS422 transmission line. The Real-Time Output Protocol is described in TD 267 and can be used as a guide to a skilled engineer into creating an application that utilizes the data from the SEAGUARD® Instrument.

Accompanying the Real-Time Output, AADI can supply a Real-Time Collector program for the receiver station for further distribution of data. Refer TD 268 for more information about the Real-Time Collector.

Install the license key in *Administrative Tools*.

The *communication settings* for RS422 are found in *System Configuration*.

The Real-Time Output of data is *enabled* in the *Deployment Settings*.

The *Recorder Panel* provides information about the Real-Time output status (enabled/disabled).

Instrument and Sensors

You will find that some menus separate the settings/configurations into two categories: *Instrument* and *Sensors*.

The items in the Instrument category can be *Platform*, *Recording*, *Storage Manager*, and *Communication Server*.

The items in the Sensor category are *Analog Sensors* and connected *external sensors*.

Symbols

Main symbols used in the SEAGUARD® display and setup menus.



Platform



Recorder



Storage Manager



Real-Time/Communication Server



System Parameters



Analog Sensors



Sensor

Figure 1-3 Symbols used in SEAGUARD® Display and the menus.

Internal Sensors

The SEAGUARD® contains two internal sensors, *System Parameters* and *Analog Sensors*. The internal sensors are always present in the system.

System Parameters

The System Parameters measures parameters which can be used for system monitoring and diagnostics. The *System Parameters* is not configurable.

System Parameters has the following parameters:

- *Battery Voltage*: Monitors the battery voltage during recording.
- *Memory Used*: Monitors the use of available system memory during recording.
- *Interval*: Monitors the time to next measurement.

Analog Sensors (Licensed Feature)

The *Analog Sensors* consists of four input channels, each of which can measure 0 to 5V, and are supported with a common 10V power supply output. This enables the user to connect external sensors with analog outputs.

User settings for the analog sensor node are power related: select either continuous power to the analog sensors or set a stabilisation time, which tells the instrument to power the analog sensors before each recording (drains less power).

When installing analog sensors to your SEAGUARD® Instrument, you must perform some sensor configurations like sensor/parameter name, engineering units, power drain, calibration coefficients, etc. These sensor settings do not have to be changed between deployments.

Install the license key in *Administrative Tools, Option Module*, refer CHAPTER 4.

The configuration of the analog sensor is found in *Administrative Tools, User Maintenance*, refer CHAPTER 4.

In the *System Configuration* you must remember to enable/disable measurement parameters from the attached analog sensor.

CHAPTER 2 The SEAGUARD® Platform

Start the instrument by pressing the power button in the front of the instrument. Wait for a few seconds before the LCD display at the front of the instrument is activated.

We recommend that you power the instrument from an AC/DC source when working with the instrument in the office to avoid unnecessary battery drain. Connect the AC/DC power cable 4499 to the electrical terminal on the Top-end plate, refer Figure 2-1 .

Important! Ensure that the protective cap is fitted and tightened to the electrical terminal before deployment.

Connection between the SEAGUARD® Instrument and a local PC

For connection between the PC and the SEAGUARD®, use cable 4573; install a RS422 to RS232 Converter between the standard cable and the PC if your PC does not come with a RS422 Serial Port. The 10-pin plug is to be connected to the SEAGUARD® Electrical Terminal, refer Figure 2-1. Standard cable 4299 also has plugs for connection to the PC USB port and for connection to the AC/DC Adapter 3786.

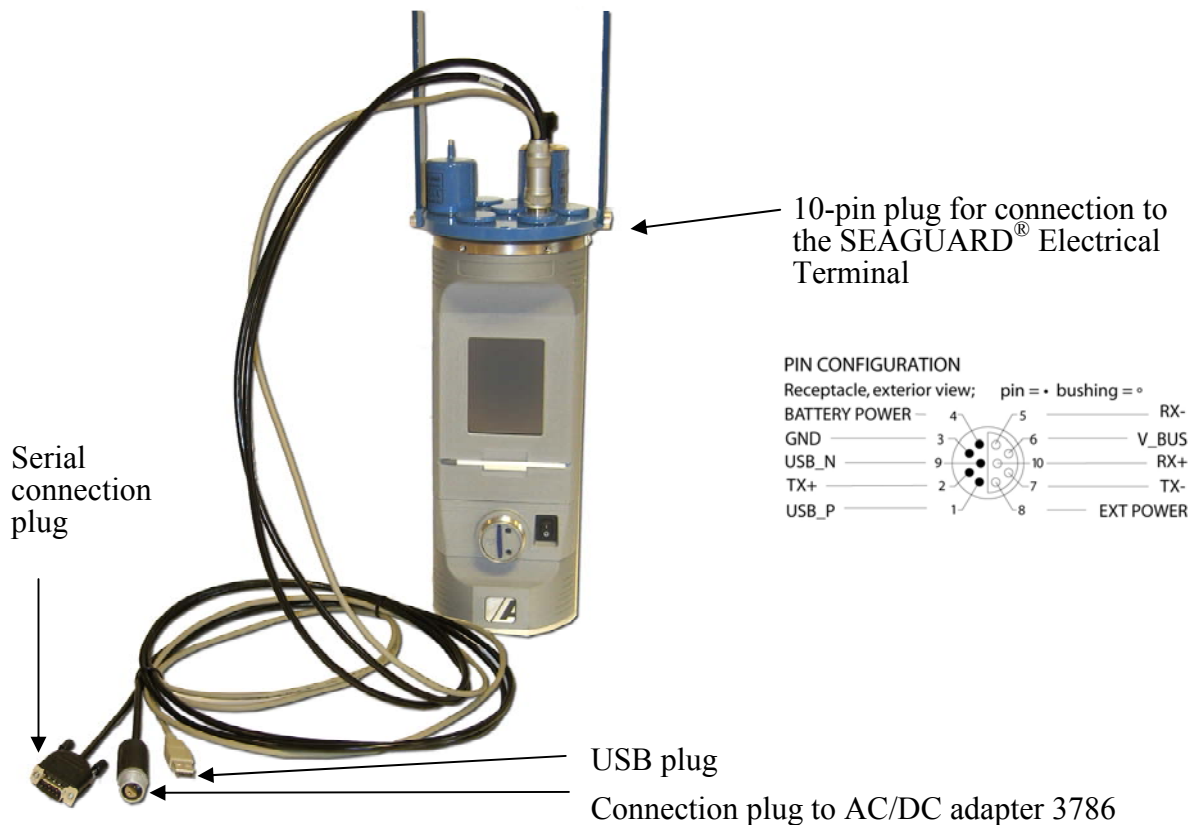


Figure 2-1 cable 4573

When connected to your local PC you are able to make backup of your data by transferring files from the SD card to the PC.

For connection between the Instrument and your local PC: Download and install Microsoft ActiveSync version 4.1 or later; connect the standard connection cable to the instrument's electrical terminal and the USB end of the cable to the PC. At instrument start up, ActiveSync will respond with a short sound from the PC, and an Icon appears on the Instrument, refer Figure 3-1.

CHAPTER 3 Preparing the Instrument for a Deployment

Your SEAGUARD® Platform has been configured from the factory to optimize the recording situation in which the instrument is to be used, refer CHAPTER 1.

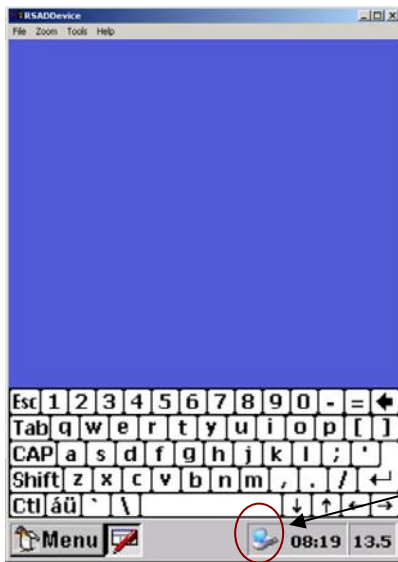
Before each deployment, you must consider configuration properties that determine how the sensors and the Data logger collect data. Examples of configuration properties are recording interval, calibration coefficients, enabling/disabling of measurement parameters, real-time output etc. During configuration of the Data logger, the Configuration Properties are modified by the user.

This chapter guides you through the SEAGUARD® Menu for preparing the instrument for deployment.


Important! We recommend that you select the Recorder options Allow sleep between recordings and Turn display off if sleep is unavailable, refer CHAPTER 4, Figure 4-5. Refer each sensor manual for power consumption issues.

Note! Some sensors are rated down to 300m and 2000m. Make sure your sensors are rated for the operating depth that you require.

Keyboard



Use the keyboard function to type your configuration on the LCD display, refer Figure 3-1.

 Tap the *keyboard* icon in the bottom left corner to activate the keyboard.

Next, tap the letters one by one to type appropriate names.

Hide the Keyboard function by tapping the *Keyboard* icon once more.

Icon for Active Sync

Figure 3-1 Illustration of Keyboard

SEAGUARD® Start Menu

The SEAGUARD® Start Menu holds the key entries for the configuration and use of the instrument.

Tapping the *Menu* button in the lower left corner of the LCD display activates the menu.

The four primary menu items for configuration and use of the instrument are:

- ❑ *Sensor Identification*: Create descriptive names for each node e.g. a sensor.
- ❑ *System Configuration*: Enable/disable individual node parameters.
- ❑ *Deployment Settings*: Enable and disable nodes/recorder settings.
- ❑ *Recorder Panel*: Start or Arm the instrument.



Figure 3-2 SEAGUARD® Start Menu

Administrative Tools holds special applications that are used for instrument diagnostics, testing and hardware setup.

The *Control Panel*: Here you can view the status on the SD card and battery, delete the content of the SD card, and adjust date and time.

Active Programs displays a list of currently active programs.

The *Programs* panel displays a list of all programs available on the system. This is mainly Windows CE programs. We recommend the user not to run any of these programs.

Important! We recommend that you do not run programs that are not described in the manual.

Always scan through all the options in each page to make sure your configuration is correct.

Always store your correct settings; a progress bar is visible on the LCD screen. When the settings have been stored, the software takes you back one level.

Tapping the 'X' in the upper right corner of each window takes you back one level without storing the changes.

If power is lost during settings or during storage of the settings, the configuration must be repeated and stored.

Sensor Identification

Each node/sensor has got its unique description; consisting of a product name, serial number and a product number, refer Figure 3-3, *Details* in the lower part of the window.

Sensor Identification gives you the possibility to rename the sensor, without changing the original description. You are then able to edit a customised name, which makes it easy for you to recognise it later. The customised sensor name will then be the sensor identity in the configuration until the sensor name is changed.

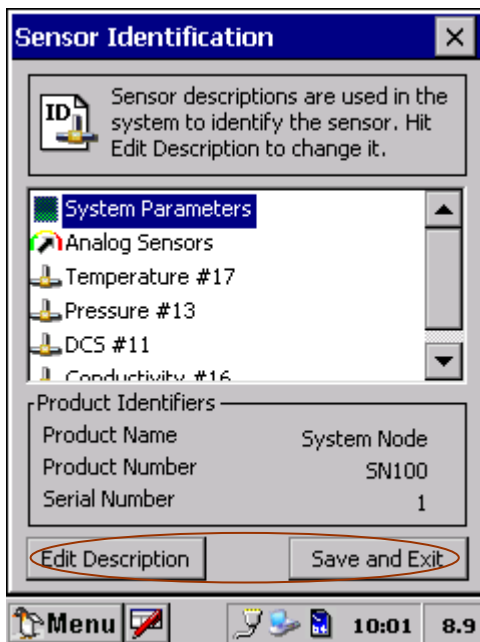


Figure 3-3 Sensor Identification

Tap the *Sensor Identification* in the SEAGUARD® Start Menu, refer Figure 3-2. The display will show a list of sensors, refer Figure 3-3. *System Parameters* and *Analog Sensors* are internal sensors. The other sensors listed are external sensors connected to the SEAGUARD® Instrument.

Select the sensor you want to rename, e.g. Pressure #13, refer Figure 3-3.

Tap the *Edit Description* button to rename the desired node. Click *Save and Exit* to store the new name. If you want to rename more than one node, you are able to edit all of them and click *Save and Exit* after the last editing.

System Configuration

In the system configuration you can enable or disable measurement parameters from each sensor.



Figure 3-4 System Configuration Menu

Open the *System Configuration* from the SEAGUARD® Start Menu. System Configuration is divided in two categories: Instrument and Sensors. Refer Figure 3-4 and Figure 3-6.

Tap *Run Wizard* to perform system configuration on all nodes in the category, or select a specific item from the list in the lower part of the window. Tap *Configure* to enable/disable the specific node properties.

The *Instrument* configuration holds settings for Real-Time communication with the Instrument, refer Figure 3-5.

The *Sensors* configuration holds sensor settings. Each sensor has its own set of properties.

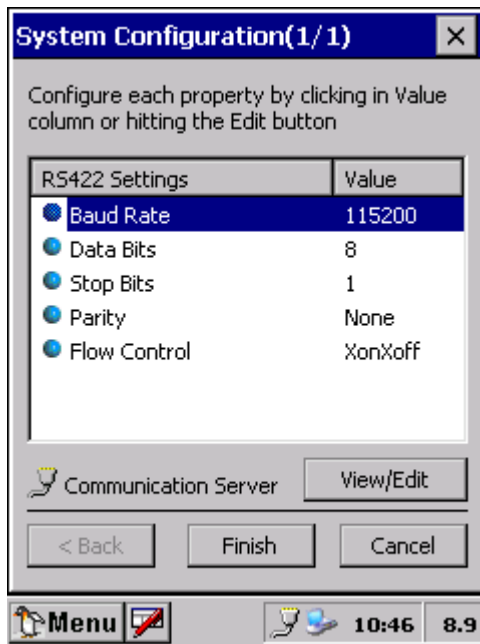


Figure 3-5 Communication Setup RS422

The *Communication Server* settings for Real-Time communication with the instrument are Baud Rate, Data Bits, Stop Bits, Parity and Flow Control, refer Figure 3-5.

Baud Rate: Select a baud rate in the range 2400 to 115200 (the baud rate must equal the receiver baud rate e.g. the AADI Real-Time Collector).

Data Bits: Set the number of Data Bits to 7 or 8. Set the value to 8 when the receiver is the AADI Real-Time Collector.

Stop Bit: Select between 1, 1.5 and 2 stop bits. Set the value to 1 when the receiver is the AADI Real-Time Collector.

Parity: Select between None, Even and Odd parity. Set the value to *None* when the receiver is the AADI Real-Time Collector.

Flow Control: Select between None and XonXoff. Set the value to Xon/Xoff when the receiver is the AADI Real-Time Collector.



Figure 3-6 Sensor Configuration

Note! Each sensor has got a default parameter (in engineering units) which can not be disabled (e.g. raw data measurements necessary to calculate the engineering units). Parameters that are not default can be enabled/disabled.

The property of a sensor is e.g. to enable/disable Raw data.

The property value *Yes* means enabled, while *No* means disabled.

The property of the *Analog Sensors* is to enable/disable measurements parameters from each of the four input channels, refer Figure 3-7.

Note! Refer CHAPTER 4 for configuration of the Analog sensor properties.

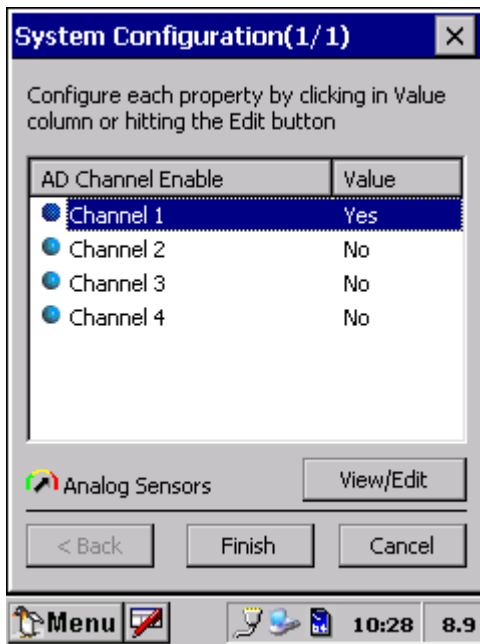


Figure 3-7 Example: System Configuration of the Analog Sensors.

To enable/disable an analog channel, you must select the appropriate Channel, press View/Edit in the right, lower part of the window, and change the setting, refer Figure 3-7. Alternatively, click in the property value field, and change the value.

Press *Finish* to store the settings, or *Cancel* to undo changes.

Note! If you enable measurement parameters from an Analog Channel that is not actually in use (Analog switch Off, refer Figure 7-9) then the channel will be visible in SEAGUARD Studio. The measurement parameter from this channel will be an approximately constant value.

We recommend that you disable Analog Sensors channels that are not in use.

Note! Refer CHAPTER 4 for setting descriptive channel names and other analog sensor properties.

Note! If Analog sensors are attached to your SEAGUARD® Instrument, perform the analog sensors configuration before continuing with the Deployment Settings (described on page 20).

Deployment Settings

In the deployment settings you can set site details like location, owner etc (Platform), recorder options like time between records and enabling/disabling nodes (Recorder). You can also set storage (Storage Manager) and Real-Time options (Communication Server), refer Figure 3-8.

Open *Deployment Settings* in the SEAGUARD® Start Menu. The deployment settings are divided in two categories: Instrument and Sensors.

The *Sensors* list is empty, since you can not perform deployment settings on individual sensors when used with the SEAGUARD® Instrument.



Figure 3-8 Deployment Settings

The *Instrument* list holds settings for the Platform, the Recorder, the Storage Manager and the Communication Server.

You can either be guided through the Deployment setup via *Run Wizard*, or you can choose to configure each specific item.

For configuring one specific item, without going through the wizard, select the item from the list in the lower part of the window, refer Figure 3-8, and tap *Configure*. Follow the guide below!

Note! We recommend using the wizard to configure your instrument.

Refer Figure 3-9 to Figure 3-17 for details regarding deployment settings for the Platform, the Recorder, the Storage Manager and the Communication Server.

Site Information (Platform)

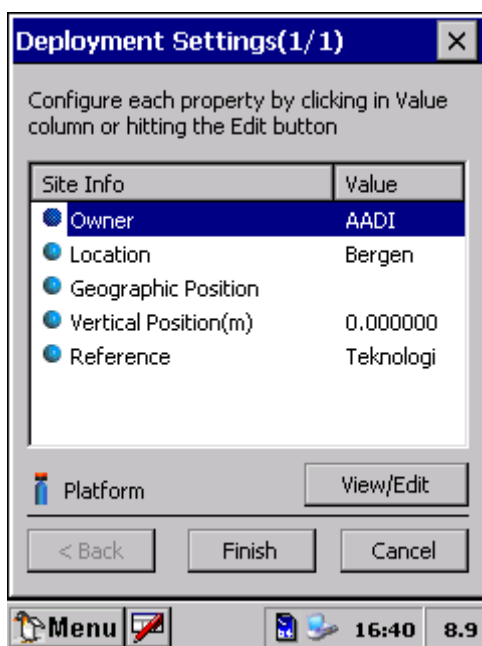


Figure 3-9 Deployment Site Details

The *Platform* settings hold information about the deployment site, refer Figure 3-9 .

Select the property, and press View/Edit to set the description. Tap *OK* to return to Figure 3-9.

Note! There are no constrains on how to type the position, but the instrument keyboard does not have a typical degree symbol. The NMEA Global Positioning System GGA uses the notation:

xxmm.dddd,<N|S>,yyymm.dddd,<E|W>, where

xx is latitude degrees

yyy is longitude degrees

mm is minutes

dddd is decimal part of minute

Press *Finish* to store the settings when complete.

Time between records (Recorder)

In the *Recorder* menu, you can set the Timing method; choose between *Fixed Interval* or *Advanced sequence*.

Fixed Time Interval (Recorder)

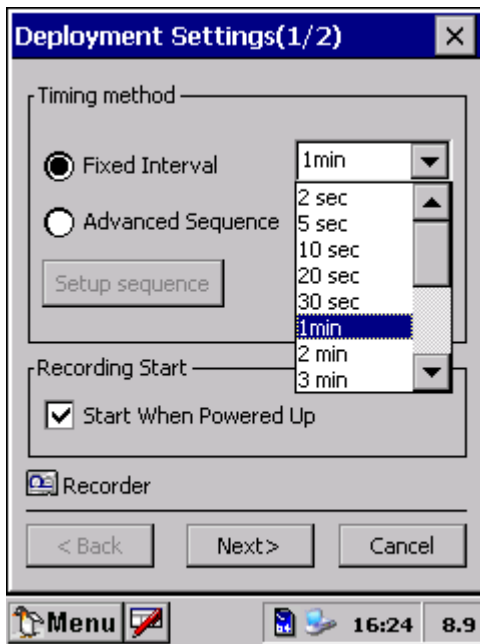


Figure 3-10 Timing method

Fixed Interval: choose a recording interval from the list given in the timing settings.

Tap *Next* to store the configuration and continue with Node settings (enable/disable nodes).

If the recording interval is configured shorter than the longest processing time of the enabled nodes, a warning sign (an exclamation mark) will appear in the Enabled Node list, refer Figure 3-11.

You can select a longer interval, or click *Next* to disable the limiting nodes, refer Figure 3-11.

If you like to start recording when the instrument is powered, select the *Select Start When Powered Up*.

IMPORTANT! Always use the Start When Powered Up if the instrument is powered from ashore via cable.

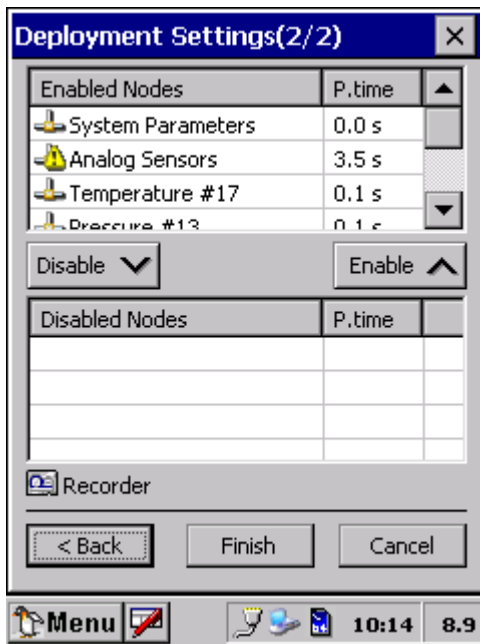


Figure 3-11 Enable/disable Nodes.

Note that it may be possible to change the sensors configuration (e.g. adjusting the ping setting in the ZPulse™), so that the node can operate at a shorter processing time.

The node processing time is given in the right column, named P.time. The processing time is the time that the node needs to provide the data.

For Analog Sensors node, the processing time is the user configured stabilization time plus 0.5s (refer

Configure Analog sensor Properties on page 35).

Advanced Recording Sequence (Recorder)

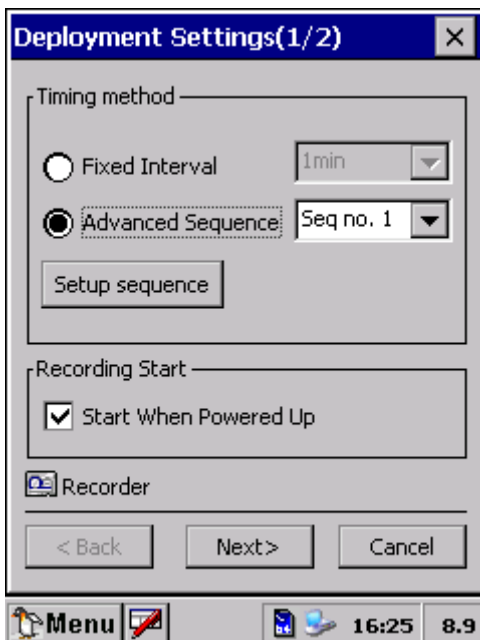


Figure 3-12 Recorder; Advanced sequence.

To use an advanced sequence, tap *Advanced sequence*, refer Figure 3-12.

To choose a predefined sequence select from the drop-down list.

Click *Next* to continue, or configure/view sequences by pressing *Setup sequence*.

If the selected timing sequence contains shorter interval than the actual node combination can operate, a warning sign will appear. You can select a longer interval, or click *Next* and disable the limiting nodes, refer Figure 3-11.

If you like to start recording when the instrument is powered, select the *Select Start When Powered Up*.

IMPORTANT! Always use the *Start When Powered Up* if the instrument is powered from ashore via cable.

Advanced Recording Sequence – for set up of timing sequences (Recorder)

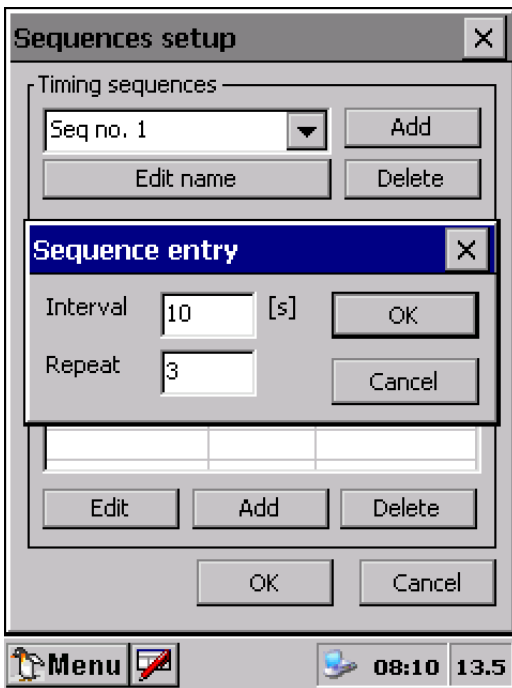


Figure 3-13 Timing sequence.

You can either edit an already existing sequence or create a new sequence.

If you want to add a new sequence, type *Add* in the upper right corner of the window.

If you want to edit an existing sequence, mark the sequence entry you want to edit and tap *Edit* in the lower left corner of the window.

Use the keyboard function to write the preferred values in the *Interval* and *Repeat* cells, refer Figure 3-13.

Tap *Add* in the lower part of the window to add a sequence entry.

Tap *Delete* in the lower part of the window to delete selected sequence entry.

Press *OK* to store, or *Cancel* to undo settings.

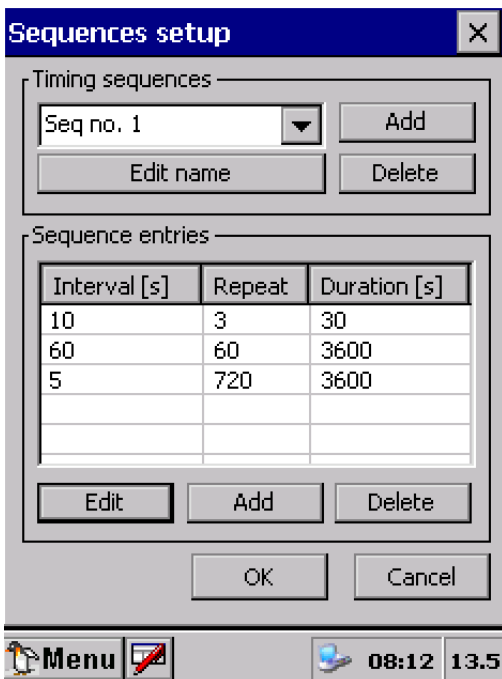


Figure 3-14 Sequences duration

The sequence entry duration is calculated for each set of interval/repetitions, refer Figure 3-14.

When the sequence setup is completed, press *Ok* to go back to Figure 3-10. Press *Next* to continue with the recorder settings, which is to enable/disable nodes.

Enable/Disable Nodes for a Deployment (Recorder)

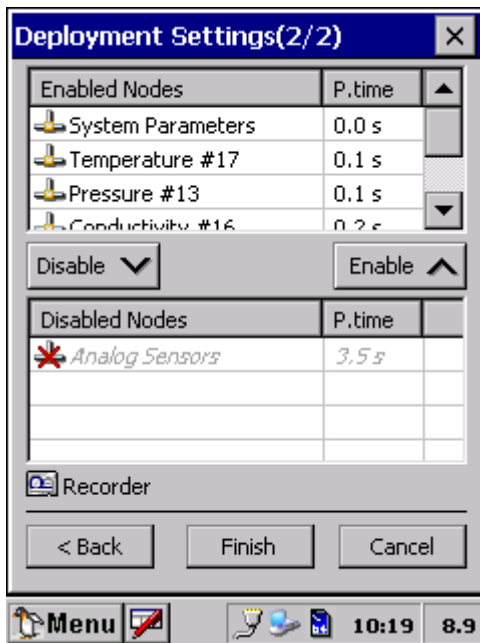


Figure 3-15 Recorder – Enabled/disabled nodes

Disable nodes that are not needed in the deployment. Select the node and tap the downward pointing arrow to disable it.

The disabled node will now appear in the lower part of the window, coloured grey, marked with a red cross over the icon.

To enable a disabled node, select the node from the *Disabled Node* list and click on the upward pointing arrow.

Tap *Finish* to store your configuration.

Storage Manager

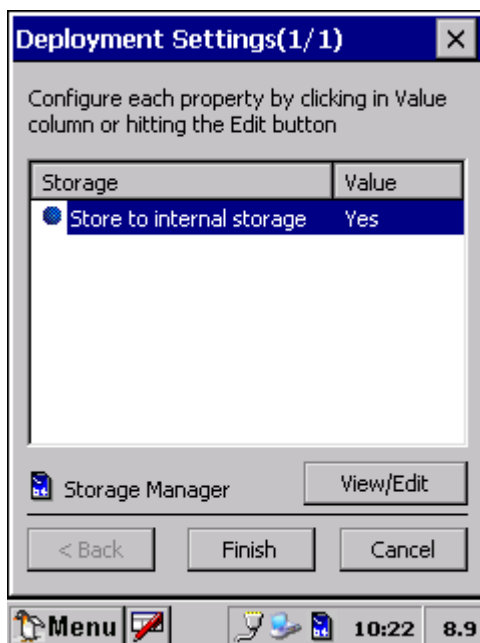


Figure 3-16 Internal Storage menu.

Select *Deployment Settings* on the Start Menu and select *Storage Manager*.

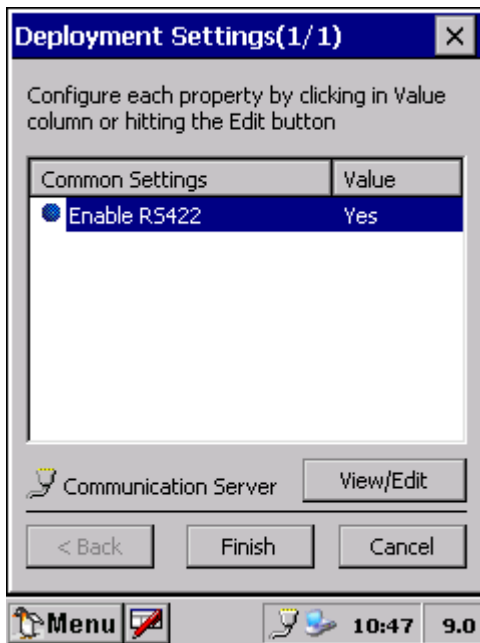
In the *Storage Manager* you can set the store to internal storage property to *Yes* or *No*; tap the value field to the right of the node name, or select the node and tap edit in the lower part of the window.

Yes: Measurement parameters are stored on the internal storage card, SD card.

No: Measurement data are not stored and will be lost.

Tap *Finish* to store your configuration.

Real-Time Output (Communication Server)



The *Communication Server* setting is to enable/disable the RS422 Real-Time output.

Select the property. Tap *View/Edit* and set *Yes* to enable or *No* to disable RS422 Real-Time output for the deployment.

Tap *Finish* to store the settings.

Figure 3-17 Real-Time Communication.

Recorder Panel

The Recorder is responsible for collection of data from the sensors and delivering it to the Storage Manager. The Recorder is operated by the Recorder Panel and configured by the Recorder Deployment Settings / User Configuration.

The Storage Manager will receive data from the Recorder and store it on the SD Card. The operation of the Storage Manager can be configured in the Storage Manager Deployment Settings.

When opening the Recorder Panel you will get information about:

- The recording status
- Which nodes are enabled/disabled and the number of measurement parameters that has been enabled for each node
- Recording interval and storage information

Refer the next subchapter for further description.

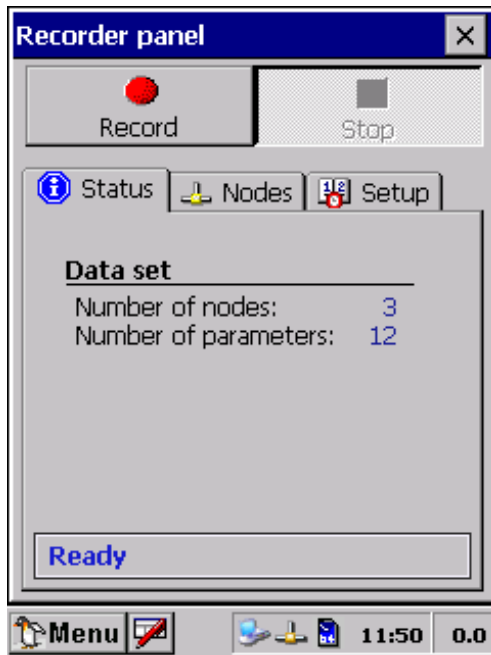


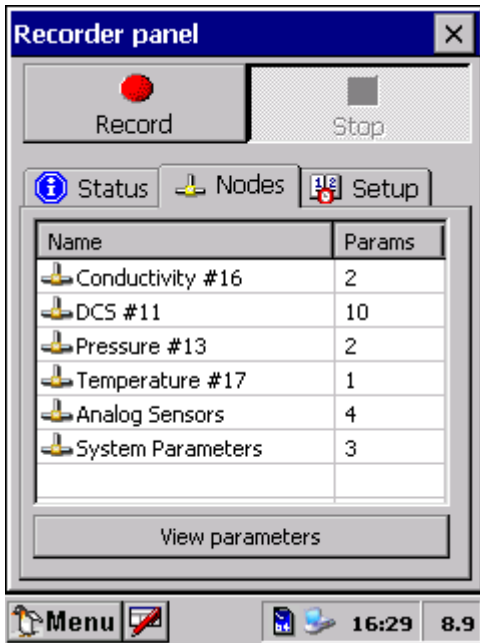
Figure 3-18 Status information before start of recording.

Before the instrument has been armed or started, the status information says *Ready*, and reports number of nodes and parameters that are enabled, refer Figure 3-18.



Figure 3-19 Status information during recording.

During a recording session, the status says *Running*, and reports number of nodes and parameters that are enabled, how many records that have been performed, and the time schedule for the next recording, refer Figure 3-19.



The *Nodes* window holds information about enabled/disabled nodes and the number of measurement parameters.

Tap *View Parameters* to view details about the parameters, refer Figure 3-20.

Figure 3-20 The Nodes window.

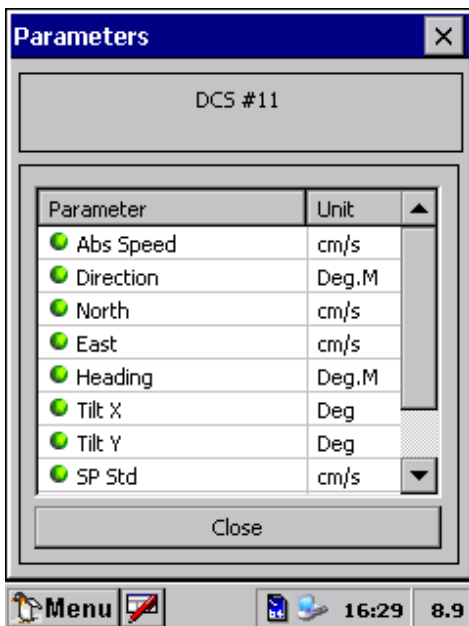
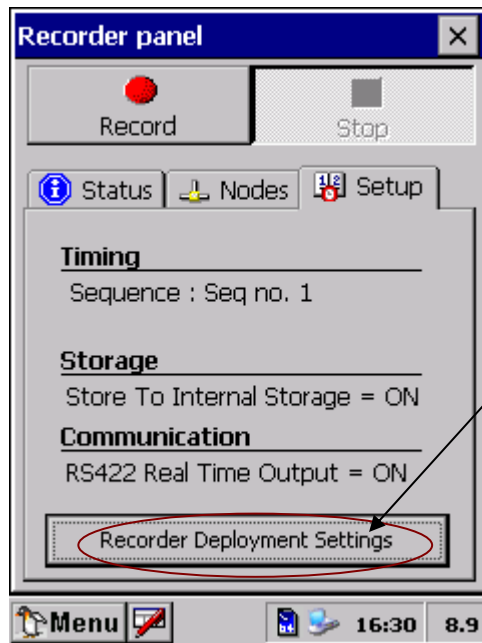


Figure 3-21 View Parameters. Green bullet in front of parameter name means active.



The *Setup* window holds information about the timing interval/sequence, storage information, and Real-Time output.

Important! If the selected timing interval is too short for the enabled nodes to provide the measurements, you will get a warning.

Press Recorder Deployment Settings (in the lower part of the window) to adjust the timing or to disable the node(s) that prevents the selected recording interval, refer Figure 3-10 and Figure 3-11.

Figure 3-22 The Setup window

If there are mismatch between the set timing interval and the node processing time, the instrument will automatically increase the timing interval to match the enabled nodes capabilities.

Sensor Sampling

ZPulse™ DCS operates in two modes: spread mode and burst mode. In spread mode the user configured number of pings is evenly spread out in the recording interval. While in burst mode, the pings are sent out during the last part of the recording interval (the time depends on the selected number of pings), for illustration refer Figure 3-23 a).

Other AADI AiCaP sensor readings are collected during the last second of the recording interval. The sensor processing time, δt , is found in the sensors manuals and in the recorder menu on the SEAGUARD® Instrument, for illustration refer Figure 3-23 b).

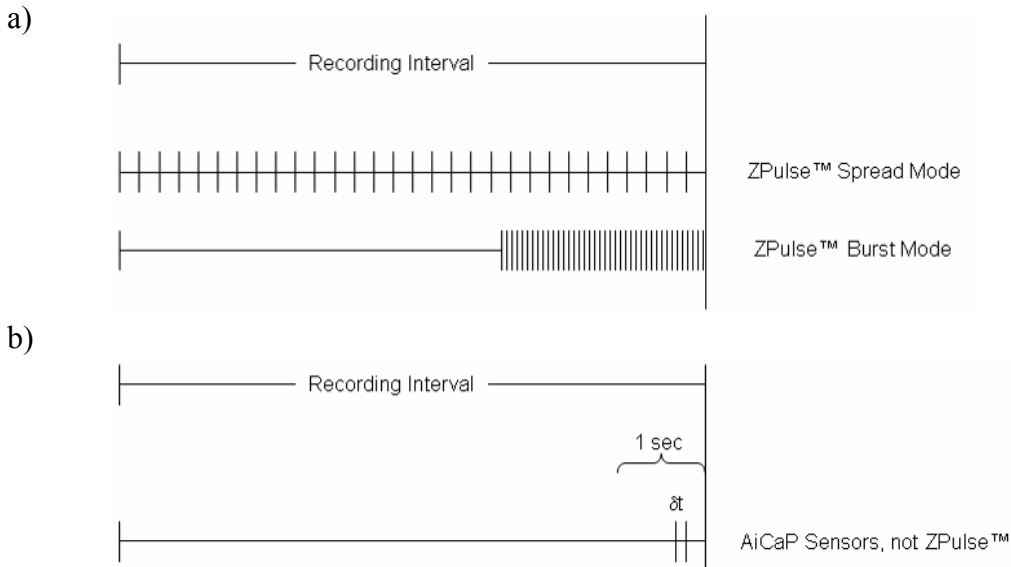
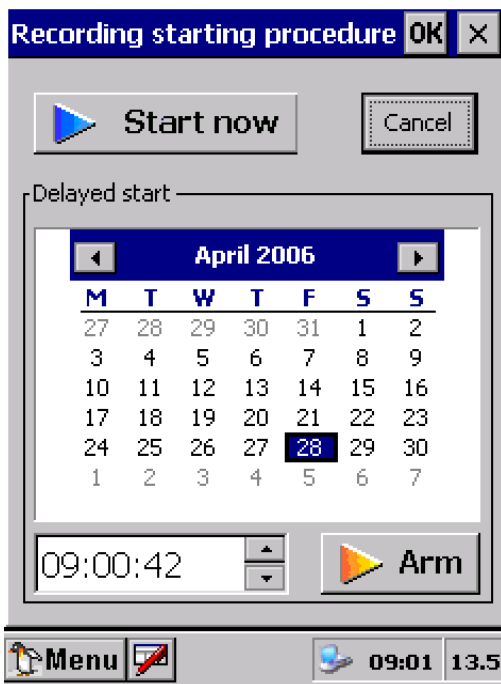



Figure 3-23 a) Sampling Interval for ZPulse™ in Spread and Burst Mode operation. b) The sampling instant for other AiCaP sensors (not ZPulse™). Δt is the processing time.

Start Recording

The SEAGUARD® Instrument is started from the *Recorder Panel*. Press *Record* in the upper left part of the *Recorder panel*, refer Figure 3-22.



Either *Arm* the instrument for a delayed start (select date and time), or select *Start now* to start the instrument immediately. A recording icon  appears in the lower part of the LCD screen.



A short red light signal  indicates every recording sample being performed.

Figure 3-24 The Start Recording window

Immediately after being armed or started , the instrument will go through a checking routine:

- ❑ If you have checked the storage facility, and a storage card is missing an error message will appear on the screen, and the instrument will not start recording.

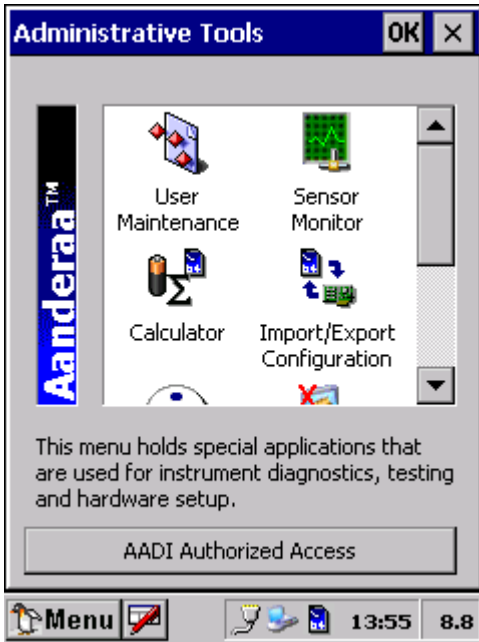
Correct the error and arm/start once more.

Put the instrument into its pressure container and deploy. When the SEAGUARD® Platform is armed and before it starts measuring data, it has the lowest possible current drain for the instrument with that specific sensor configuration (CTD or RCM).

Note! The current configuration is automatically stored in the Data Session folder on the SD card when the recording is started. The file format is xml, and the file is stored in a folder holding the start up time of the recording. The configuration file can be imported later using the Import/Export function found in Administrative Tools, refer CHAPTER 4 page 42 for a description of Import/Export.

Important! If touching the display when the Platform is armed, the display will not be switched off until recording starts or the instrument is re-armed. Re-arm the instrument and avoid touching the display until the instrument starts recording.

CHAPTER 4 Administrative Tools

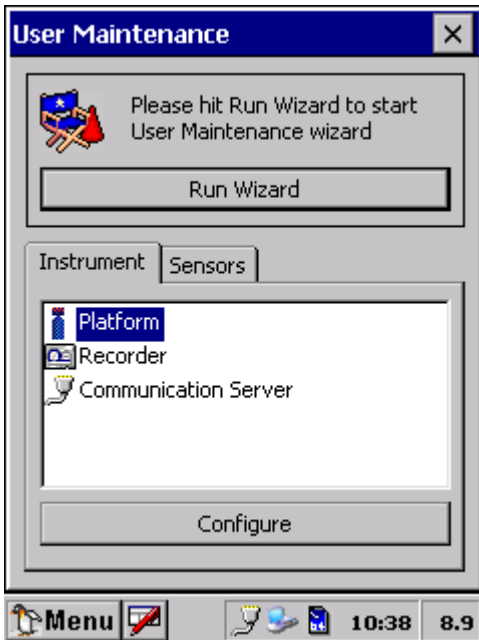


The Administrative Tools menu holds special applications which are used for instrument diagnostics, testing and hardware setup. It also holds configuration of analog sensors, refer page 35.

The menu contains *User Maintenance*, *Sensor Monitor*, *Calculator*, *Import/Export Configuration*, *Instrument Identification*, *Display Off* and *Command Prompt*.

Figure 4-1 Administrative Tools menu.

User Maintenance



In *User Maintenance* you find properties that are password protected and are set/alterd by the ‘advanced user’. Those properties are therefore not changed during normal operation.

Note! The password is: 1000

User Maintenance is divided in two categories: Instrument and Sensors.

Select *Run Wizard* to start the user maintenance wizard for each category, or configure specific items by choosing from the list and tapping configure in the lower part of the window, refer Figure 4-2.

The items in the *Instrument list* are: Platform, Recorder and Communication Server. Refer pages 33 to 34 for a description.

Figure 4-2 User Maintenance, Instrument.



Figure 4-3 User Maintenance, Sensors.

The items in the *Sensors list* are available smart sensors (on the instrument), and the internal sensor Analog sensors.

This menu is for setting sensor configuration that does not usually change between deployments.

Refer each smart sensors operating manual for information about the sensor configuration.

Refer page 35 in this manual for information about configuring an analog sensor.

Platform

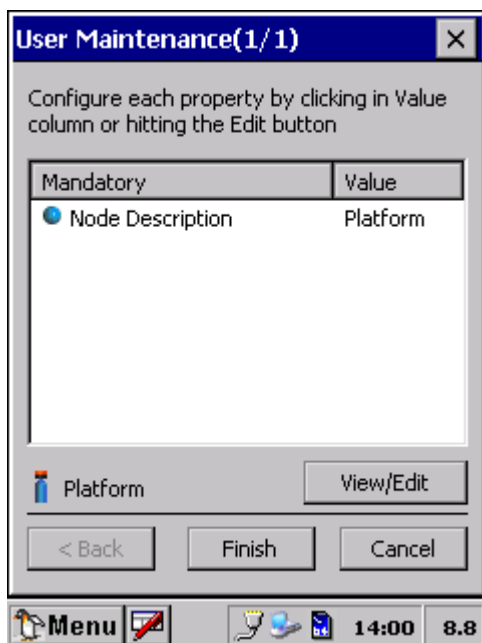
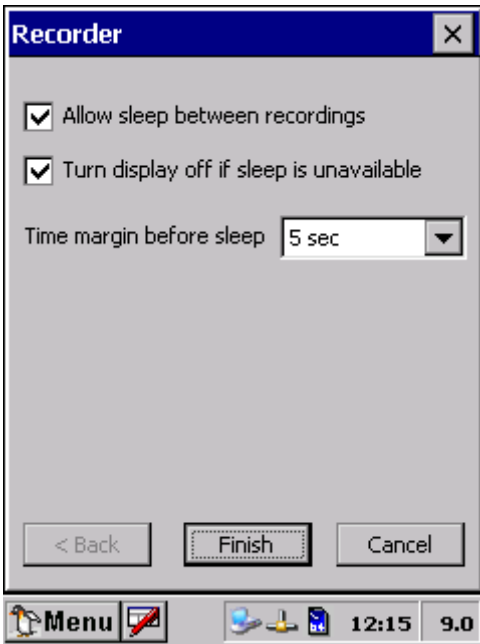


Figure 4-4 Platform Description.

Select the property in the list and set the value.

Press *Finish* to store the settings.

Recorder

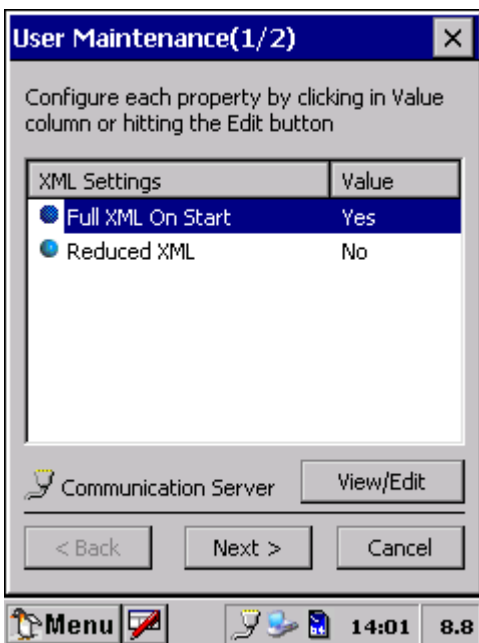


The *Recorder* options are *Allow sleep between recordings* and *Turn display off if sleep is unavailable*, refer *Figure 4-5*. Select the *Time margin before sleep* from the drop-down menu. Set these options to reduce the battery consumption.

Important! We recommend these options to be selected. The recording interval must be longer than 5 seconds for the instrument to go to sleep between recordings.

Figure 4-5 Recorder adjustments.

Communication Server



For Real-Time output, select if the *first message* at Instrument start up will be a full version XML message or a reduced XML message. Refer TD267 for a description of the AADI Real-Time Output Protocol.

The first message at Instrument startup contains all instrument/sensor configurations; measurement parameters are dummy values.

Select if the *following messages* are full version or reduced version XML messages.

IMPORTANT! A reduced XML version of the message is not yet available for non-pollled mode.

Figure 4-6 XML Messages

Tap *Next* to continue the Communication server settings.

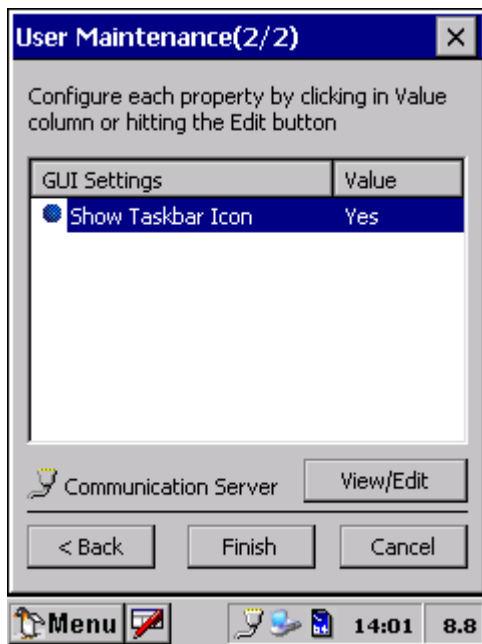


Figure 4-7 Transmitting Icon

Set *Yes* to *Show Taskbar Icon* for the Real-Time icon to show when the messages actually are transmitted. A blue frame surrounds the icon during transmission.

Tap *Finish* to store the settings.

Configure Analog sensor Properties

To configure the Analog sensor properties: open *Administrative Tools*-> *User Maintenance* -> *Analog Sensors* and press *Configure* in the lower part of the window.

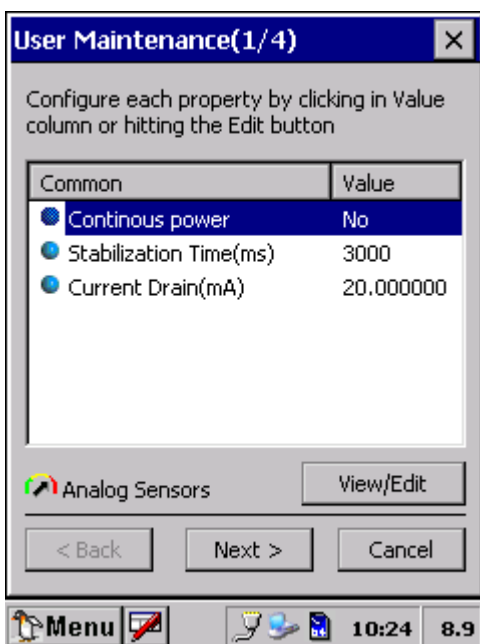


Figure 4-8 Analog Sensors

User settings for the Analog sensors are related to power and current drain, descriptive names, engineering units and calibration coefficients. These settings provide correct visualisation of the measurement data in SEAGUARD Studio.

Power settings for Analog sensors:

When *Continuous Power* is set to *Yes* the 10 V power is kept on continuously during recording.

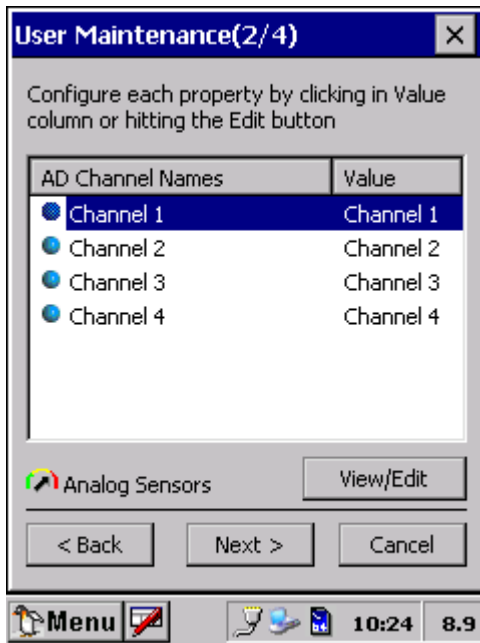
When *Continuous Power* is set to *No* the selected *Stabilization Time* decides when the instrument will deliver power (10V) to the sensor. Select an appropriate value for the *Stabilization Time*; the value must cover the longest time required by the analog sensors.

In Figure 4-8 the *Stabilization Time* is set to 3000ms (3 seconds). This means that the instrument switch on power 3 second before the measuring instant. The

power is switched off immediately after the measurement is taken.

Set the total *Current drain* as the sum of the current drain from each analog sensor; the instrument can calculate the current drain for the deployment.

Note! The total current drain is an input to the calculator.

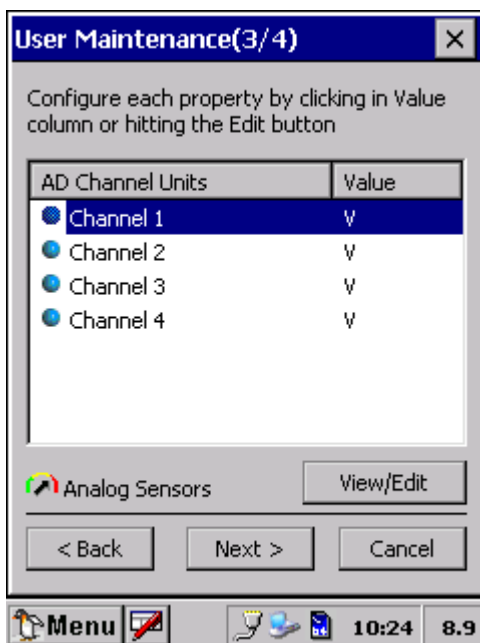


Tap *Next* to continue the configuration.

Rename the Analog sensor's Channel names for easy recognition later. The default names are Channel 1, Channel 2, Channel 3, and Channel 4, respectively.

Select the Channel, press View/Edit and type the name as the *Value* setting.

Figure 4-9 Analog Sensors



Tap *Next* to type the engineering unit for the sensor measurements; the engineering unit will appear in SEAGUARD Studio. In the example given in Figure 4-10, the channel unit has been set to V (Voltage).

Tap *Next* to enter calibration coefficients.

Figure 4-10 Set Engineering Units

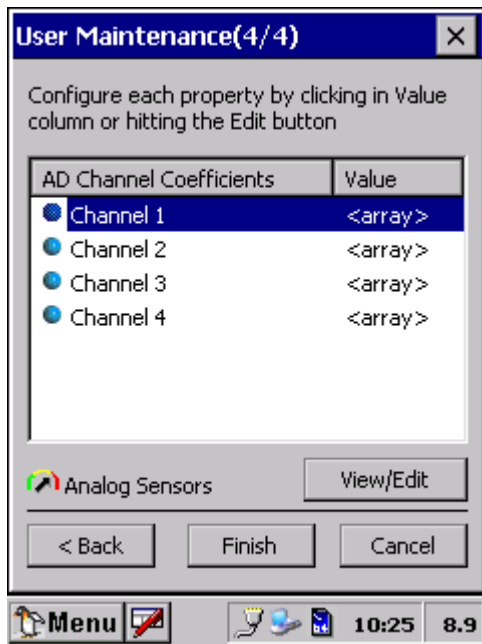


Figure 4-11 Configure each analog sensors Calibration Coefficients.

To set the sensor calibration coefficients:

1. Select the sensor channel, refer Figure 4-11, press *View/Edit* in the lower part of the window; a window similar to Figure 4-12 appears.
2. Select and *Edit* each Index; Index 0 and Index 1 are values in an equation forming a linear relationship between the raw data readings and the measurements in engineering units:

$$\text{Index 0} + \text{Index 1} \times N$$

Where N is the raw data readings.

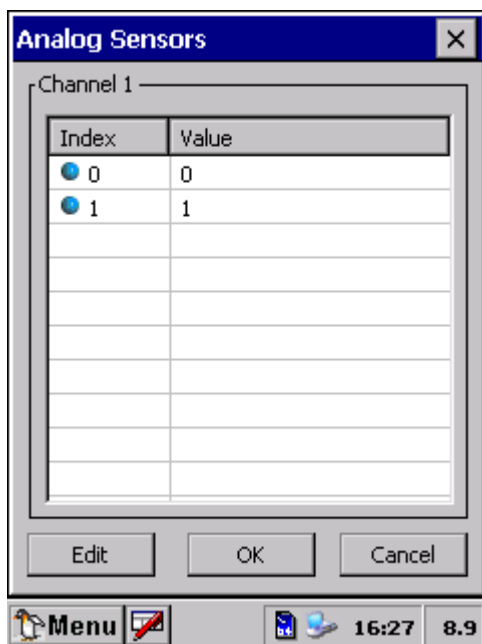
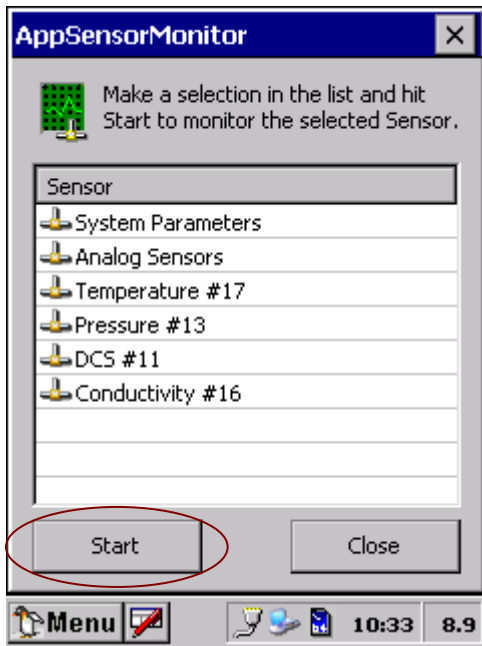


Figure 4-12 Set Calibration Coefficients.

Tap *OK* to return to the window shown in Figure 4-22.

Tap *Finish* to store the configuration. The configured name will appear e.g. in the SEAGUARD Studio.

Sensor Monitor

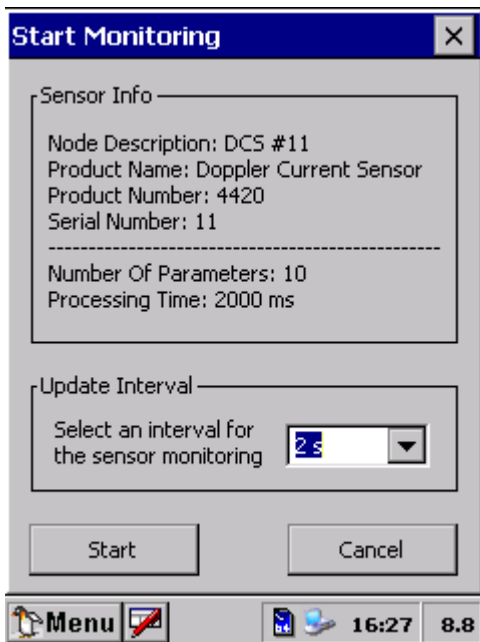


Open *Administrative Tools-> Sensor Monitor*.

Sensor Monitor can be used as a direct reading of the sensor; the function is mainly used for test purposes.

Select a sensor from the list, and press *Start*, refer Figure 4-13.

Figure 4-13 Sensor Monitor

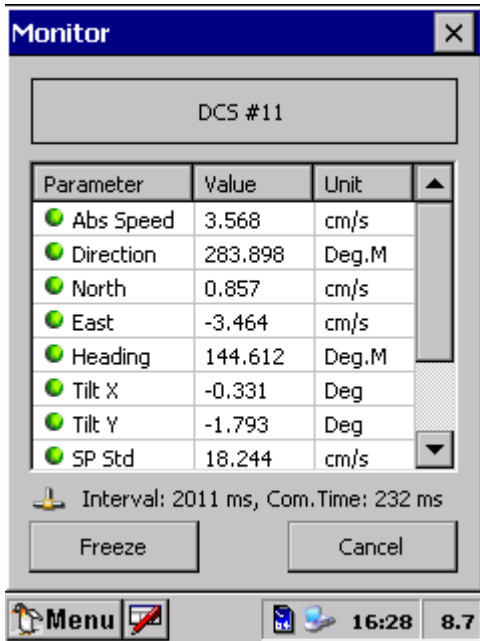


The next window shows sensor information like the Node Description, Product name and number and Serial number, refer Figure 4-14.

The number of sensor parameters and the processing time is also viewed in the window.

Select an *Update Interval* for the sensor monitoring, and press *Start* to start monitoring the sensor readings.

Figure 4-14 Start Monitoring

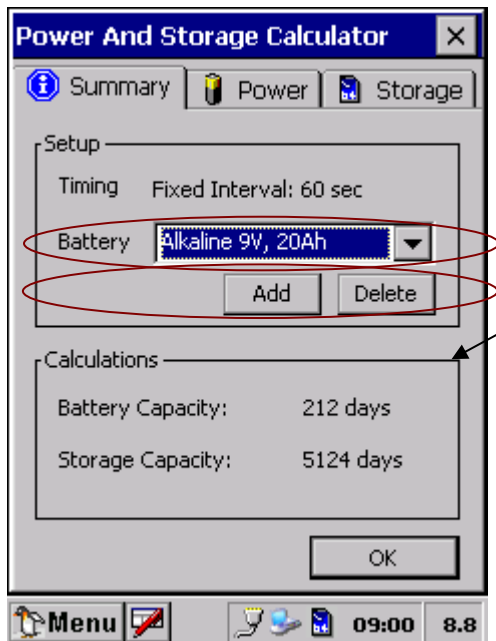


The parameter reading in engineering units is shown as illustrated in Figure 4-15. The reading updates according to the update interval. Press *Freeze* to temporarily stop the update, Press *Start* to restart the monitoring (Start is the same button as Freeze).

Press *Cancel* to stop the monitoring.

Figure 4-15 Sensor Reading

Calculations of Power and Storage Capacity



In *Calculator* you can find the Instruments estimated *Battery* and *Storage* capacity based on the current configuration. Refer Figure 4-16 Summary page.

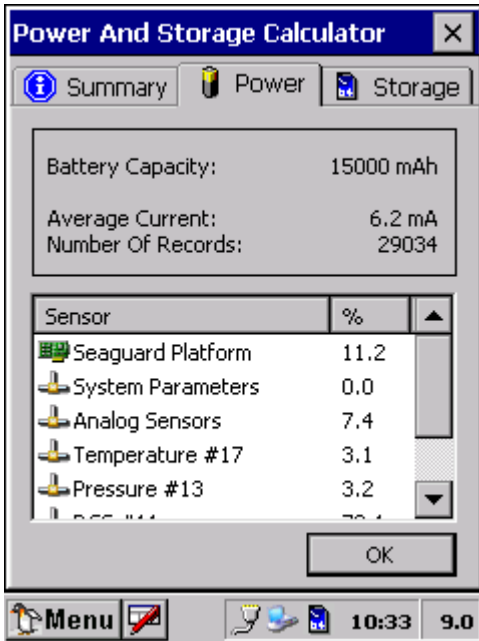
You can also see more details regarding the power drain and storage, refer Figure 4-17 and Figure 4-18.

Select the applied battery from the list in the *Summary* page. The calculations are shown in the lower part of the window, refer Figure 4-16 Summary page.

Press *Add* to define a new battery in the list. Refer page 41 for a description. Pres *Delete* to remove a battery from the list.

Note! Power calculations are not available when Real-Time Output is enabled.

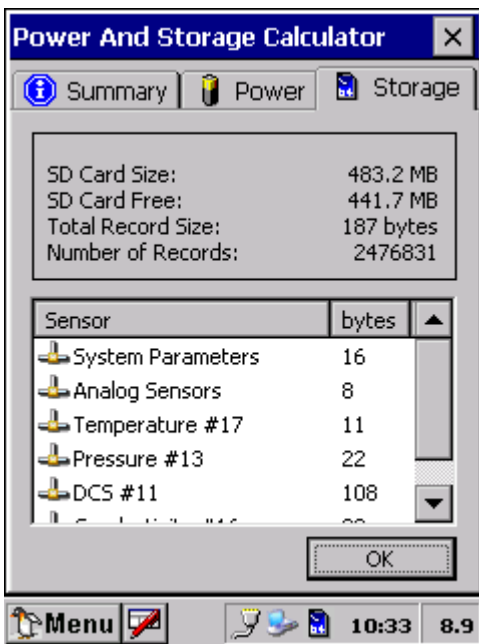
Figure 4-16 Summary page



In the *Power* page, you can see the average current drain for the deployment, and the number of records the battery can supply (based on the capacity of the battery that you selected in the summary page).

You can also see the individual power drain of each sensor in the system, refer Figure 4-17.

Figure 4-17 Power Calculations.



In the *Storage* page, you can see the size of the installed SD card, the available storage, the total record size and the number of records that can be stored based on the available storage capacity, refer Figure 4-18.

You can also see the storage requirements of each sensor in the system per recording.

Note! Sensors that provide several measurement parameters also take up more storage.

Figure 4-18 Storage Calculations.

Define/Add new Battery details

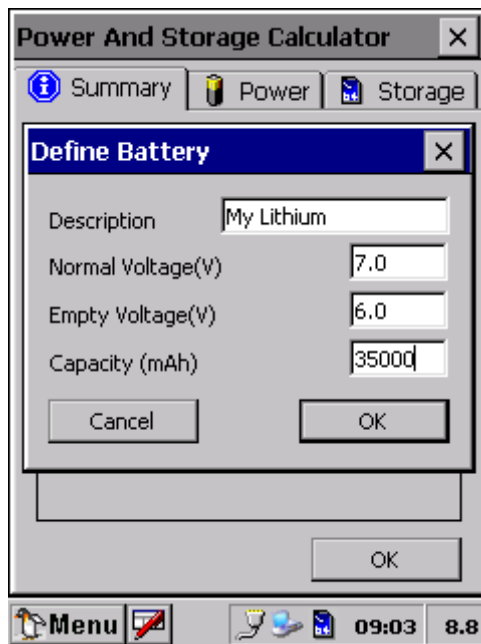


Figure 4-19 Define a new Battery.

You can specify your own battery; refer the *Summary* page shown in Figure 4-16.

Press *Add* and type a *Battery Description*, *Normal Voltage*, *Empty Voltage* and the *Battery Capacity*; refer Figure 4-19.

Press *OK* to store the changes. The defined battery will show in the battery list; refer Figure 4-20.

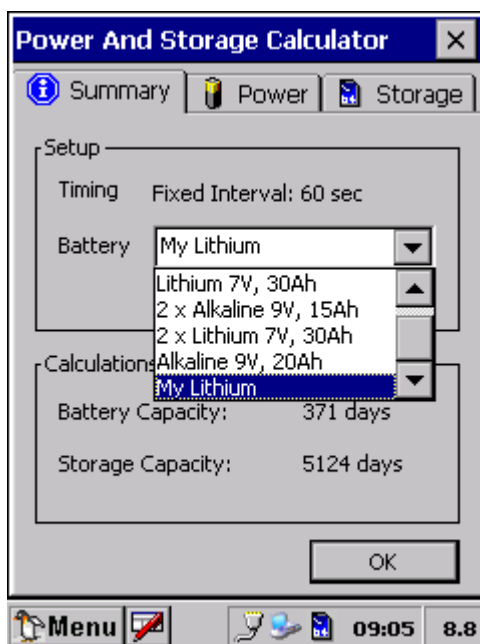


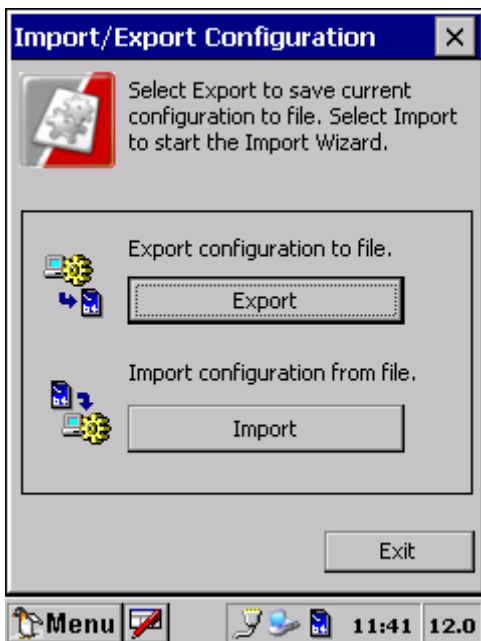
Figure 4-20 The new Battery is shown in the list.

Import/Export Configuration

The *Import/Export Configuration* offers import and export of configuration settings from the *Deployment Settings* and *System Configuration* categories.

Applications for Import/Export:

- Backup (export) current configuration to the SD card.
- Restore (import) a previously saved configuration.
- Restore (import) a configuration used in a previous recording (the configuration is automatically stored to the data session folder when a recording is started, refer CHAPTER 3, page 30).
- Copy (import) a configuration from another instrument.
- Import a configuration that was modified or created with the Seaguard Offline Configuration PC software.



Press *Export* to save the current configuration to the SD card.

Press *Import* to get a configuration file from the SD card and start the *Import Wizard*.

Figure 4-21 Import/Export Configuration.

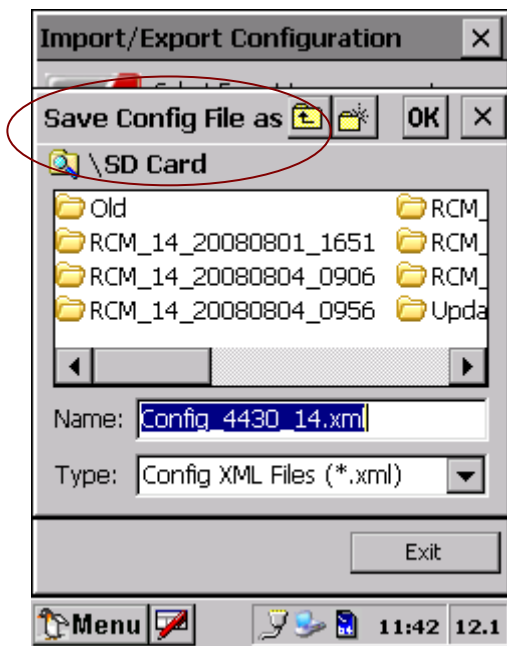


Figure 4-22 Export Configuration file to SD card.

Export: Type a file name to store current configuration to the SD card. A message box appears with the message *Export OK* if the export succeeded.

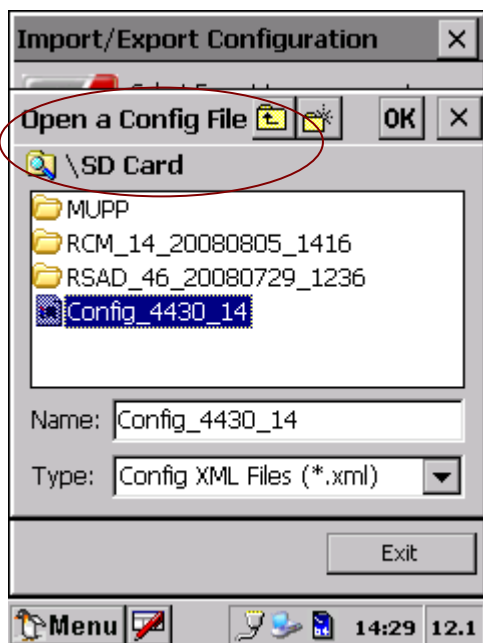


Figure 4-23 Import Configuration file to SD card.

Import: Select the correct configuration file from the SD card. If the file contains a valid configuration, the import wizard will start.

If the configuration file is not valid, you will get a warning.

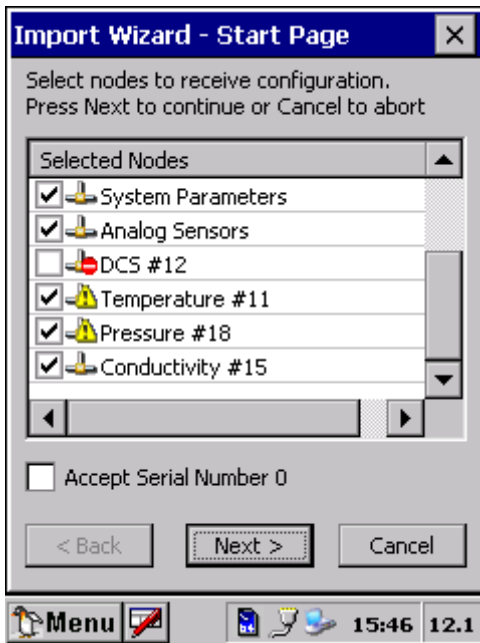




Figure 4-24 Import Wizard.

The product number and configuration version are used as criteria to match a node configuration in the file against a node on the instrument. Import is available if both the product number and configuration version are equal.

All nodes that are available for import are checked by default. Uncheck a node's checkbox to de-select the import.

 A *Node Mismatch* means that the configuration file does not contain any matching configuration. Import is therefore not available for this node.

 A *Node Warning* indicates an ambiguity between the source and target nodes due to serial number mismatch or multiple source selection. If the configuration of a node with a warning symbol is selected for import, the wizard will guide you through these warnings to enable import, refer Figure 4-25 and Figure 4-26.

The *Accept Serial Number 0* checkbox is displayed if one of the node serial numbers in the file is 0, and the corresponding node on the instrument is different from 0. If checked, serial number 0 will be accepted without any warnings displayed (refer TD275 Seaguard Offline Configuration, for the usage of serial number 0).

Press *Next* to continue or *Cancel* to abort the import wizard.

Note: Some sensors with an early software version do not support configuration version handling and will be given configuration version 0. If the configuration structure in the file differs from the one on the instrument, there is a possibility that import is unavailable for sensors with configuration version 0.

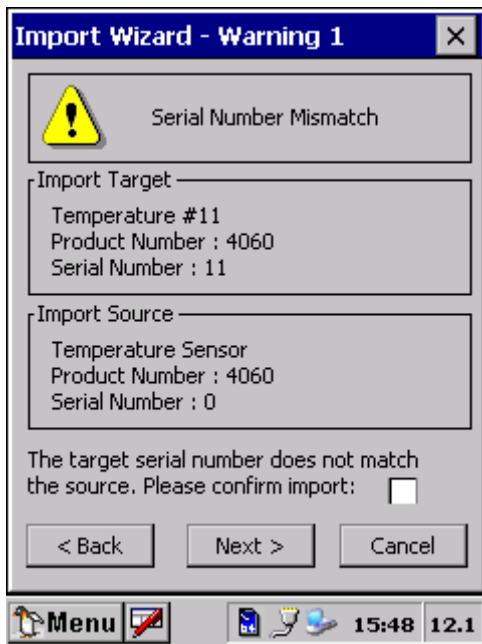


Figure 4-25 Warning message; Serial Number Mismatch.

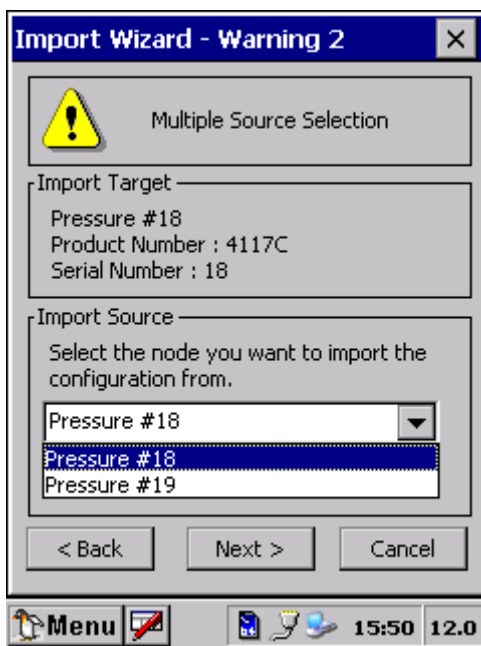


Figure 4-26 Warning message; Multiple Source Selection.

The *Serial Number Mismatch* warning appears when the matching node in the configuration file has a different serial number than the node on the instrument. The import must be confirmed by checking *Please confirm import*.

Note! If the serial number is 0, this warning can be avoided by checking the Accept Serial Number 0 on the Import Wizard Start Page, refer Figure 4-24.

Press *Next* to continue, *Back* to go to the previous page or *Cancel* to abort the Import Wizard.

The *Multiple source selection* warning appears when there is more than one available configuration for a target node in the configuration file. The preferred source for import can be selected in the *Import Source* drop-down box. If one of the source nodes has a matching serial number, the node will be selected by default.

Press *Next* to continue, *Back* to go to the previous page or *Cancel* to abort the import wizard.

Example: Figure 4-26 shows that the sensor named Pressure # 18 on the instrument can choose to import the settings from either Pressure #18 or Pressure #19 in the configuration file.

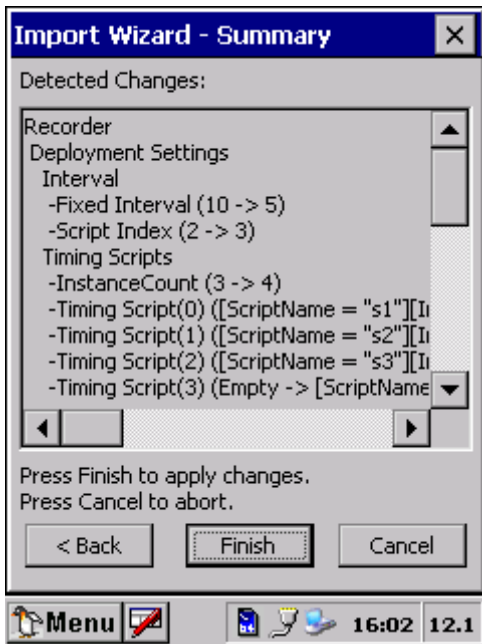


Figure 4-27 Import Wizard Summary.

The *Summary* page will list all changes that will be made to the current configuration if you press *Finish*.

Click *Finish* to apply the changes, *Back* to go to the previous page or *Cancel* to abort the Import Wizard.

Instrument Identification

Instrument Identification gives the instrument's and the sensor's identity, and is therefore mainly used when you have contact with factory for e.g. service reasons.

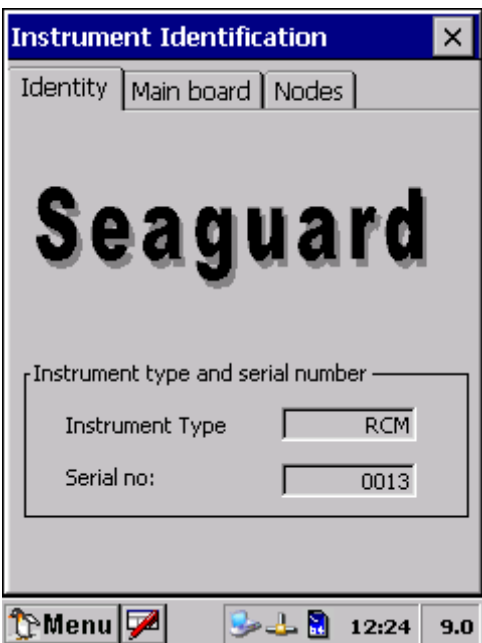


Figure 4-28 Instrument's identity.

In the *Identity* pane you get information about the Instrument type and Serial number, refer Figure 4-28.

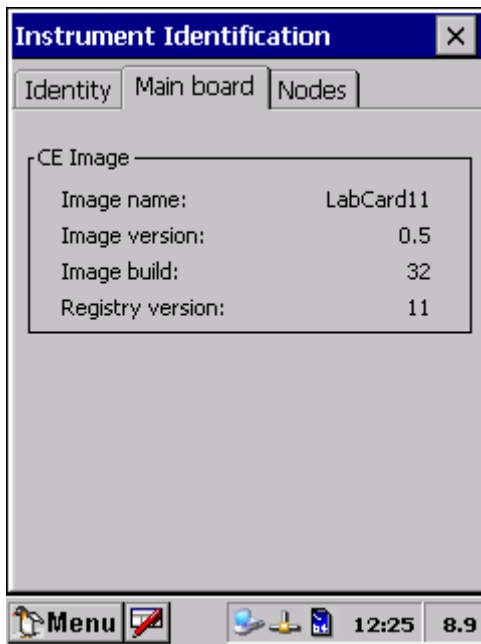


Figure 4-29 Information about the Main board.

In the *Main Board* page, information about the CE Image is available; Image name, Image version, Image build, and Registry version, refer Figure 4-29.

CE Image is the AADI version of the Instruments operating System.

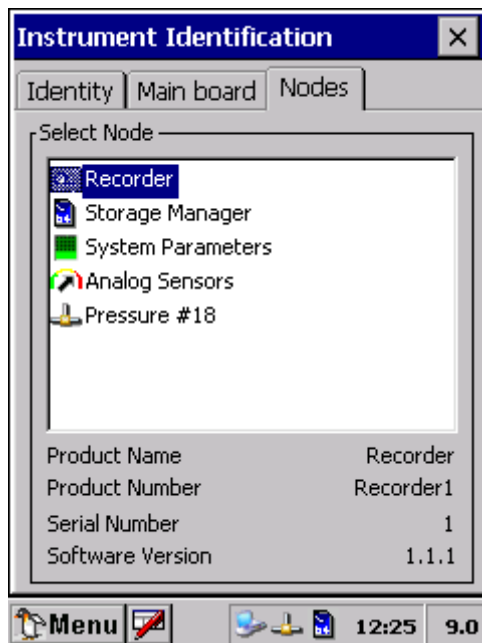


Figure 4-30 Information about the Nodes.

In the *Nodes* page you get information about each node. Select Nodes from the list in the middle of the window, refer Figure 4-30.

Display off

Display off is used for minimizing current consumption.

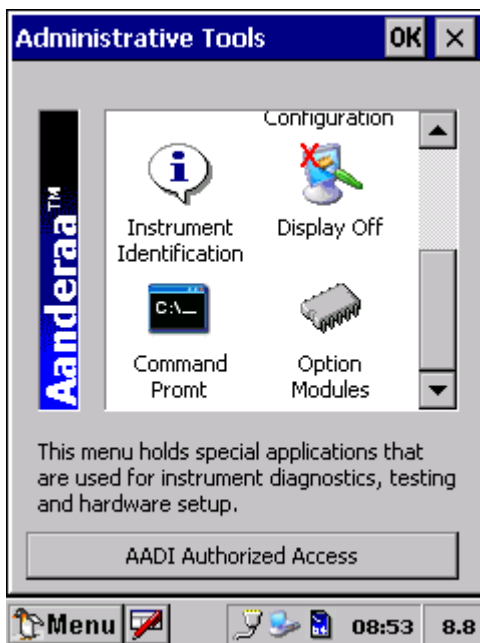
Command prompt

Command Prompt is used for running DOS programs. It is mainly used when manually updates from SD card should be driven.

Licensed Features –Option Modules

A licensed feature is enabled by installing a license key. The license key can be installed from a license file on the SD card or entered directly as a 16 digits number code. The license key is Instrument unique (based on the product- and serial number) and can not be installed in multiple instruments.

Note! Make sure that the SEAGUARD® Image version supports the new option. An Image upgrade can be necessary.

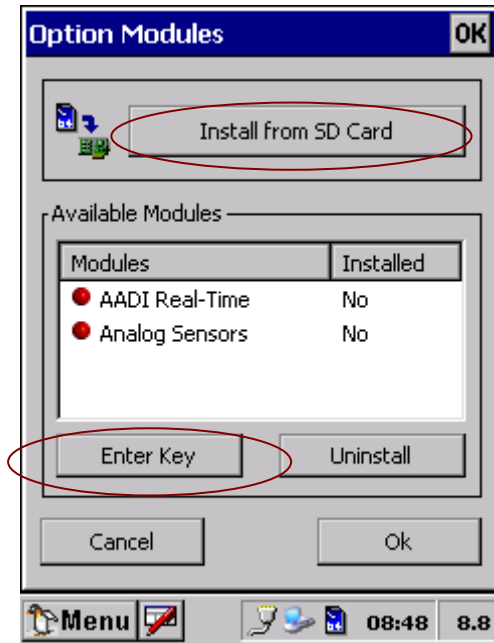


Open *Administrative Tools*-> *Option Modules*.

The license key or the license file can be received by e-mail. Download the license file to the SEAGUARD® SD card and install the SD card in the instrument.

The installation procedure is independent of which module to enable; we will illustrate the installation with the AADI Real-Time Module.

Figure 4-31 Information about the Nodes.



Start installing the license by either:

- Press *Install from SD card* to install the license key as part of the license file. All license files on the SD card are automatically detected and installed. When installed from the license file, the key is entered automatically.
- Or select the correct module and press *Enter Key* to enter the license key directly, refer Figure 4-33.

Figure 4-32 Install license key.

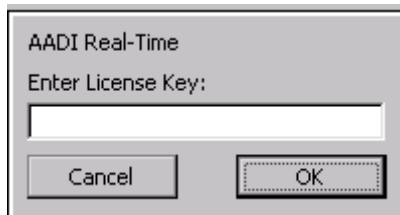


Figure 4-33 Enter License key

The license key number format is:

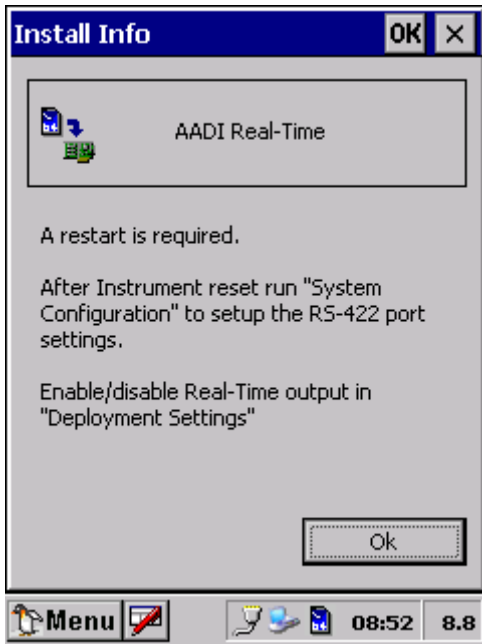
XXXX-XXXX-XXXX-XXXX.



Figure 4-34 Information about the Nodes.

If the license file/key is valid for the instrument/module you are asked *Do you wish to install the Module?* Press *Yes* to install or press *No* to abort the installation.

You are told to restart the instrument. Refer CHAPTER 1, page 11 and 13 for deployment configuration and setup issues.



When the license file has been installed from the SD card, you are notified with some installation requirements and setup issues. You are also notified if the SEAGUARD® Image version does not support the option module.

Read the instructions on screen. Press *OK* to finish the installation.

Figure 4-35 Installation from SD card provides the user with some Installation Information.

CHAPTER 5 Control Panel



Figure 5-1 Control Panel Menu

The Control Panel mainly contains standard Windows CE Icons. Only specific SEAGUARD® icons are described below.

Date/Time, Network and Dial-up Co, Regional Settings, Storage Manager and Stylus are therefore not described any further.

Battery Capacity

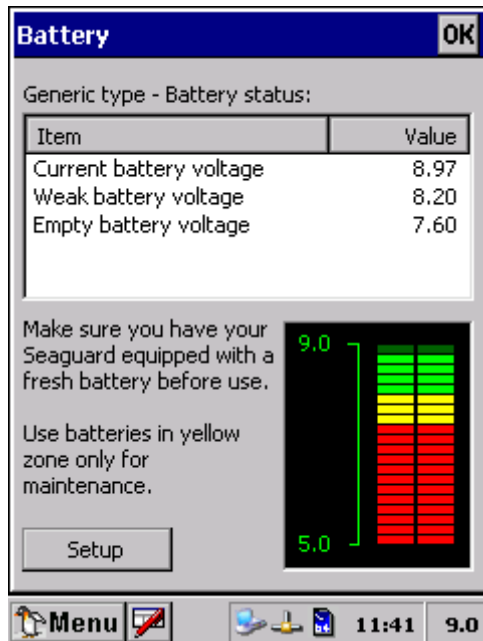
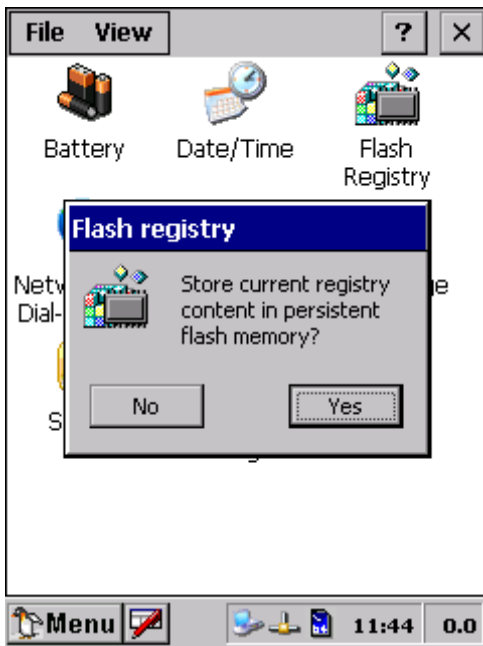


Figure 5-2 Battery Capacity

The user can check the battery capacity by looking at the battery icon at the lower right end of the LCD screen. A more accurate reading is presented in the *Battery Menu* in the *Control Panel*.

Flash Registry

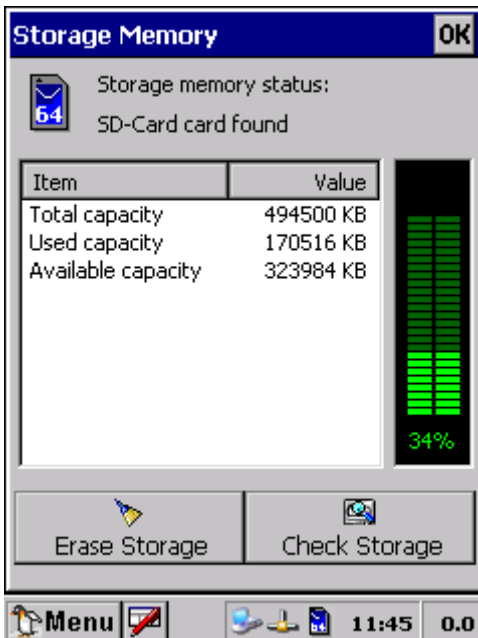


With *Flash Registry* you can store current registry content in persistent flash memory.

For more information of Flash Registry and updating of Flash Registry refer subchapter *Software update of Main Board* in CHAPTER 8.

Figure 5-3 Flash Registry

SD Storage



In the *SD Storage* menu you find status about Storage Memory and you are able to Erase Storage on SD Card or Check Storage.

Figure 5-4 SD Card

S-Flash

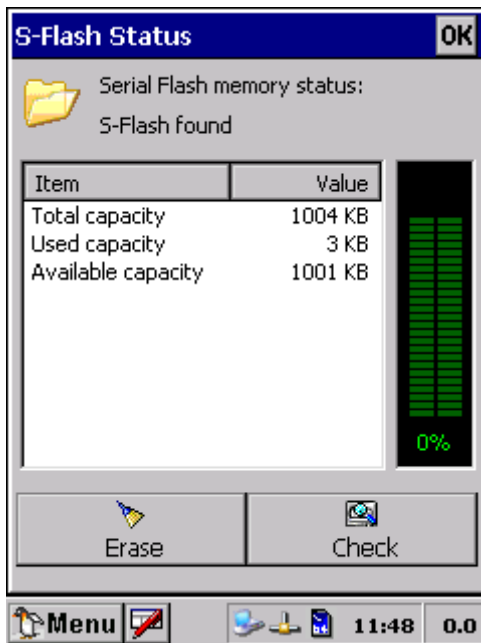


Figure 5-5 S-Flash Status

In the *S-Flash* menu you find status about the Serial Flash memory status.

You are also able to Erase or Check out the Serial Flash in the lower part of the window.

Important! Do not delete the S-Flash without consulting AADI personnel. The Recorder, storage manager, analog configuration are stored in the S-Flash and will be lost if deleted.

CHAPTER 6 SEAGUARD Studio

SEAGUARD® creates a data session folder containing several files. The complete folder must be imported into SEAGUARD Studio. The folder name is automatically created based on the deployment date and time: *Instrument_Serialno_yyyymmdd_hhmm*, refer Figure 6-1.

This chapter guides you in SEAGUARD Studio: how to import your measurement data folder, how to open and customise graphs for best visualisation of your data, and how to export graphs or data set.


Note! Install the SEAGUARD Studio from the installation CD.

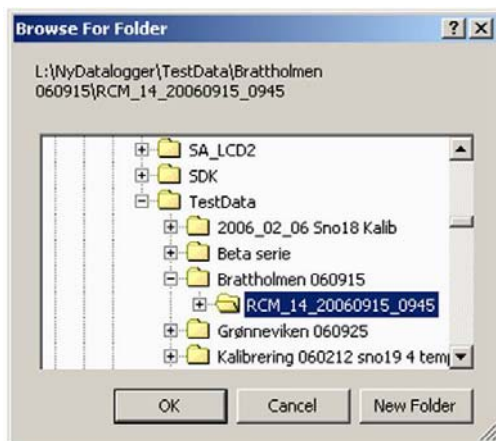
Important! Always use the latest version of the SEAGUARD Studio Software. Download the latest version from our customer web site that you find at www.aadi.no , or contact your local representative or e-mail info@aadi.no

Import Data

Note! We recommend that you copy all of the data session folders from the storage device (SD card) to a directory with names that links to the deployments.

A new measurement set must be imported into SEAGUARD Studio:

1. Connect your SEAGUARD® Instrument to the PC, refer the section *Connection between the SEAGUARD® Instrument and a local PC*, page 14. Copy your data session folder from the SD card to a folder on your PC. Refer *Retrieval of the Instrument*, page 65 for more information about importing data from SD card to PC.
2. Start SEAGUARD Studio.
3. Click the *import* button  or select *Import* in the *file* menu..
4. Browse for the data session folder in which you copied your data, and click *OK*, refer Figure 6-1.



A progress bar informs you the download status.

Figure 6-1 Browse for Folder

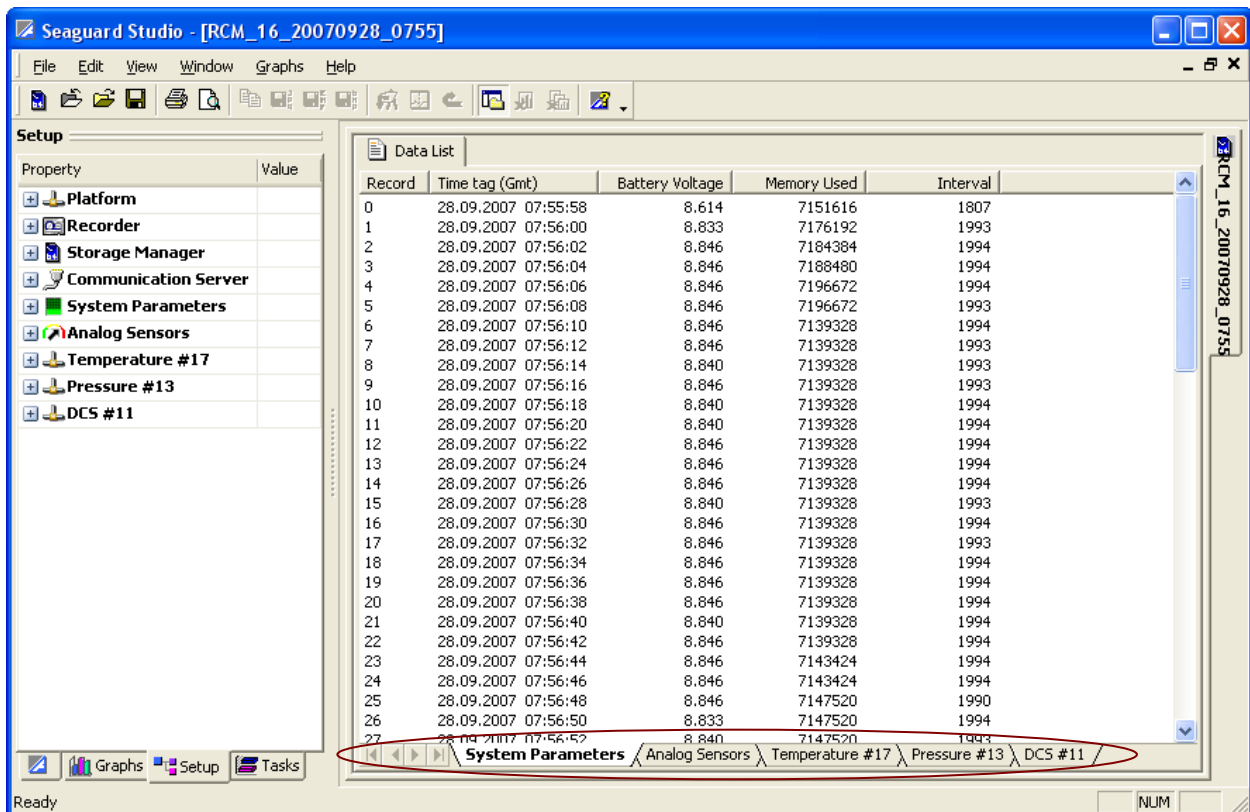


Figure 6-2 SEAGUARD Studio Main window to the right, and the Control panel to the left.

When the data session folder has been imported, the data list is seen in the main window, and a control panel is found to the left, refer Figure 6-2.

Each node has its separate sheet in the Data list; each *Record* is numbered and has a *Time tag* in GMT.

The Control panel consists of a *Setup* view, a *Graph* view and a *Tasks* view. *Setup* holds information about the deployment configuration and settings, *Graphs* View visualises your measurements, and you can import/export data set from the *Tasks* view. Refer the next pages for guides.

Note! Several data sets can be imported into SEAGUARD Studio at the same time for comparisons between measured parameters from different deployments.

Customising Graphs

To display a graph: click the *Graphs* tag at the bottom of the control panel, select *Sensor Values versus Time* under *General Line Graphs*, and start configuring, refer Figure 6-3.

Expand the data set to view nodes and the measured parameters. Select one or more parameter from the listed nodes.

By default, none of the parameters are selected. When selected, the icon in front of the parameter name turns red, and a small mark will show next to the icon.

Note! When you expand a second node, the first nodes parameters are not longer listed; all selected parameters will show on the graph.

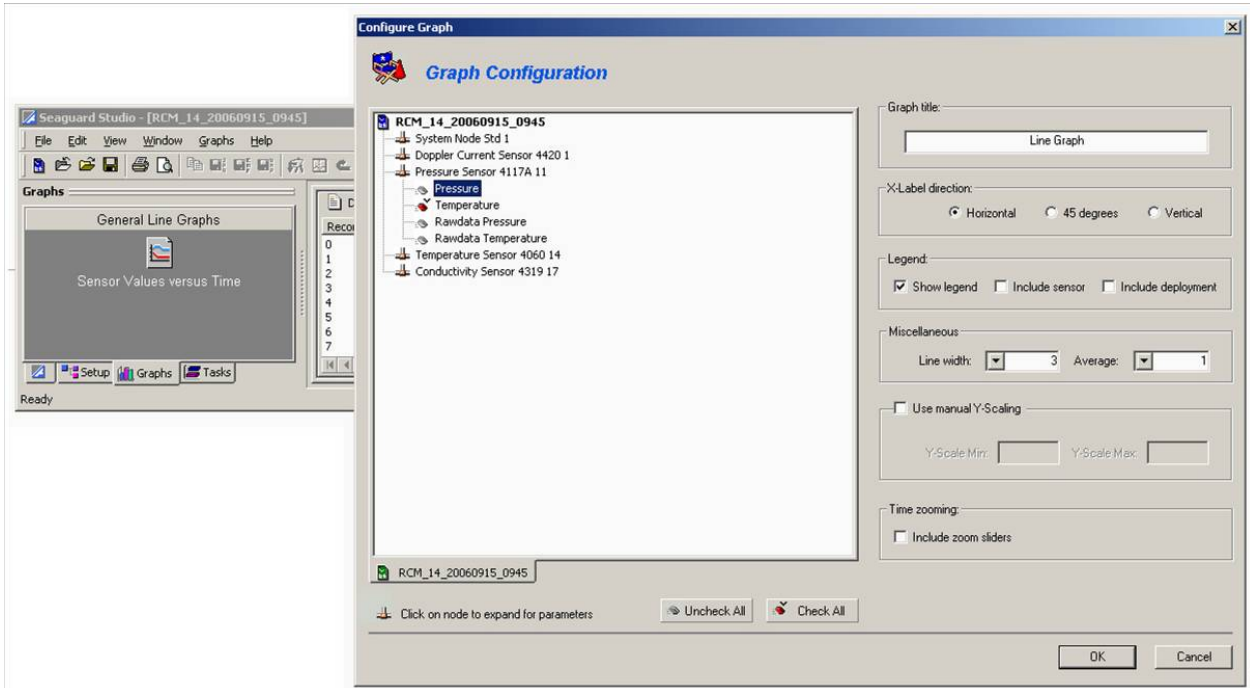


Figure 6-3 Graph Configuration; single data set

When the parameters have been selected, type *Graph Title*, add *Legend*, *Time zooming* sliders etc from the right part of the graph configuration window. Include time zooming sliders to confine the time interval without deleting records, refer Figure 6-4.

Right click the icons on the toolbar above the main window/control panel to reconfigure the graph setup, add cursor, reset graph, store graphs, etc. Hold down CTRL + left mouse button allows you to select a graph area to zoom in.

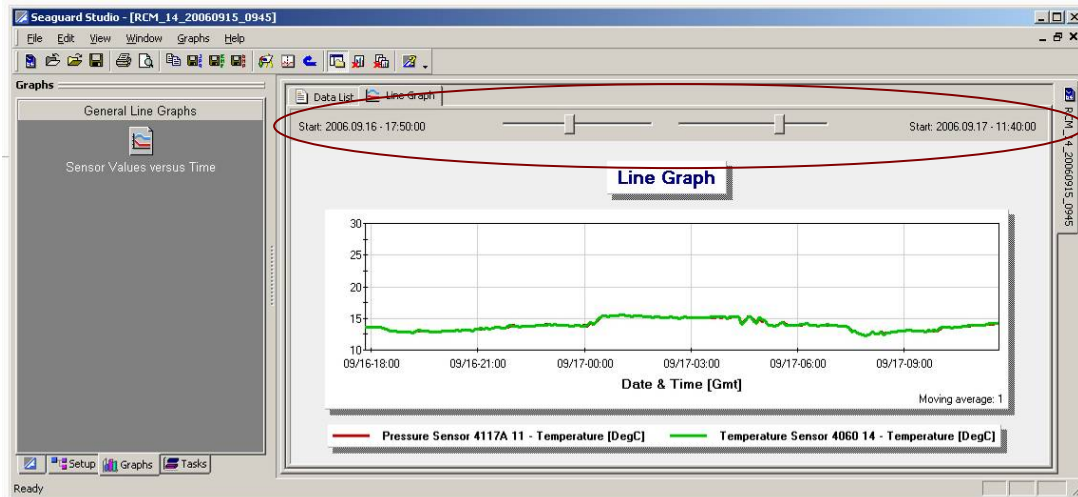


Figure 6-4 Zoom sliders

Data from all of the imported data sets are available in graphs; each data set has its separate sheet in the Graph Configuration window, refer Figure 6-5.

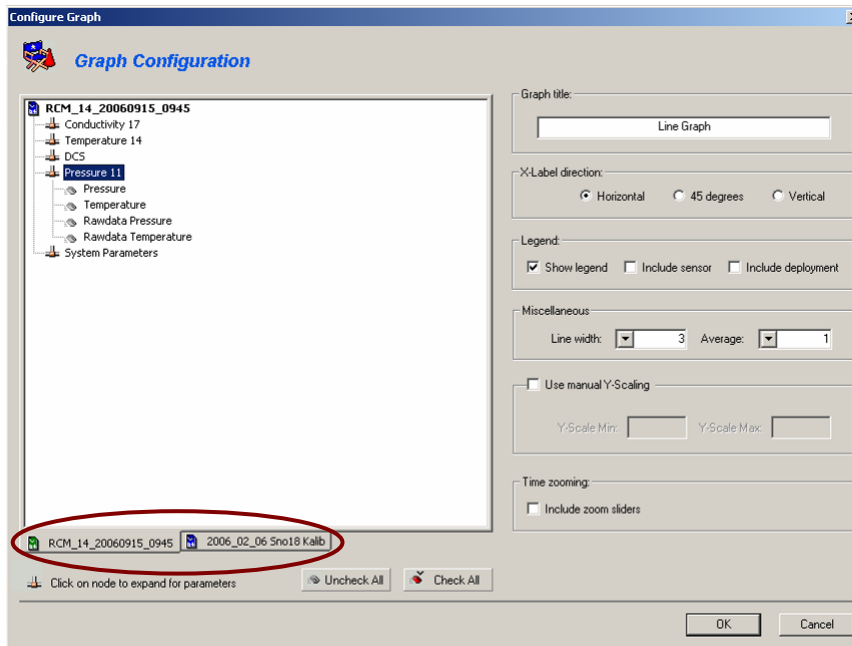


Figure 6-5 Graph Configuration; two data sets imported

Full Screen View

Press the *Alt + Enter* key for a full screen view of the current graph or data list. Press *Esc* to return to the *Main window/Control panel*.

Exporting Graphs

The graph can be saved as it is currently displayed in either .jpg, .emf, or .bmp format by pressing the respective buttons in the toolbar above the main window/control panel.

Export Data

Click the *Tasks* tag at the bottom of the control panel, and select from the menu:



Figure 6-6 Export value type data to text file

Export value type data to text file, Export value type data to MatLab, Export value type data to DRP5059, Export array type data to text file, or Export array type data to MatLab .

If you select to export *value* type data, you can export parameters from all of the nodes in the deployment configuration.

If you select to export *array* type data, you can only export parameters generated from the ZPulse™.

If you select to export value type data to *DRP5059*, *Data List* must be active, and only parameters from one single node can be exported at a time.

Note! The DRP5059 operates with sensor readings at 10 bit resolution, which is less than the sensor resolution..

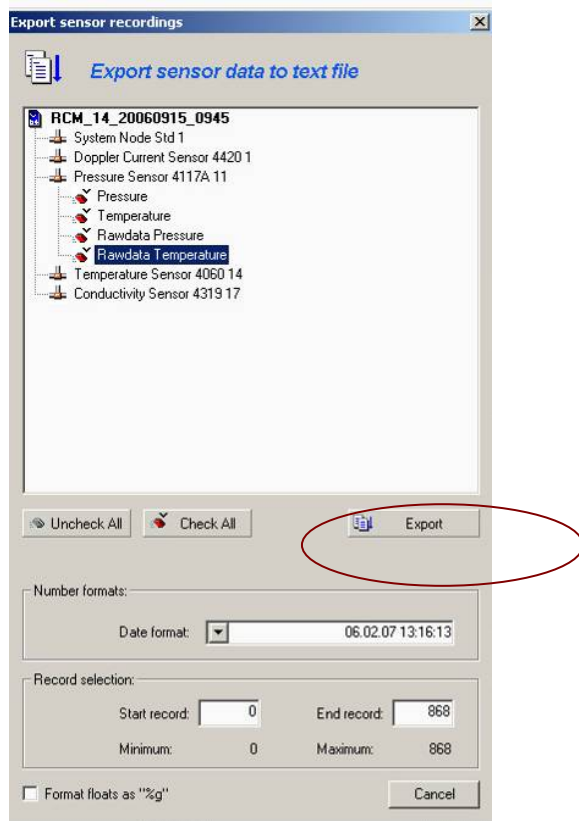


Figure 6-7 Export value type data to text file

MatLab function generates one file for each node you choose to export parameters from. The .cvs file can be viewed in e.g. MS Excel. Import the .cvs file in Matlab using the *Import File* function.

If exporting to *DRP5059*, enter a file name. Two files will be generated: one .asc file with the measured parameters (in the raw data format used in *DRP5059*), and one .sti file with the calibration coefficients and other information required for import into *DRP5059*. Refer the operating Manual for *DRP 5059*, TD 208, for import of data set.

Edit listed data

When the data list is open, you can *remove selected records*, or *remove all but selected records*, refer Figure 6-8 top two options. Mark the desired records, right-click the mouse and select either to remove the selected records, or to remove all but selected records.

Expand the data set to view nodes and the parameters from each node. Select the parameters to be exported from the list. The bullet in front of the parameter name turns red when checked. The Record number and Time Tag in GMT will also be exported. The exported files include headers.

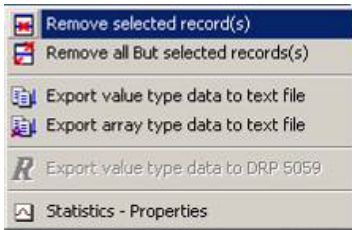
Select Date format if export to Text file (not optional if export to MatLab has been selected).

Select start and end record; the default setting is to export all records. Press the *Export* button to start the export function.

Browse for the correct folder to save the file.

If exporting to *text file*, enter a file name; the file format will be .txt. One single file is generated; the parameters from the first node are listed at the top of the file, while parameters from the second node follows after the last record, etc. The .txt file can be viewed in e.g. MS Excel.

If exporting to *MatLab*, the file name will be the node name; the file format is .cvs. The Export to



Graphs that are open during the editing session will be deleted.

Figure 6-8 Edit the Data list

Note! To select more than one record, press and hold the shift button on your keyboard while marking the records with the mouse or the arrow button (on the keyboard).

Important! When saving the modified data set, make sure you use the save as option to avoid overwriting and losing the original data.

Splitting one data series into several shorter data series

Choosing one of these options *remove selected records*, or *remove all but selected records*, you can export a selection of your data set, either e.g. one week or one month, and save in separate folders for presentation or more analysis.

Setup

In the Setup page you can watch information about the instrument and sensors, as well as the Deployment Settings, refer Figure 6-9.

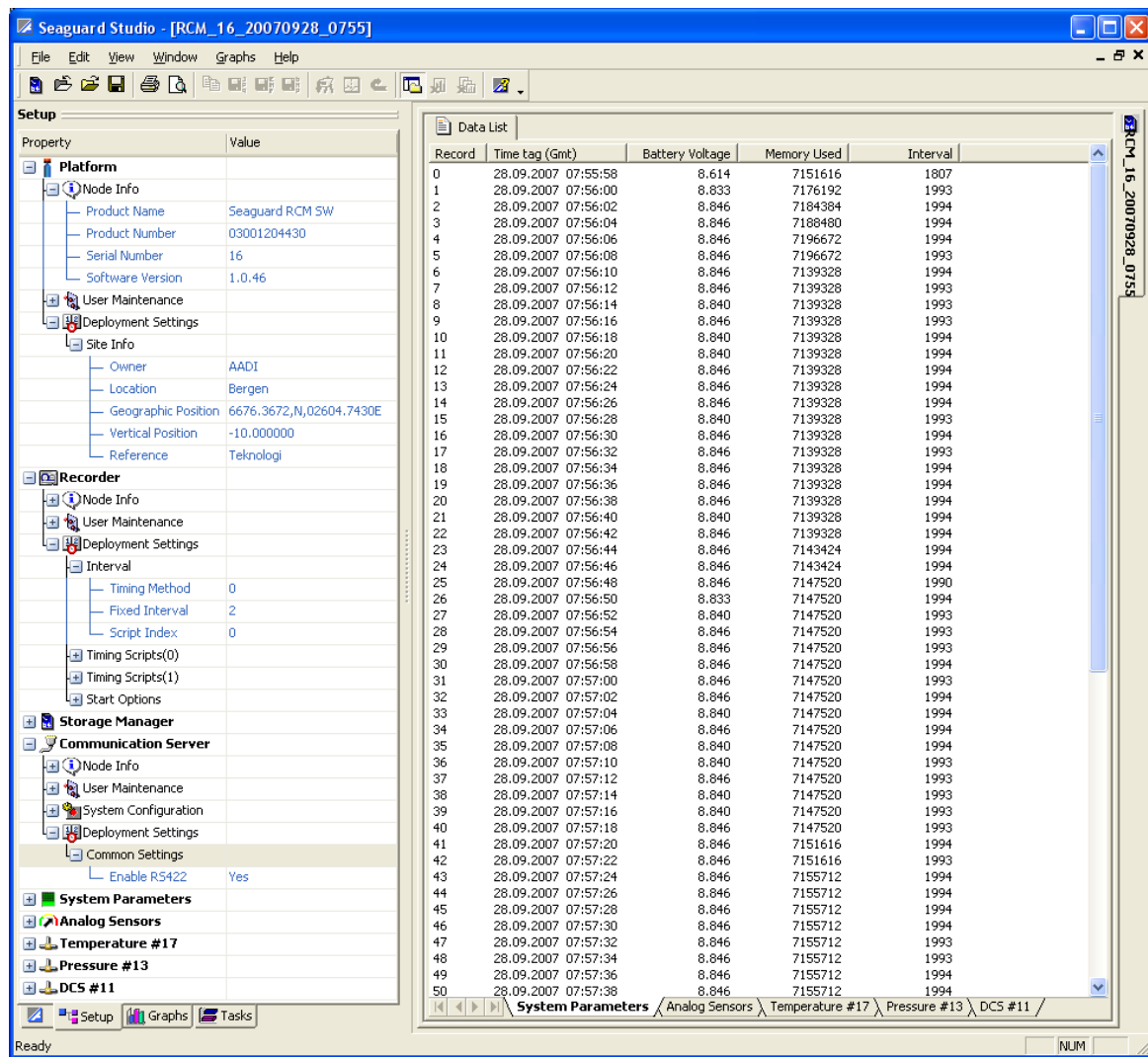


Figure 6-9 Setup

CHAPTER 7 Operating Instructions

Preparations for Use

- ❑ Perform deployment configurations and recording configurations (described in CHAPTER 3):
 1. Customise the *Node Descriptions*.
 2. Open the *System Configuration* menu and enable/disable node parameters to be measured.
 3. Open the *Deployment Settings*: set the recording interval and enable/disable nodes.
 4. Configure Analog sensors settings if analog sensors are attached, refer CHAPTER 3 and CHAPTER 4.
 5. Activate the *Recorder* menu. View the deployment settings and select to start the instrument instantly or at a postponed time.
 6. After being armed, the instrument will automatically shut off the LCD display.

The LCD may be reactivated by tapping the display.

However, before putting the instrument into the pressure container, make sure the display is switched off to conserve power. If not done automatically, tap the *Display Off* menu item in the *Administrative Tools* menu, refer CHAPTER 4.

Important!

When disconnecting the instrument from external AC Power, remember always to screw the Cover Cap tightly onto the electrical terminal to avoid water infusing the instrument when deployed!

Make sure the O-ring inside the Cover Cap is clean and undamaged. Always grease the O-ring before deployment.

If your instrument is equipped with a pressure sensor, make sure you do not deploy the instrument at a greater depth than the maximum depth for the pressure sensor, unless a pressure stopper is installed on the pressure inlet.

- ❑ Inspect O-ring grooves, and replace O-rings before deployment. Make sure that the O-ring on the Top-end plate is clean and greased.
- ❑ Make sure that the protective cap is installed on the electrical terminal.
- ❑ When the system is armed and ready for deployment, the main switch must stay switched on.
- ❑ When placing the instrument into its pressure case we recommend that you insert the instrument 90° off orientation mark. When the instrument is resting on the O-ring, spin the instrument towards orientation.
- ❑ Tighten the C-clamps until the Top-end plate rests against the top of the case. Avoid over tightening, as this will damage the clamp.

Illustrations of deployment preparations

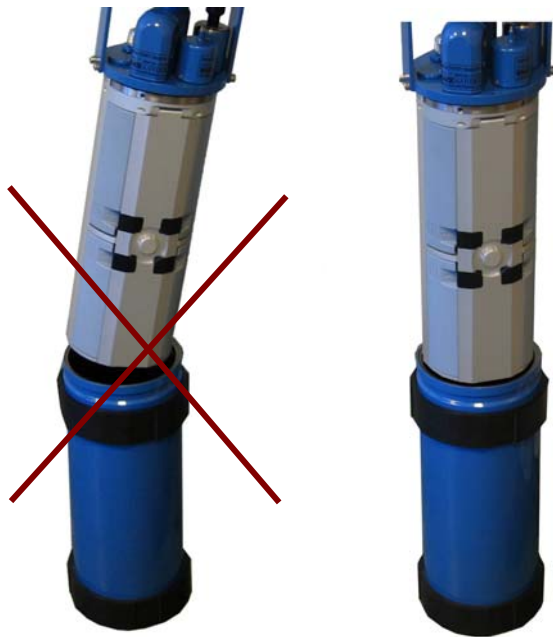


Figure 7-1 Insert Instrument into Pressure Case.

Note! Lower the instrument carefully straight down into the pressure case, do not pinch or nick O-ring. With the instrument Top-end plate seated into pressure case, sin the Top-end plate assembly 180° on the O-ring in order to seat the O-ring and remove any possible contamination from between the O-ring and its sealing surfaces.



Figure 7-2 Tighten C-clamps until the pressure case rotates on the floor. Avoid over tightening as this will bend the C-clamps.



Important! When connecting one shackle to another, remember to use shackles of same type of metal to avoid corrosion.

Figure 7-3 Fasten shackle in frame. Tighten thoroughly.



Figure 7-4 Splice the rope and fasten it to the thimble attached to the shackle.



Figure 7-5 Lock the shackle with strips or locking wire. Locking wire is recommended for higher security in long deployments.



Figure 7-6 Mount the instrument into the frame.

Retrieval of the Instrument

When the instrument is retrieved after deployment, remove marine growth and barnacles from the sensor(s) using a hand scrub. To remove seashells or corals use plastic handle or similar tools.

Note! Do not use any kind of steel brush or any sharp objects; this might damage the acoustic elements.

When inspecting, look for corrosion on connector's cracks on the back potting of connectors and scratches on protecting cable(s) jacket.

Rinse the instrument in fresh water and dry it. The unit can then be opened and the instrument removed from its pressure container.

Procedure for retrieving measurement data:



Figure 7-7 SD card

- ❑ Stop the recorder if any battery capacity is left. Wait until the progress bar has completed.
- ❑ Write down the time of the last recording.
- ❑ Turn off the power switch in the front of the instrument.
- ❑ Connect the standard cable 4299 between the instrument and your PC. Open the Windows Explorer and copy the measurement data from the SD card folder in the *mobile device*. OR via an SD card reader: Remove the data storage unit, the SD card, from the recording unit by releasing the screw cover below the display, and press the card in to have it released. Put the SD card into an SD reader connected to your PC and copy the measurement data.

- ❑ Start up the SEAGUARD Studio and import your data as described in CHAPTER 4.

Connection and disconnection of sensors

Procedure for connecting a sensor

Important! Do not twist the sensor to connect it. Gently push down the sensor.

AiCaP sensors can be connected in sensor position 1-6 (refer Figure 5-8); Analog sensors (0-5V) must be connected in sensor position 2,3,4 and 5. AiCaP sensors in position 1,2,3,4,5 are connected directly onto the HUB, while AiCaP sensors in position 6 must be connected to the sensor board using a ribbon cable. Inspect and replace sensor O-rings if necessary. Align the orientation pin for correct orientation of the sensor.

For connections of the sensors, please follow the listed procedure (steps 1 to 8):

1. Remove the instrument from the pressure case by releasing the two C-clamps at the Top-end plate and lift the instrument.
2. Switch OFF the instrument.
3. Loosen the set screw that goes with the sensor position, refer Figure 7-11, rightmost illustration. Do not unscrew the set screw completely and remove it, as it might be lost.
4. Pull up the sealing plug. Clean the boreholes.

5. Inspect the O-rings of the new sensor. Follow option a - c depending on the type of sensor to connect/the sensor position on the Top-end plate:
 - a. AiCaP sensor in position 6: Disconnect the upper battery. Unscrew and remove the two screws that hold the top cover. Refer Figure 7-12. Remove the top cover. Thread the ribbon sensor cable through the borehole. Align the orientation pin for correct orientation of the sensor. Gently push down the sensor. Refer Figure 7-13. Connect the sensor cable to J6 on the HUB; refer Figure 7-14.
 - b. AiCaP sensor in position 1,2,3,4,5: Gently push down the sensor, refer Figure 7-11. Ensure that the red dip switch on the HUB is in *off* position, refer Figure 7-9.
 - c. Analog sensor in position 2,3,4,5: Gently push down the connecting end of the cable. Set the red dip switch on the HUB in *on* position, refer Figure 7-9. Attach the analog sensor to the adapter end of the cable.
6. Fasten the sensor position set screw.
7. Remount the top front cover, reinsert the upper battery, and tighten the battery lid.
8. Put the instrument back into the pressure case and tighten the C-clamps.

Important! Make sure that the sensors and the C-clamps are well tightened to prevent water to infuse the system. Do not over tight, as this will damage the sensors and the clamps.

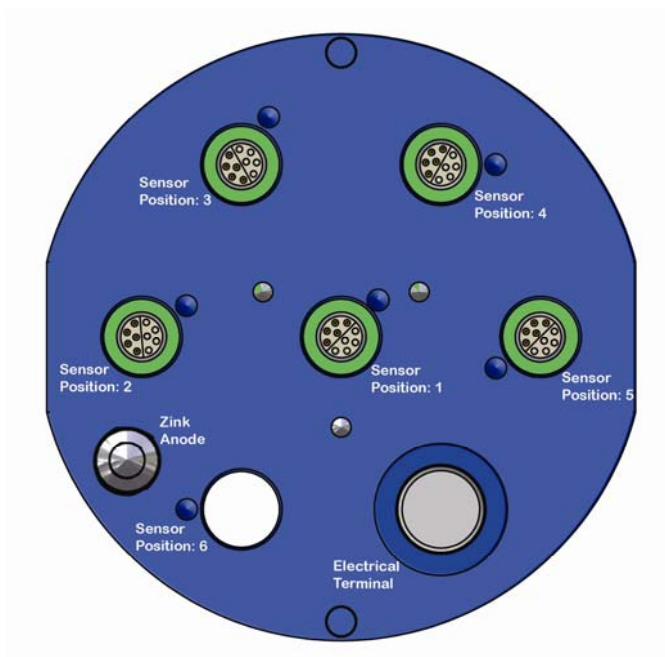


Figure 7-8 Top view of Top-end plate; Sensor Positions.

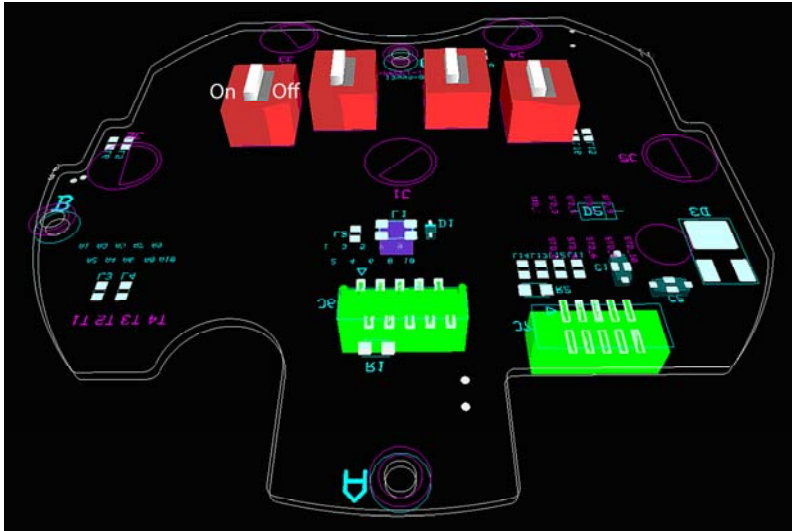


Figure 7-9 Drawing of HUB with 4 red Dip Switches at the back. AiCaP sensors installed: Switch to the right (off-position), Analog sensors: Switch to the left.

Illustration of a sensor connection

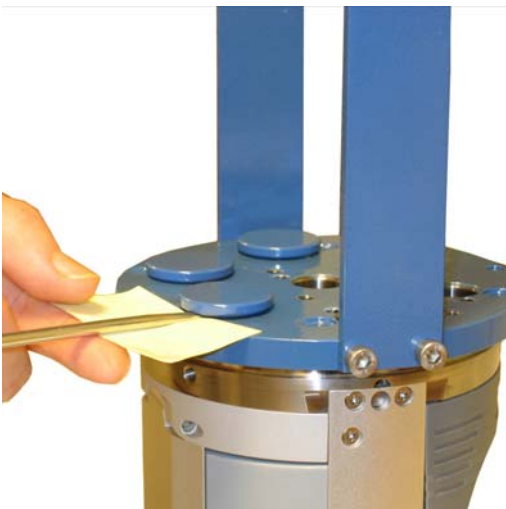


Figure 7-10 Removal of sealing plug. Loosen the set screw. Use a small bit of paper/cardboard to protect the top end plate.

AiCaP Sensor in position 1,2,3,4 and 5:

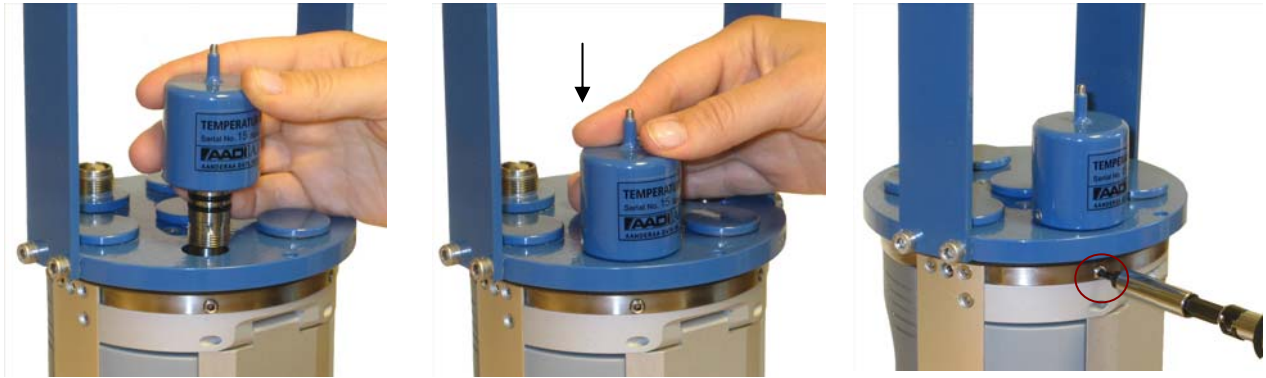


Figure 7-11 AiCaP sensors: Place the sensor according to the orientation pin. Push down the sensor and fasten the set screw.

AiCaP Sensor in position 6:

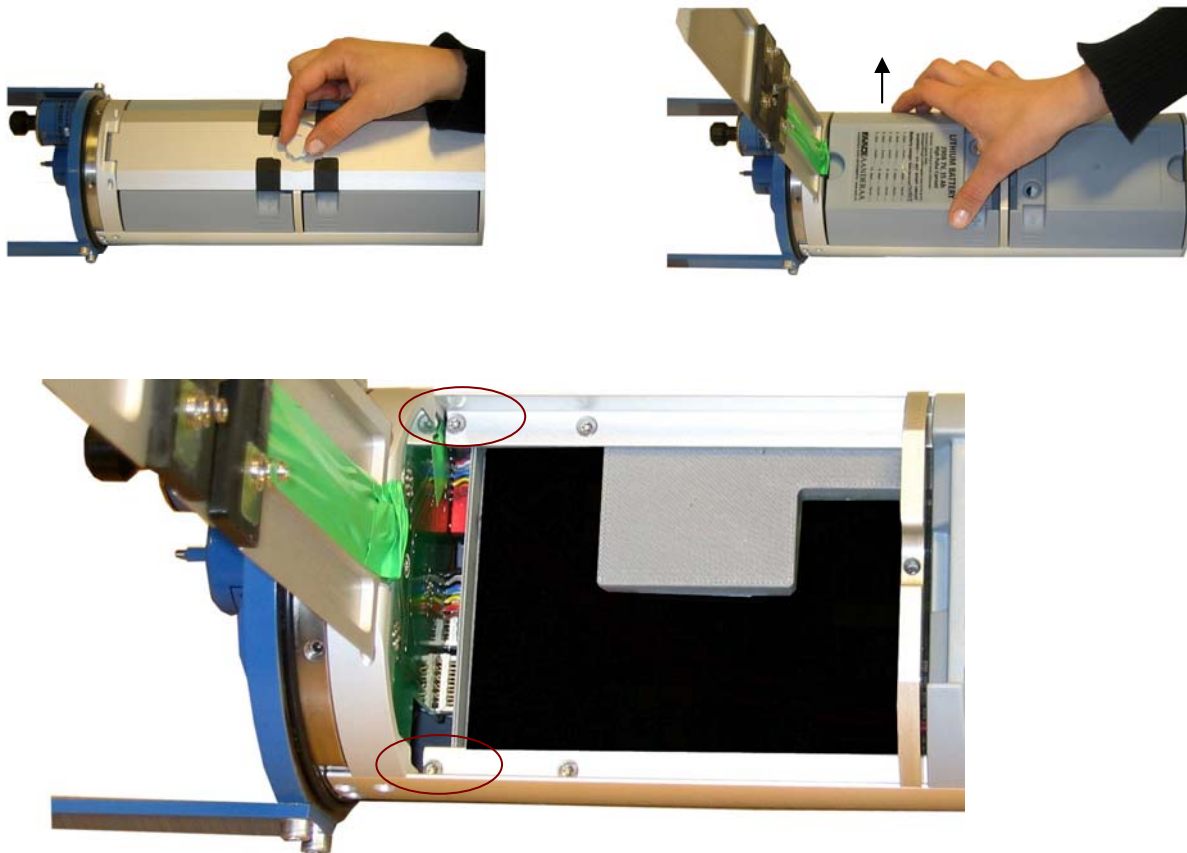


Figure 7-12 Open the battery lid, remove the upper battery, and unscrew the two top screws that holds the top front cover. Turn the instrument and pull off the top front cover.

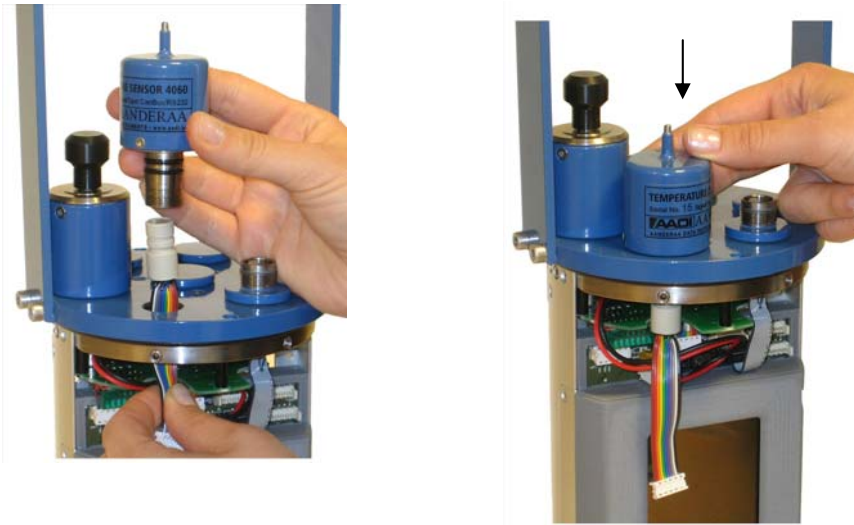


Figure 7-13 Connect the sensor to the patch cable 3969492.

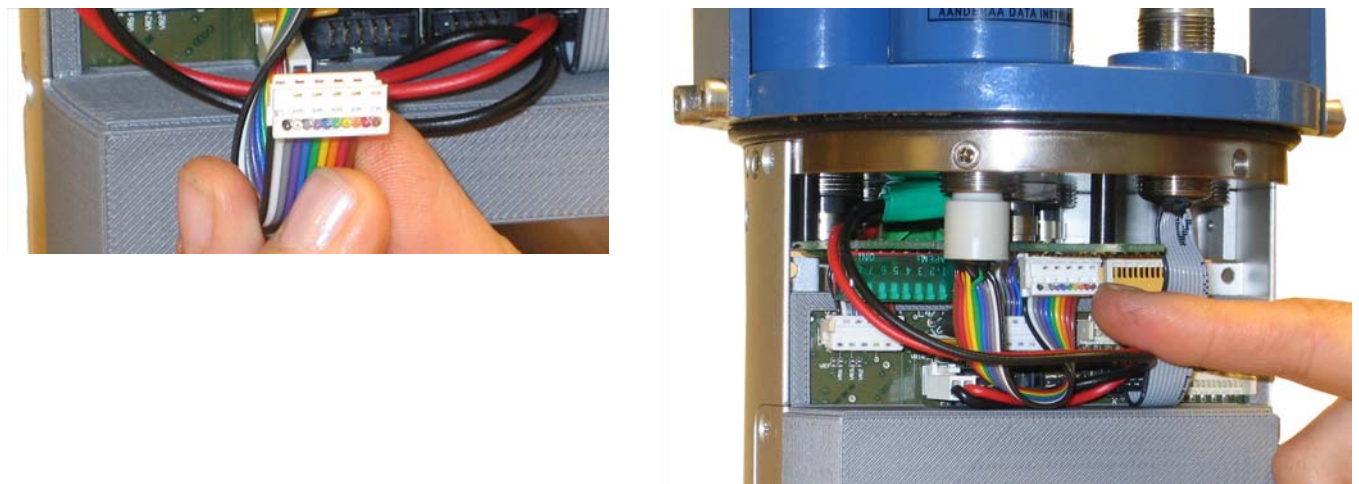


Figure 7-14 Connect the patch cable to HUB plug J6.



Figure 7-15 Connect the ZPulse™ DCS for the SEAGUARD® RCM.

Procedure for disconnecting a sensor

Important! Do not twist the sensor to disconnect it. Pull the sensor straight up until released.

For disconnection of the sensors, please follow the listed procedure:

1. Remove the instrument from the pressure case by releasing the two C-clamps at the Top-end plate and lift the instrument.
2. Switch OFF the instrument.
3. Loosen the set screw that goes with the sensor position; refer Figure 7-11, rightmost illustration. Do not unscrew the setscrew completely and remove it, as it might be lost.
4. Disconnect the upper battery, refer procedure on page 72 and Figure 7-11. Unscrew and remove the two screws that hold the top front cover, refer Figure 7-12. Remove the top front cover. Follow option a or b depending on the type of sensor to disconnect/the sensor position on the Top-end plate (refer Figure 7-8):
 - a. Sensor in position 1,2,3,4, and 5: pull up the sensor or the Analog sensor cable. If the removed sensor is an analog sensor: switch *off* the corresponding dip switch, refer Figure 7-9.
 - b. Sensor in position 6: Disconnect the sensor cable from the HUB. Disconnect the sensor from the patch cable and pull up the sensor.
5. Clean the borehole. Inspect and replace the O-ring of the sealing plug if necessary, and insert it into the sensor connection position. Fasten the set screw that goes with the sensor position.
6. Remount the top front cover, insert the upper battery and tighten the battery lid.
7. Put the instrument back into the pressure case and tighten the C-clamps.

Important! Make sure that the sealing plug and the C-clamps are tightened to ensure that no water will infuse the system. Do not over tighten as this will damage the sensors and the clamps.

Battery

The battery compartment, at the rear of the SEAGUARD[®], has room for two batteries, refer Figure 0-2.

Note! If the manufacture date of your lithium battery has expired one month, or you have not used the instrument the last month, you probably have to rejuvenate the battery to remove oxidizing. Start the instrument and wait for about 10 minutes while the battery is recharging or use a 100 Ω resistor up to 6.3 V for rejuvenating.

Removal and insertion of the Battery

To remove a battery from the SEAGUARD[®] instrument, follow the instructions below. The procedure is illustrated in Figure 7-12:

1. Place the instrument on the desk with the front facing down.
2. Loosen the centre screw at the rear of the instrument. *NOTE! The screw can not be completely removed.*
3. Flip up the battery cover.
4. Lift the battery straight out.

To insert the battery, follow these instructions:

1. Place the instrument on the desk with the front facing down.
2. Open the rear cover and remove the battery to be replaced, refer the procedure listed above.
3. Place the battery with the connection pins towards the centre, refer Figure 7-16.
4. Let down the battery cover.
5. Tighten the cover screw in the rear centre of the instrument.



Figure 7-16 The battery compartments are in the rear of the instrument.

Rejuvenating of Lithium batteries



If the manufacture date of your lithium battery has expired one month, or you have not used the instrument the last month, you probably have to rejuvenate the battery to remove oxidizing.

The rejuvenating can be done in two ways. Either start the instrument and wait for about 10 minutes while the battery is recharging or use a 100 Ω resistor up to 6.3 V, refer Figure 7-18.

Figure 7-17 Check the manufacture date



Figure 7-18 Use a 100 Ω resistor up to 6.3 V to rejuvenate the battery.

SD card

Insert the *SD card* by first unscrewing the SD card-cover at the front of the instrument, refer Figure 7-7. Secondly insert the card with the terminals to the right.

CHAPTER 8 Maintenance

General

Fouling of the SEAGUARD® Instrument will occur during deployment, especially at low latitudes. The use of anti-fouling paint must be considered based on your own experience.

The complete firmware in the SEAGUARD® may be upgraded by means of the SD card.

Yearly Maintenance

The procedure below indicates the minimum maintenance that must be carried out each year or every time the SEAGUARD® has been retrieved, two to four times a year for fixed installations depending on the environmental conditions, and every 3 years for factory service:

1. Remove marine growth and barnacles from the sensor(s) using a hand scrub. To remove sea shells or corals use plastic handle or similar tools.
2. When inspecting, look for corrosion on connector's cracks on the back potting of connectors and scratches on protecting cable(s) jacket.
3. Rinse the exterior of the instrument in fresh water and let dry.
4. Clean the transducer head.
5. Open the instrument and check for leakage through the transducer head or in the pressure case. If leakage, locate the source of the leakage and correct it.
6. Replace the zinc anodes and corroded parts if necessary.
7. Remove the O-rings.
8. Make sure that the O-ring seatings have a clean and smooth surface.
9. Lubricate the O-rings with grease (Klüber Lubrication Syntheso Glep 1 or similar synthetic grease).
10. Replace the O-rings and pressure inlet.
11. If the transducer head has been disconnected, replace the silica gel bags.
12. Always install new O-rings on plugs that have been disconnected.
13. Check for deformation of the C-clamps. Replace if necessary.
14. Always apply TECTYL® on screws before installation to avoid crevice corrosion. Add also TECTYL® around sensors and sealing plugs.
15. Check for scars on the EPOXY coating, the Top-end plate and the frame.
16. Clean the scars with Acetone.
17. Apply Repair Lacquer to repair the scars.
18. Control that the Electrical terminal is securely tightened.

Illustrations of Maintenance Procedures



Figure 8-1 Clean O-ring seating.



Figure 8-2 Clean O-ring seating; instrument up-side-down.



Figure 8-3 Fasten the set screws before putting on new O-ring.



Figure 8-4 Lubricate O-rings with grease. (Klüber Lubrication Syntheso Glep 1 or similar synthetic grease).



Figure 8-5 Add Tectyl® around sensors and sealing plugs.

Factory Service

Factory service is offered for maintenance, repair or calibration of instrument and parts.

When returning instrument or parts for service, always include the *Instrument Service Order*, Form No. 135, see our web pages under 'Support and Training'. Normal servicing time is four to six weeks, but in special cases the service time can be reduced.

A main overhaul and service is recommended at the factory every three years.

Tools- and Maintenance Kit

The manufacturer always keeps a stock of spare parts, accessories and consumable parts for quick delivery. Orders may be placed by fax, telephone or e-mail. See Table 8-1 for SEAGUARD® Tool Kit list, kit no. 3986A.

Table 8-1 Tool Kit for SEAGUARD®, kit no. 3986A

Part. no	Description	Pieces
913013	Allen Key, NV 5 mm	1
913002A	Allen Key, NV 4 mm	1
913022	Allen Key, NV 3 mm	1
913009	Allen Key, NV 2.5 mm	1
913035	T-10 Torx Screwdriver	1
913036	Flat Screwdriver (5 mm)	1

Maintenance Kit for SEAGUARD®

This kit, part no. 3813, can be ordered from the manufacturer, refer to Table 8-2.

Table 8-2 Maintenance Kit 3813C/3813D for SEAGUARD®

Part. no	Description	Pieces	Pieces
		3813C (LW/IW)	3813D (DW)
963352	Zinc Anode, Ø16	1	1
865001	O-Ring, SOR 71 (109.5 x3.0mm)		2
865000	O-Ring, SOR 72 (114.5x3.0mm)	2	
863008	O-Ring, SOR 131 (18.1x1.6)	2	2
862011	O-Ring, SOR 125 (12.1x1.6)	2	2
963384	Pressure Inlet.	1	1
260087	Kluber, Syntheso GLEP I.	1	1
972579A	Repair Lacquer, Jotun Blue.	1	1
972577	Tectyl 506. 10cl.	1	1

Software update of Main Board

Instructions for uploading SEAGUARD® Image and descriptions around the procedures are given below.

Upload SEAGUARD® Image and Update New Registry

This section covers the task of upgrading a SEAGUARD® image (the main software of the unit) and the instrument database (the Registry).

The Registry is a vital part of the SEAGUARD® software. The registry holds information that the Instrument software applies to obtain information about different software components the system loads and unloads during an execution.

There are actually three copies of the Registry in the system. One is stored together with the image and is called the ROM version. Another is stored in Flash

and is called the Flash version. None of these are not lost when power is switched off.

When the instrument is switched ON, the operating system first looks for a copy of the Registry in the Flash; this version of the Registry is then copied into RAM and becomes the working Registry. If it does not find a valid Registry in the Flash, it copies the default ROM version (which is always present) into RAM and makes this one the working Registry.

When uploading an image from a SD card, this will erase the Flash version of Registry and force the instrument to use the ROM version that came with the new image.

Instructions for Uploading SEAGUARD® Image

If you already have a SD card with a SEAGUARD® Image ready, skip to step 5.

1. Use a SD card of at least 64 MB. Preferably use the SD card you received with the instrument.
2. Insert the SD Reader into the USB slot. Make sure a disk named *Removable Disk* appears in *Explorer*.
3. Erase all content of the SD card. Make sure that the file system is *FAT* in the properties command in *Explorer*. If you prefer to erase the card using the *Format* command, use *FAT* file format (not FAT32 or NTFS).
4. Copy the file named *NK.nb0* to the SD card.
 - a) Select the file in the PC directory.
 - b) Right-click and select *Copy*.
 - c) Move to the *Removable Disk* folder, right-click and select *Paste*.
 - d) It takes some time to transfer the large file (32 MB). However, *Explorer* will report *finish* before the complete transfer has taken place. Thus, monitor the yellow light on the SD Reader for blinking. When the blinking stops, wait an additional minute.
 - e) Remove the SD card from the reader.
 - f) Click *Refresh* in *Explorer* (or go to another directory and back to *Removable Disk*) and confirm that there is no card in the reader.
 - g) Insert the SD card again and confirm that the file *NK.nb0* actually exists on the card.
5. Install the SD card in the SEAGUARD® SD slot.



Figure 8-6 The SD card Housing

6. Open the SD card Housing in the SEAGUARD®.
7. Use the stylus to press and hold down the lower boot button in the SD card Housing; Switch *ON* the SEAGUARD® before releasing the boot button. Observe that the LCD screen turns on.
8. Release the boot button.
9. Tap the boot button once more; the LCD screen will now appear dark.
10. Release the boot button once more and wait until the LCD screen turns on again; the new image is about to be transferred. The image is large in size, and will take approximately 10 minutes to download.
11. When the download has finished, the ordinary start-up screen, with the *Menu* button appears.
12. Switch *OFF* the instrument using the power switch, and then switch it back *ON* to confirm that the new image has been installed.

Time settings



Figure 8-7 Date/Time Properties

Greenwich Mean Time (GMT) is set as default time zone. It is not possible to change the default setting.

You can adjust the time settings. Tap *Control Panel* in the main menu. Double click on the Date/Time icon, and you will get the *Date/Time Properties*, refer Figure 8-7.

Note! If possible we recommend to adjust the time every 3rd month.

Appendix 1 Technical Specifications

SEAGUARD® Platform Specifications

SEAGUARD® Platform Specifications	
Platform capability: 60 nodes can be connected to the platform	
Top-end plate capability: Up to 6 sensors can be fitted onto the Top-end plate, of which 4 can be analog sensors (0-5V, requires the optional analog kit)	
Recording System:	Data Storage on SD card
Storage Capacity:	512 MB
Battery Alkaline 3614:	9V, 15Ah (nominal 12.5Ah; 20W down to 6V at 4°C)
or Lithium 3677:	7.2V 30Ah
Recording Interval:	From 2s, depending on the node configuration for each instrument
Recording settings:	Fixed interval settings Customized Sequence setting
Protocol:	AiCaP CANbus based protocol
Depth Capacity:	300m/2000m/6000m
Platform Dimensions: 300m version:	H: 356mm OD: 139mm
2000m version:	H: 352mm OD: 140mm
6000m version:	H: 368mm OD: 143mm
External Materials 300m version:	PET, Titanium, Stainless Steel 316, Durotong DT322 polyurethane
2000/6000m version:	Stainless steel 316, Titanium, OSNISIL, Durotong DT322 polyurethane
Weight:	Depend on node configuration
Packing:	Depend on node configuration