



***Simrad SN90
Purse Seine and Trawling Sonar
Factory Acceptance Test***

This is the Factory Acceptance Test for the Simrad SN90 Purse Seine and Trawling Sonar.

The purpose of this Factory Acceptance Test is to verify that the SN90 system is fully functional, and meets the operational requirements. It is then ready for packing and shipment. When all the tasks have been done, the report form must be signed by the relevant parties. The completed document then becomes the official report.

Vessel/Customer

Serial numbers (if applicable)	
Processor Unit	
Operating Panel	
Transceiver Unit	
Hull Unit	
Transducer	

Document information

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Kongsberg Maritime disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Disclaimer

Kongsberg Maritime AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

Support information

If you require maintenance or repair, contact your local dealer. You can also contact us using the following address: simrad.support@simrad.com. If you need information about our other products, visit <https://www.simrad.com>. On this website you will also find a list of our dealers and distributors.

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Introduction

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Purpose

This is the Factory Acceptance Test for the Simrad SN90 Purse Seine and Trawling Sonar.

The purpose of this Factory Acceptance Test is to verify that the SN90 system is fully functional, and meets the operational requirements. It is then ready for packing and shipment. When all the tasks have been done, the report form must be signed by the relevant parties. The completed document then becomes the official report.

Note

Due to physical and functional restrictions, the Factory Acceptance Test of the SN90 is done without Hull Unit and transducer. The hull unit and the Motor Control Unit are replaced with a hull unit simulator. The transducer is replaced with a dummyload.

Personnel and location

Successful completion of the test requires qualified and experienced test engineers and/or technicians.

This Factory Acceptance Test is done at the Kongsberg Maritime premises in Horten, Norway. The test is done by personnel from Kongsberg Maritime. All personnel must have good knowledge of the product and/or module(s) at hand. Basic knowledge of computer BIOS and the Windows® operating systems, as well as electronic circuitry and device programming is required.

Representatives from the client and/or end user may be present to witness the test and results.

As with all assembly and test procedures related to advanced technical and/or electronic equipment, the skill of the operator is vital to a successful completion of the tasks. The only way to secure high quality of our products is first rate workmanship and high professional standards throughout the production chain.

It is equally important that all members of the production and test crews show initiative, and are willing to suggest improvements to functionality, design, procedures and documents. If you find a mistake in a document, or find that information is missing, offer this information to the proper authorities without further delay. Likewise, your experience as a skilled worker is valuable. Please forward any suggestions to make improvements to the product, the design, the production method, or any other matters related to your expertise.

Referenced documents

The installation and use of the SN90 is described in several documents and end user manuals. Internal test documents are used throughout the production and test of the SN90.

This list is not complete. Additional documents and end user manuals are available for the SN90. These publications are not relevant for this Factory Acceptance Test.

Note

Unless specified in the applicable procedure(s), the SN90 publications listed here are not required during this Factory Acceptance Test.

All the document numbers refer to the English version of each publication.

End user manuals

- **Reference Manual and On-line Help:** 381294
- **Installation Manual:** 381298

Software documents

- **Software Release Note:** 429756

Customer acceptance test procedures

- **Factory Acceptance Test:** 438849
- **Harbour Acceptance Test:** 438850
- **Sea Acceptance Test:** 438851

Qualifying documents

- **EC Declaration of Conformity:** 415475

Tools and test equipment

Specific tools and test equipment are required for this Simrad SN90 Factory Acceptance Test. The required tools and equipment must be made available before the test can start.

The required test equipment is listed. For each item, record the instrument's serial number and - if relevant - its calibration expiry date.

Simrad SN90 Factory Acceptance Test

Dummyload (Make and model)	Serial number	Calibration expiry date
Kongsberg Maritime 382-222028	N/A	N/A

Hull unit simulator (Make and model)	Serial number	Calibration expiry date
Kongsberg Maritime 348583	N/A	N/A

Multimeter (Make and model)	Serial number	Calibration expiry date

Acceptance test summary

The purpose of this Factory Acceptance Test is to verify that the SN90 system is fully functional, and meets the operational requirements. This acceptance test summary is provided to offer an overview of the functions and items that need to be tested. References are made to the individual chapters in this Factory Acceptance Test.

Context

A hull unit may be provided as an optional method to lower and hoist the transducer.

Note

All information and tasks related to the hull unit may be disregarded and omitted if the SN90 is known to be supplied without this unit.

Procedure

- 1 Record the software and hardware items that are included in the test.
 - [Hardware and software registration, page 10](#)
- 2 Do a visual inspection of each unit that is comprised by the SN90 delivery.
 - [Visual inspection, page 16](#)
- 3 Test the main functionality of the SN90.
 - [Testing the SN90 operational functionality, page 23](#)
- 4 Test the interfaces between the SN90 and relevant external devices and/or sensors.
 - [Testing the interfaces with peripheral devices, page 36](#)
- 5 When all the tests have been successfully concluded, open the *Customer acceptance* form, and fill it in with the relevant signatures.
 - [Customer acceptance form, page 45](#)

Hardware and software registration

Topics

[Software items, page 11](#)

[Hardware items, page 12](#)

Software items

Every software program that is provided as a part of the SN90 delivery must be registered. Part number and software version must be registered. When software media (USB flash drive, CD, DVD etc) is provided, the part number of the media and the SN90 software version provided on the media must be registered.

Software	Part number	Software version
Simrad SN90	382869	

Software media	Part number	Software version
Simrad SN90 Software	382870	
Simrad SN90 End user manuals	385347	N/A
When applicable, the <i>software media</i> item can be any memory device (CD, DVD, USB flash drive, etc) that contains the SN90 software. End user documentation may be included on the same software media, or provided on a separate device.		

Hardware items

Topics

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[Processor Unit, page 12](#)

[Transceiver Unit, page 13](#)

[Operating Panel, page 14](#)

[Hull Unit, page 14](#)

[Transducer, page 15](#)

Display

Each display provided with the SN90 delivery must be uniquely identified. Make(s), model(s), part number(s) and serial number(s) must be registered. Any unit that is not provided by Kongsberg Maritime AS does not need to be registered.

Display (Make and model)	Part number	Serial number	Revision

Fill in the make, model and serial number for each unit that is provided with the SN90 delivery. If applicable, add the order number. The unit contains neither circuit boards nor modules that need to be identified separately.

Processor Unit

The Processor Unit provided with the SN90 delivery must be uniquely identified. Make, model, part number and serial number must be registered.

Processor Unit	Part number	Serial number	Revision
Processor Unit (with SN90 software)	382908		
The unit contains neither circuit boards nor modules that need to be identified separately.			

Transceiver Unit

The Transceiver Unit provided with the SN90 delivery must be uniquely identified. Make, model, part number and serial number must be registered. The Transceiver Unit contains circuit boards and modules that must be recorded separately.

SN90 Transceiver Unit

The Transceiver Unit controls the transmission and reception made by the 256 transmitters and 256 receiver channels. 8 identical transceiver boards are used. The Transceiver Unit also holds an Ethernet switch and a large capacitor bank.

Transceiver Unit	Part number	Serial number	Revision
SN90 Transceiver Unit	383022		
This unit contains circuit boards or modules that must identified separately. Observe the relevant hardware registration tables.			

Transceiver boards

Transceiver boards(From left)	Serial number	Revision
1		
2		
3		
4		
5		

Transceiver boards(From left)	Serial number	Revision
6		
7		
8		
Transceiver board (Type): LPT32 Transceiver Board		
Part number: 425841		

Ethernet switch

Ethernet switch (Make and model)	Part number	Serial number	Revision
Hewlett Packard HP3600-24	382039		
The unit contains neither circuit boards nor modules that need to be identified separately.			

Operating Panel

The Operating Panel provided with the SN90 delivery must be uniquely identified. Make, model, part number and serial number must be recorded.

Operating Panel	Part number	Serial number	Revision
SN90 Operating Panel	SH8-203593		
SN90 Operating Panel Power Supply	361102	N/A	N/A
These units do not contain any circuit boards or modules that must be identified separately.			

Hull Unit

A hull unit may be provided as an optional method to lower and hoist the transducer. The hull unit provided with the SN90 delivery must be uniquely identified. Type, part number and serial number must be registered.

Hull Unit (Type)	Part number	Serial number	Revision
Hull Unit SN92H	424184		
The unit contains neither circuit boards nor modules that need to be identified separately.			

Transducer

The transducer provided with the SN90 delivery must be uniquely identified. The SN90 transducer is available in four different versions. Only the version ordered is provided with the delivery.

Transducer	Part number	Serial number
Transducer SN90	382806	
Transducer SN91	382811	
Transducer SN92	382816	
Transducer SN93	382817	
The unit contains neither circuit boards nor modules that need to be identified separately.		

A hull unit may be provided as an optional method to lower and hoist the transducer. When this option is selected, the transducer is delivered readily mounted at the lower end of the transducer shaft.

Visual inspection

Topics

[Inspecting logistic items, page 17](#)

[Visual inspection of the display, page 17](#)

[Visual inspection of the Processor Unit, page 18](#)

[Visual inspection of the Operating Panel, page 19](#)

[Visual inspection of the Transceiver Unit, page 20](#)

[Visual inspection of the hull unit, page 20](#)

[Inspecting the transducer, page 21](#)

Inspecting logistic items

All relevant logistic items that are included with the SN90 delivery shall be inspected. This includes end user manuals, operational software and software media. If spare parts are included in the delivery, these shall also be inspected.

Prerequisites

The list of logistic items to be delivered (order confirmation or contract) must be available. All the relevant items must be available for inspection. Neither tools nor instruments are required.

Procedure

- 1 Verify that the SN90 end user manuals have been provided.
- 2 Verify that the applicable SN90 software media (USB flash disk, CD, DVD etc) have been provided.
- 3 Verify that the spare parts provided matches the order confirmation for the SN90 delivery.

Result

Requirements	Results
All logistical items are available.	
Date and signature:	

Visual inspection of the display

A visual inspection of the SN90 display is required to verify its physical condition and appearance prior to delivery.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The SN90 is turned off. Neither tools nor instruments are required.

Context

This test procedure is only applicable when the display is provided by Kongsberg Maritime as a part of the SN90 delivery.

Procedure

- 1 Make sure that the unit's serial number has been recorded in the list of hardware items.
- 2 Make sure that the display is new.
- 3 Make sure that the unit is not physically damaged, and that the paint-work is clean without dents or scratches.
- 4 Make sure that the unit has been identified with the relevant product label(s), and that one label includes the part and serial numbers.

Result

Requirements	Results
The display is new, clean and free from scratches, dents or other physical damage.	
The display is clearly identified with the relevant product labels.	
Date and signature:	

Visual inspection of the Processor Unit

A visual inspection of the SN90 Processor Unit is required to verify its physical condition and appearance prior to delivery.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The SN90 is turned off. Neither tools nor instruments are required.

Procedure

- 1 Make sure that the unit's serial number has been recorded in the list of hardware items.
- 2 Make sure that the computer is new.
- 3 Make sure that the unit is not physically damaged, and that the paint-work is clean without dents or scratches.
- 4 Make sure that the unit has been identified with the relevant product label(s), and that one label includes the part and serial numbers.

Result

Requirements	Results
The Processor Unit is new, clean and free from scratches, dents or other physical damage.	
The Processor Unit is clearly identified with the relevant product labels.	
Date and signature:	

Visual inspection of the Operating Panel

A visual inspection of the Operating Panel is required to verify its physical condition and appearance prior to delivery.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The SN90 is turned off. Neither tools nor instruments are required.

Procedure

- 1 Make sure that the unit's serial number has been recorded in the list of hardware items.
- 2 Make sure that the Operating Panel is new.
- 3 Make sure that the unit is not physically damaged, and that the paint-work is clean without dents or scratches.
- 4 Make sure that the unit has been identified with the relevant product label(s), and that one label includes the part and serial numbers.

Result

Requirements	Results
The Operating Panel is new, clean and free from scratches, dents or other physical damage.	
The Operating Panel is clearly identified with a product label.	
Date and signature:	

Visual inspection of the Transceiver Unit

A visual inspection of the Transceiver Unit is required to verify its physical condition and appearance prior to delivery.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The SN90 is turned off. Neither tools nor instruments are required.

Procedure

- 1 Make sure that the unit's serial number has been recorded in the list of hardware items.
- 2 Make sure that the Transceiver Unit is new.
- 3 Make sure that the Transceiver Unit is fully populated with all circuit boards and modules mounted.
- 4 Make sure that the unit is not physically damaged, and that the paint-work is clean without dents or scratches.
- 5 Make sure that the unit has been identified with the relevant product label(s), and that one label includes the part and serial numbers.

Result

Requirements	Results
The Transceiver Unit is new, clean and free from scratches, dents or other physical damage.	
The Transceiver Unit is clearly identified with the relevant product labels.	
The Transceiver Unit is fully populated with all circuit boards and modules mounted.	
Date and signature:	

Visual inspection of the hull unit

A visual inspection of the hull unit is required to verify its physical condition and appearance prior to delivery.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The SN90 is turned off. Neither tools nor instruments are required.

Procedure

- 1 Make sure that the unit's serial number has been recorded in the list of hardware items.
- 2 Make sure that the hull unit is new.
- 3 Make sure that the unit is not physically damaged, and that the paint-work is clean without dents or scratches.
- 4 Make sure that the unit has been identified with the relevant product label(s), and that one label includes the part and serial numbers.

Result

Requirements	Results
The hull unit is new, clean and free from scratches, dents or other physical damage.	
The hull unit is clearly identified with the relevant product labels.	
Date and signature:	

Inspecting the transducer

The transducer surface must be inspected for potential damage that may have an effect on SN90 operation.

Prerequisites

Neither tools nor instruments are required.

Context

The transducer is covered with a thick red protective coating made of a special plastic type. The red protective coating is an vital part of the transducer. It is very important that neither this coating nor the internal parts of the transducer are damaged during the handling, installation or cleaning. Any holes and/or scratches in the transducer surface will allow water to penetrate the transducer. If a leak occurs, the transducer must be replaced.



Procedure

- Do a thorough visual inspection of the transducer.
Check for dents, scratches, holes or other damage to the surface.

Result

Requirements	Results
The transducer is new, clean and free from scratches, dents or other physical damage.	
Date and signature:	

Testing the SN90 operational functionality

Topics

[Measuring the BITE noise with the transducer disconnected from the Transceiver Unit, page 23](#)

[Measuring the B-Scan noise with the transducer disconnected from the Transceiver Unit, page 25](#)

[Testing the user interface to verify basic functionality, page 27](#)

[Verifying SN90 operation by means of the BITE functionality, page 28](#)

[Verifying SN90 operation by means of the Element BITE functionality, page 31](#)

Measuring the BITE noise with the transducer disconnected from the Transceiver Unit

Low noise is a key factor for high quality and reliable measurements. The performance of the SN90 will always be limited by different noise sources. A high noise level will mask the echoes and make them difficult to read and interpret. The noise is measured while the SN90 operates in *Passive* mode with the transducer disconnected.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The hull unit and the Motor Control Unit are replaced with a hull unit simulator. The transducer is replaced with a dummyload. The SN90 is turned on, and it is working normally. Neither tools nor instruments are required.

Context

This task allows you to check the noise conditions. To measure the noise level, observe the value presented on the **Noise** page in the **BITE** dialog box.

Note

This task must be done with the transducer cable disconnected from the Transceiver Unit.

Procedure

- 1 Open the **Operation** menu.
- 2 Set **TX Power** to *Off*.
- 3 Disconnect the dummyload from the Transceiver Unit output.
- 4 Make the following preparations.
 - a At the bottom of the SN90 presentation, select a suitable presentation mode, and activate the *Horizontal* view.
 - b Set **Range** to: *1500 m*
 - c Set **Gain** to: *20*
The **Gain** setting has no effect on the noise measurement.
 - d Open the **Active** menu.
 - e Set the **Frequency** to: *75 kHz*
 - f Open the **Setup** menu.
 - g Select **BITE** to open the **BITE** (Built-In Test Equipment) dialog box.
 - h Select **Noise** to open the page.
- 5 Select **Start Noise Measurements**.
 - a Observe the noise curve.
 - b Read the maximum and average noise values.
 - c Repeat for selected frequencies.
 - d Record the frequencies and the measured values in the result table.

Result

For each transmit frequency (in kHz), write down the measured noise levels (in dB).		
Frequency	Maximum	Average
75 kHz		

For each transmit frequency (in kHz), write down the measured noise levels (in dB).		
95 kHz		
115 kHz		

Requirements	Results
Maximum noise level (in dB) shown on the Noise page when the transducer is disconnected is ≤ 46 dB.	
Maximum noise level measured on the Noise page:	
Date and signature:	

Measuring the B-Scan noise with the transducer disconnected from the Transceiver Unit

Low noise is a key factor for high quality and reliable measurements. The performance of the SN90 will always be limited by different noise sources. A high noise level will mask the echoes and make them difficult to read and interpret. The noise is measured while the SN90 operates in *Passive* mode with the transmit pulses disabled.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*. The hull unit and the Motor Control Unit are replaced with a hull unit simulator. The transducer is replaced with a dummyload. The SN90 is turned on, and it is working normally. Neither tools nor instruments are required.

Context

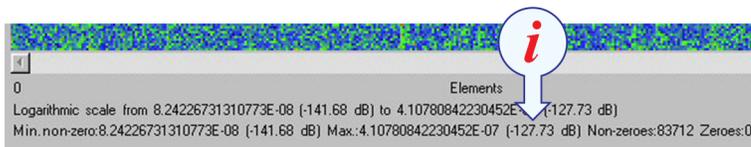
This task allows you to check the noise conditions. To measure the noise level, observe the value presented on the **B-Scan** page in the **Element BITE** (Element Built In Test Equipment) dialog box.

Note

This task must be done with the transducer cable disconnected from the Transceiver Unit.

Procedure

- 1 Open the **Operation** menu.
- 2 Set **TX Power** to *Off*.
- 3 Make sure that the dummyload is disconnected from the Transceiver Unit.
- 4 Make the following preparations.
 - a At the bottom of the SN90 presentation, select a suitable presentation mode, and activate the *Horizontal* view.
 - b Set **Range** to: *1500 m*
 - c Set **Gain** to: *20*
The **Gain** setting has no effect on the noise measurement.
 - d Open the **Active** menu.
 - e Set the **Frequency** to: *75 kHz*
- 5 Open the **Element BITE** (Element Built-In Test Equipment) dialog box.
 - a Open the **Setup** menu.
 - b Select **BITE** to open the **BITE** (Built-In Test Equipment) dialog box.
 - c Select **Processor** to open the page.
 - d Select **Element BITE** to open the dialog box.
 - e Select the **B-Scan** tab to open the page.
 - f Select **Element amplitude**.
 - g Set **Start sample** to *400*
 - h Set **Sample range** to *10,000*
- 6 Make sure that the channels are uniform.
- 7 Record the noise value at the bottom of the **B-Scan** page.



- 8 Make a screen capture of the **B-Scan** page, and save it.
Save the screen capture using a unique file name that identifies context, date, time and the relevant serial number.
- 9 Connect the dummyload to the Transceiver Unit output.

Result

Requirements	Results
Maximum noise level (in dB) shown on the B-Scan page when the transducer is disconnected is -115 dB.	
Maximum noise level measured on the B-Scan page:	
Screen captures are recorded and saved.	
Date and signature:	

Testing the user interface to verify basic functionality

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*.

- The transducer is replaced with a dummyload.
- The hull unit and the Motor Control Unit are replaced with a hull unit simulator.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Procedure

- 1 Make sure that the SN90 user interface is fully operational.
 - a Make sure that the SN90 visual presentation is shown with adequate quality.
If necessary, adjust the display and/or the relevant properties in the Processor Unit operating system.
 - b Make sure that the Operating Panel is functional.
Press and/or turn each button, and make sure that the corresponding function is activated in the user interface.
 - c Make sure that the menu system offered by the SN90 is operational.
Make random selections, and make sure that the relevant sub-menus, functions or dialog boxes are activated.

- d Make sure that the relevant views are operational.
Move the cursor to the views in the main SN90 presentation. Click inside one of the views. Make sure that the view is activated, and that relevant changes are made in any dynamic menus.
 - e If relevant, connect a computer mouse to the Processor Unit.
Make sure that the computer mouse works in the SN90 user interface. Make random selections, and make sure that the relevant sub-menus, functions or dialog boxes are activated.
 - f If relevant, connect a keyboard to the Processor Unit.
Make sure that the keyboard works in the SN90 user interface. Open relevant functions or dialog boxes, and make sure that you can type in them.
- 2 Select the icon on the top bar to open the **Messages** dialog box. 
- a Verify that no error messages are presented during normal operation.
 - b Close the dialog box by selecting **Close** or **[X]** in its top right corner.
- 3 Select **Help** on the top bar. 
- a Make sure that the online help opens on its start page.
 - b Close the online help.

Result

Requirements	Results
The basic functionality of the SN90 is present.	
No error messages are presented.	
The context sensitive online help is functional.	
Date and signature:	

Verifying SN90 operation by means of the BITE functionality

The purpose of the **BITE** (Built-In Test Equipment) dialog box is to allow on-line testing and verification of the SN90 hardware components.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*.

- The transducer is replaced with a dummyload.
- The hull unit and the Motor Control Unit are replaced with a hull unit simulator.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

By means of the **BITE** (Built-In Test Equipment) functionality, you can easily determine if the SN90 hardware is operational. And most important, you can make sure that all the transceivers channels and the transducer elements are functional. To open the different pages in the **BITE** (Built-In Test Equipment) dialog box, use the large "buttons" on the left hand side. Each button provides a small colour coded indicator.

- **No indicator**: Status is OK. No actions are necessary.
- **Yellow**: This is a warning. A closer investigation is recommended.
- **Red**: This is an alarm. A closer investigation is required.
- **Blue**: A device monitored by the BITE system is disabled.
- **Grey**: No information is available.

Note

*The **BITE** (Built-In Test Equipment) dialog box and functionality is only provided for performance monitoring. The functionality is not required for normal use of the SN90. The **BITE** dialog box does not permit you to change any operational parameters.*

Procedure

- 1 Do the following preparations.
 - a At the bottom of the SN90 presentation, select a suitable presentation mode, and activate the *Horizontal* view.
 - b Open the **Operation** menu.
 - c Set **TX Power** to *Maximum*.
 - d Set **Transmission Mode** to *Maximum*.
 - e Set **Operation** to *Normal*.
 - f Open the **Setup** menu.
 - g Select **BITE** to open the **BITE** (Built-In Test Equipment) dialog box.

- 2 Select **Transceiver** to open the page.

This page provides a graphic presentation of the 8 transceiver boards. The presentation reflects their physical location in the Transceiver Unit. Only static information is provided. The **Board Information** parameters offer key information about the supply power to the selected transceiver board, as well as the environmental conditions.

- 3 Make sure that all the 8 transceiver boards are fully functional.

- 4 Select **Transducer** to open the page.

The **Transducer** page presents all the elements that are used in the SN90 transducer. The presentation attempts to organize the elements in the same manner as in the physical transducer. The transceiver boards are shown as "buttons". Select a transceiver board to highlight the elements that are physically connected to the board.

- 5 Select **Reception Test** to start an automatic test of the individual transducer elements.

The reception test validates each single element in the SN90 transducer, and returns the status using a simple colour coding.

- **Green:** The transducer element is fully operational.
- **Red:** The transducer element offers reduced performance.
- **Black:** The transducer element is not working ("dead").

For more information, observe the tooltip provided for each element rectangle.

- 6 Verify that the maximum number of unserviceable ("dead") elements does not exceed 3.

A small number of unserviceable transducer elements are accepted, even for operational use. This is regarded as "graceful degradation".

The SN90 operates with 256 individual channels handled by 8 transceiver boards. If a single channel fails during normal operation, you are not likely to detect it. Even if several channels fail, you may not see it.

The detection of a faulty channel depends on the physical location of the relevant transducer element. If faulty channels are grouped together on the transducer face, this may cause a visible defect in the SN90 presentation. If they are scattered, the visible defect may be a lot harder to see. In all cases, the echoes from the neighbouring channels cause an interpolation that will restore a lot of the degraded presentation.

Note

*For further investigations of this issue, use the functionality offered by the **Element BITE** (Element Built In Test Equipment) dialog box.*

Result

Requirements	Results
The maximum number of unserviceable elements is 3.	
Maximum noise level measured on the B-Scan page:	
Screen captures are recorded and saved.	
Date and signature:	

Verifying SN90 operation by means of the Element BITE functionality

The purpose of the **Element BITE** (Element Built-In Test Equipment) dialog box is to allow on-line test and verification of the individual elements in the transducer. It allows you to see if the transducer elements are operational during transmission and reception. The **B-Scan** page allows you to monitor the time series of data that is received from each of the elements in the SN90 transducer. The start sample and the number of samples to be displayed are adjustable.

Prerequisites

The SN90 has been set up with its hardware units connected as specified in the SN90 *Installation manual*.

- The transducer is replaced with a dummyload.
- The hull unit and the Motor Control Unit are replaced with a hull unit simulator.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

By means of the **Element BITE** (Element Built-In Test Equipment) functionality, you can easily determine if the SN90 hardware is operational. The following pages are provided.

- **Matrix**

The **Matrix** page allows you to monitor the average signal values or signal phases from each of the channels and transducer elements in the SN90. The presentation is provided on a matrix corresponding to the element locations in the transducer.

- **B-Scan**

The **B-Scan** page allows you to monitor the time series of data that is received from each of the elements in the SN90 transducer. The start sample and the number of samples to be displayed are adjustable.

When you move the cursor over the B-Scan presentation of the SN90 transceiver channels, each element in the transducer is clearly identified as a long coloured vertical rectangle. If you place the cursor on top of one of these B-Scan rectangles, a small yellow tool-tip will identify key information.

- The identification of the transducer element
- The identification of the transceiver board
- The current sample you are looking at
- The measured echo value (in dB)

Procedure

- 1 Do the following preparations.
 - a At the bottom of the SN90 presentation, select a suitable presentation mode, and activate the *Horizontal* view.
 - b Set **Range** to: *1500 m*
 - c Set **Gain** to: *20*
 - d Open the **Operation** menu.
 - e Set **TX Power** to *Maximum*.
 - f Set **Transmission Mode** to *Maximum*.
 - g Set **Operation** to *Normal*.
 - h Open the **Active** menu.
 - i Set the **Frequency** to: *70 kHz*
 - j Open the **Setup** menu.
 - k Select **BITE** to open the **BITE** (Built-In Test Equipment) dialog box.
- 2 Open the **Element BITE** (Element Built-In Test Equipment) dialog box.
 - a Select **Processor** to open the page.
 - b Select **Element BITE** to open the dialog box.
 - c Select the **B-Scan** tab to open the page.
 - d Select **Element amplitude**.
- 3 Test the transmitter performance.

- a Set **Start sample** to *400*
 - b Set **Sample range** to *10,000*
 - c Look at the pattern in the B-Scan presentation, and compare them with the example provided.
- 4 Test the receiver performance.
- a Set **Start sample** to *1500*.
 - b Set **Sample range** to *10,000*.
 - c Look at the pattern in the B-Scan presentation, and compare them with the example provided.

The sample frequency in the SN90 is 5 kHz. Since the sound travels approximately 750 meter back and forth every second, each sample will cover 750 m divided by 5000 Hz, which is approximately 15 cm. These settings will thus allow you to test the receiver in the near range between 0 and 150 meters from the transducer.

- If a single element is "dead" (no transmit, no receive), the rectangle is easily spotted because its colour is black.
- If a single element is receiving, but not transmitting, the rectangle is normally presented in lighter shades of blue.
- If a transceiver board is "dead" (no transmit, no receive), all the transducer elements connected to the board are easily spotted because they are all black.

- 5 Check for any weak elements in the transmission sample range.

If any weak elements are detected, record these in the result table.

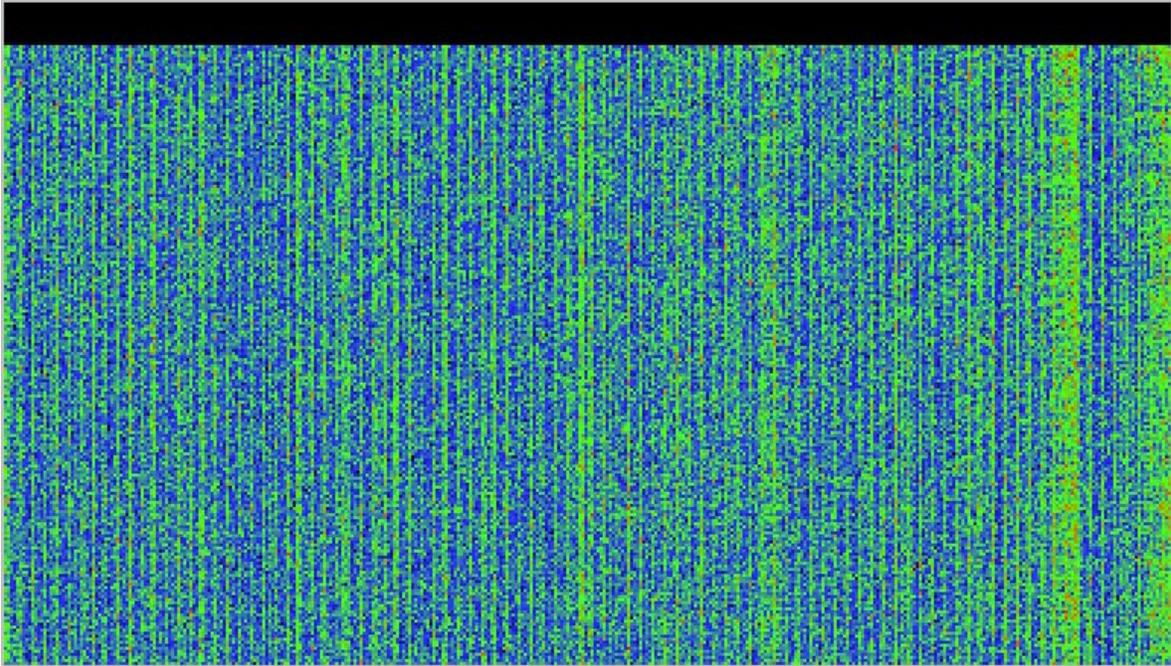
- 6 Check for any black lines in the transmission and reception sample ranges.

A black line would indicate an unserviceable element. If any such elements are detected, record these in the result table.

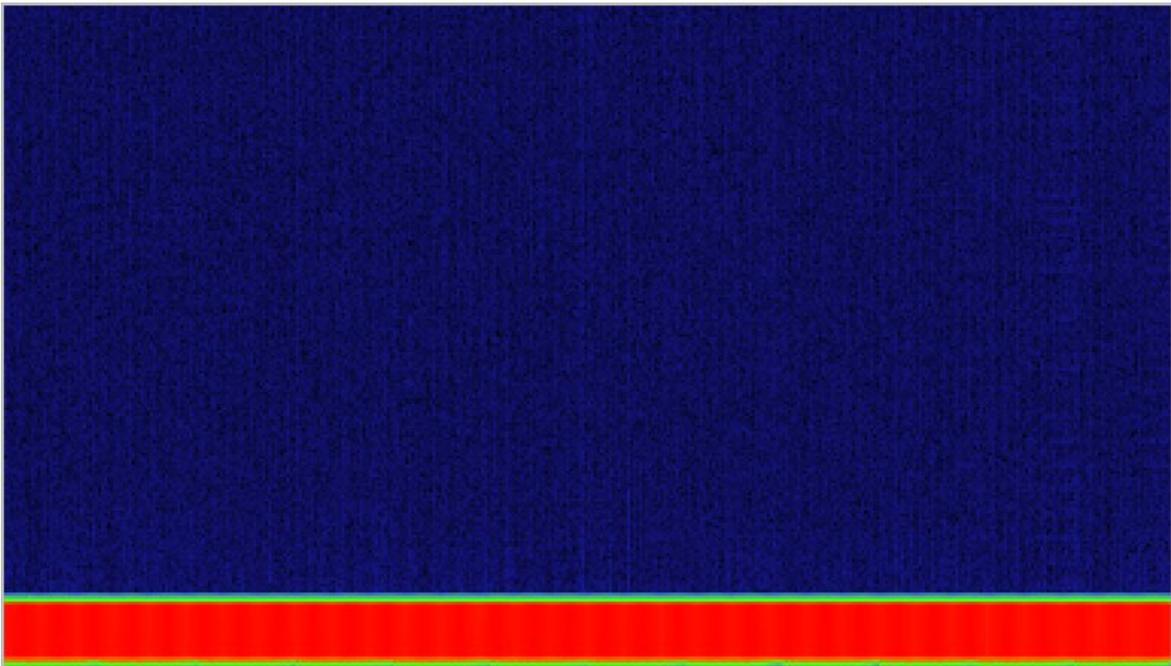
Result

Requirements	Results
The information presented by the B-Scan page verifies that the SN90 is fully operational.	
All elements are operational in both transmit and receive. The maximum number of unserviceable elements is 3.	
Weak elements:	
Unserviceable elements:	
A screen capture of the B-Scan page is archived.	
Date and signature:	

Example



This screen capture shows the B-Scan pattern while testing the receiver in the near range.



This screen capture shows the B-Scan pattern while testing the transmitter. You can clearly see the transmit pulse.

Testing the interfaces with peripheral devices

Topics

[Verifying the communication with a navigation system \(GPS\), page 36](#)

[Verifying the communication with speed log, page 38](#)

[Verifying the communication with the course gyro, page 40](#)

[Verifying the communication with the motion reference unit \(MRU\), page 42](#)

Verifying the communication with a navigation system (GPS)

For the SN90 to use and offer correct navigational information, one or more external sensors must be connected. The communication with the sensor is tested.

Prerequisites

This procedure assumes that:

- A sensor simulator is connected to the Processor Unit.
- The interface port is set up with the correct communication parameters.
- You are familiar with NMEA and other relevant datagram formats.
- You know how to set up the parameters for serial and local area network (LAN) communication.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

The properties of each of the available communication ports are defined on the **I/O Setup** page. The **Sensor Installation** page allows your SN90 to communicate with external sensors and systems. To make sure that the information from the "most reliable" sensors are used by the SN90, use the **Sensor Configuration** page to define a datagram priorities.

The communication parameters defined for **NMEA 0183** are:

- **Baud rate:** 4800 b/s
- **Data bits:** 8
- **Parity:** None
- **Stop bits:** 1

Procedure

- 1 Open the **Setup** menu.
- 2 On the **Setup** menu, select **Installation**.



- 3 On the left side of the **Installation** dialog box, select **I/O Setup**.
 - a Observe that the available serial interface ports on the Processor Unit are listed.
 - b Select the port you wish to check.
 - c Select **Monitor** to open the **Port Monitor** dialog box.

The **Port Monitor** dialog box provides one text field for incoming messages (**Rx Data**), and one for outgoing (**Tx Data**). Use these fields and your own knowledge of the data communication to investigate the datagrams.

- d Select **Cancel** to close the dialog box without making any changes.
- 4 On the left side of the **Installation** dialog box, select **Sensor Installation**.
 - a Select the relevant sensor in the **Installed Sensors** list.
 - b Make sure that the correct installation parameters are used for the sensor.
 - 5 On the left side of the **Installation** dialog box, select **Sensor Configuration**.
 - a Select the relevant sensor in the **Sensor** list.
 - b Make sure that the correct parameters are used for sensor configuration.
 - 6 Close the **Installation** dialog box without making any changes.
 - 7 Observe the top bar.
 - 8 Make sure that the information from the sensor is displayed.

If necessary, enable the read-out in the **Display Options** dialog box.

- 9 If possible, use another instrument to verify that the information provided by the SN90 is correct.
- 10 Fill in the result tables.

Result

Datagram	Port	Baud rate	Talker ID

Requirements	Results
Position data is provided and displayed.	
The relevant communication parameters are recorded.	
Date and signature:	

Verifying the communication with speed log

In order to operate correctly, the SN90 requires input from a speed log. The vessel speed is shown on the top bar if you have enabled this in the **Display Options** dialog box. The communication with the sensor is tested.

Prerequisites

This procedure assumes that:

- A sensor simulator is connected to the Processor Unit.
- The interface port is set up with the correct communication parameters.
- You are familiar with NMEA and other relevant datagram formats.
- You know how to set up the parameters for serial and local area network (LAN) communication.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

In order to operate correctly, the SN90 requires input from a speed log. Without the input from a speed log, the SN90 will neither be able to present correct navigational information, nor compensate for vessel movements. This lack of compensation will prevent the SN90

from providing correct echo information. In most cases a suitable sensor is already installed on the vessel. A global positioning system (GPS) with a fitting output format can also be used.

The properties of each of the available communication ports are defined on the **I/O Setup** page. The **Sensor Installation** page allows your SN90 to communicate with external sensors and systems. To make sure that the information from the "most reliable" sensors are used by the SN90, use the **Sensor Configuration** page to define a datagram priorities.

The communication parameters defined for **NMEA 0183** are:

- **Baud rate:** 4800 b/s
- **Data bits:** 8
- **Parity:** None
- **Stop bits:** 1

Procedure

- 1 Open the **Setup** menu.
- 2 On the **Setup** menu, select **Installation**.



- 3 On the left side of the **Installation** dialog box, select **I/O Setup**.
 - a Observe that the available serial interface ports on the Processor Unit are listed.
 - b Select the port you wish to check.
 - c Select **Monitor** to open the **Port Monitor** dialog box.

The **Port Monitor** dialog box provides one text field for incoming messages (**Rx Data**), and one for outgoing (**Tx Data**). Use these fields and your own knowledge of the data communication to investigate the datagrams.

- d Select **Cancel** to close the dialog box without making any changes.
- 4 On the left side of the **Installation** dialog box, select **Sensor Installation**.
 - a Select the relevant sensor in the **Installed Sensors** list.
 - b Make sure that the correct installation parameters are used for the sensor.
- 5 On the left side of the **Installation** dialog box, select **Sensor Configuration**.
 - a Select the relevant sensor in the **Sensor** list.
 - b Make sure that the correct parameters are used for sensor configuration.
- 6 Close the **Installation** dialog box without making any changes.
- 7 Observe the top bar.

- 8 Make sure that the information from the sensor is displayed.
If necessary, enable the read-out in the **Display Options** dialog box.
- 9 If possible, use another instrument to verify that the information provided by the SN90 is correct.
- 10 Fill in the result tables.

Result

Datagram	Port	Baud rate	Talker ID

Requirements	Results
Speed data is provided and displayed.	
The relevant communication parameters are recorded.	
Date and signature:	

Verifying the communication with the course gyro

In order to operate correctly, the SN90 requires input from a course gyro. The current heading is shown on the top bar if you have enabled this in the **Display Options** dialog box. The communication with the sensor is tested.

Prerequisites

This procedure assumes that:

- A sensor simulator is connected to the Processor Unit.
- The interface port is set up with the correct communication parameters.
- You are familiar with NMEA and other relevant datagram formats.
- You know how to set up the parameters for serial and local area network (LAN) communication.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

The input from a course gyro is essential for SN90 operation. Without the input from a course gyro, the SN90 will not be able to present correct navigational information. In most cases a suitable course gyro is already installed on the vessel. A global positioning system (GPS) with a fitting output format can also be used.

The properties of each of the available communication ports are defined on the **I/O Setup** page. The **Sensor Installation** page allows your SN90 to communicate with external sensors and systems. To make sure that the information from the "most reliable" sensors are used by the SN90, use the **Sensor Configuration** page to define a datagram priorities.

The communication parameters defined for **NMEA 0183** are:

- **Baud rate:** 4800 b/s
- **Data bits:** 8
- **Parity:** None
- **Stop bits:** 1

Procedure

- 1 Open the **Setup** menu.
- 2 On the **Setup** menu, select **Installation**.



- 3 On the left side of the **Installation** dialog box, select **I/O Setup**.
 - a Observe that the available serial interface ports on the Processor Unit are listed.
 - b Select the port you wish to check.
 - c Select **Monitor** to open the **Port Monitor** dialog box.

The **Port Monitor** dialog box provides one text field for incoming messages (**Rx Data**), and one for outgoing (**Tx Data**). Use these fields and your own knowledge of the data communication to investigate the datagrams.

- d Select **Cancel** to close the dialog box without making any changes.
- 4 On the left side of the **Installation** dialog box, select **Sensor Installation**.
 - a Select the relevant sensor in the **Installed Sensors** list.
 - b Make sure that the correct installation parameters are used for the sensor.
 - 5 On the left side of the **Installation** dialog box, select **Sensor Configuration**.
 - a Select the relevant sensor in the **Sensor** list.
 - b Make sure that the correct parameters are used for sensor configuration.

- 6 Close the **Installation** dialog box without making any changes.
- 7 Observe the top bar.
- 8 Make sure that the information from the sensor is displayed.
If necessary, enable the read-out in the **Display Options** dialog box.
- 9 If possible, use another instrument to verify that the information provided by the SN90 is correct.
- 10 Fill in the result tables.

Result

Datagram	Port	Baud rate	Talker ID

Requirements	Results
Heading data is provided and displayed.	
The relevant communication parameters are recorded.	
Date and signature:	

Verifying the communication with the motion reference unit (MRU)

The information from a motion reference unit (MRU) (normally heave, roll and pitch information) is imported into the SN90 to increase the accuracy of the echo data. The communication with the sensor is tested.

Prerequisites

This procedure assumes that:

- A sensor simulator is connected to the Processor Unit.
- The interface port is set up with the correct communication parameters.
- You are familiar with NMEA and other relevant datagram formats.
- You know how to set up the parameters for serial and local area network (LAN) communication.
- The SN90 is turned on, and it is working normally.

Neither tools nor instruments are required.

Context

A motion reference unit (MRU) measures the vessel's pitch and roll movements in the sea. The information provided by the motion sensor is used by the SN90 to stabilize the echo presentation.

Procedure

- 1 Open the **Setup** menu.
- 2 On the **Setup** menu, select **Installation**.



- 3 On the left side of the **Installation** dialog box, select **Motion Reference Unit**.
 - a If you use the motion sensor in the Motor Control Unit on the hull unit, make sure that **LAN** is selected.

The sensor uses a local area network (LAN) port on your Processor Unit. A message on the page verifies that it is connected to the SN90 beamformer application.
 - b If you use an external motion reference unit (MRU), make sure that a COM port is selected, and that the correct parameters are provided.

- 4 Close the **Installation** dialog box without making any changes.
- 5 Observe the top bar.
- 6 Make sure that the information from the sensor is displayed.

If necessary, enable the read-out in the **Display Options** dialog box.

Note _____

In order to read the motion compensation values, the SN90 must be "pinging".

- 7 If possible, use another instrument to verify that the information provided by the SN90 is correct.
- 8 Fill in the result tables.

Result

Port	Baud rate	Protocol

Simrad SN90 Factory Acceptance Test

Requirements	Results
Motion compensation is operational.	
The compensated values are shown.	
Date and signature:	

Customer acceptance form

Fill in and sign this form for formal acceptance of the Simrad SN90 system.

The Simrad SN90 system is (<i>tick relevant column</i>):		
Accepted	Accepted with comments	Not accepted
Vessel/Customer		
Place and date		
Comments		
Test done by (name)	Company/Position	Date and signature
Test accepted by (name)	Company/Position	Date and signature
When this test procedure has been completed with all relevant signatures and applicable forms filled in, the document must be sent to the Simrad Support Department at Strandpromenaden 50, P.O.Box 111, 3191 Horten, Norway. Alternatively, scan all the pages to PDF using minimum 200 DPI resolution, and send the file to simrad.support@simrad.com .		

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