



KONGSBERG

K-Controller
Installation and runtime controller for
EM multibeam echo sounders
Reference Manual
Release 2.0

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Table of contents

ABOUT THIS MANUAL	5
K-CONTROLLER	6
System description	7
Network security	7
Support information	8
GETTING STARTED	9
Installing the K-Controller	10
Turning on the K-Controller	10
FUNCTIONS AND DIALOG BOXES	12
Top bar description	13
Runtime dialog box.....	14
Sector coverage dialog box	15
Depth settings dialog box	17
Transmit control dialog box	19
Sound Velocity dialog box	21
Filter and gains dialog box	22
Simulator dialog box	26
Runtime Mini dialog box	26
Installation Parameters dialog box.....	29
Runtime dialog box	29
Input Setup dialog box	37
Output Setup dialog box.....	41
Transducer setup dialog box.....	41
System test dialog box.....	43

About this manual

The purpose of this manual is to provide the descriptions, procedures and detailed parameter explanations required to allow for safe and efficient use of the K-Controller. The manual also provides you with a thorough understanding of the K-Controller parameters and adjustments.

Target audience

This manual is intended for all users of the K-Controller. Due to the nature of the descriptions and the level of detail provided by this manual, it is well suited for those who are - or wish to be - expert users.

A good understanding of system functions and controls is essential to fully take advantage of the functionality provided. Sea conditions vary, sometimes drastically, and it is not possible to identify settings that will provide the best data at all times. A careful study of the information in this manual is highly recommended, preferably while exploring the K-Controller functionality.

Online information

For information about the K-Controller and other products from Kongsberg Maritime, visit our website.

<https://www.km.kongsberg.com>

Software version

This K-Controller Reference Manual complies with software version 2.0.

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K-Controller

Topics

[System description, page 7](#)

[Network security, page 7](#)

[Support information, page 8](#)

System description

K-Controller is the software and user interface for real time data processing for hydrographic instruments. It is included on all deliveries of multibeam echo sounders from Kongsberg Maritime.

K-Controller controls the EM multibeam runtime parameters. It allows users to configure sensor inputs, installation offsets and manage the sound velocity profile used by the processing unit. The K-Controller works independently of display and acquisition software and is required to make the multibeam system work.

Network security

If a K-Controller system is connected to a local area network, data security is important.

Equipment manufactured by Kongsberg Maritime is frequently connected to the vessel's local area network (LAN). When you connect a computer to a local area network you will always expose the data on that computer. All other computers connected to the same network may be able to access your data. Several threats may immediately occur:

- Remote computers can read the data.
- Remote computers can change the data.
- Remote computers can change the behaviour of the computer, for example by installing unwanted software.

Usually, two parameters are used to define the threat level:

- 1 The likelihood that any remote connection will do any of the above.
- 2 The damage done if a remote connection succeeds doing this.

Kongsberg Maritime has no information regarding the complete system installation on any vessel. Systems provided by Kongsberg Maritime are regarded as stand-alone offline systems. They are stand-alone even though they may be connected to a network for sensor interfaces and/or data distribution.

Note

No network safety applications are installed on any Kongsberg Maritime computers. The computers are thus not protected against viruses, malware or unintentional access from external users.

Securing the K-Controller system itself has no meaning unless there is a policy in place that secures all computers in the network. This policy must include physical access by trained and trusted users. The customer/end user of the K-Controller system will always be in charge of defining and implementing a security policy, and providing the relevant network security applications.

Note

Kongsberg Maritime will not accept any responsibility for errors and/or damages caused by unauthorized use or access to the K-Controller.

If you wish to connect the K-Controller system to the ship's local area network, you must implement the same security mechanisms on the K-Controller computer(s) as for the rest of the network. This is a task for the network responsible person on board. Some key elements here must be:

- The same anti-virus protection on all computers, including routines for updating this protection.
- The same settings for the firewall on all computers.
- Controlled physical access to computers on the network.
- Trusted and trained operators.
- Log-in access mechanisms.
- Same policy for attaching peripheral equipment to the computers (USB devices, hard drives etc).
- Installation of programs on any computer in the network, verification that each program is authentic.
- Definition of which programs are allowed to run on each computer.
- Logging mechanism of computer activity, and inspection of these logs.

How to define and implement these rules depends on each end user's network system configuration, which again must be a result of the policies and threat levels the end user has defined for the complete installation. For some products the network consists of only processor units and/or work stations, transceivers and a few sensors. On other vessels, larger computer systems can be installed to include numerous products and data systems. There must be one responsible person for the security of the system, large or small.

Support information

Should you need technical support for your K-Controller you must contact a Kongsberg Maritime office. A list of all our offices is provided on our website. You can also contact our main support office in Norway.

- **Company name:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3190 Horten, Norway
- **Telephone (24h support):** +47 33 03 24 07
- **Website:** <https://www.km.kongsberg.com>
- **E-mail address:** km.hydrographic.support@kongsberg.com

Getting started

Topics

[Installing the K-Controller, page 10](#)

[Turning on the K-Controller, page 10](#)

Installing the K-Controller

Install the program on the Computer.

Prerequisites

In order to install the software, you need the relevant file set on a suitable media.

Note

Make sure that you have administrative rights on the Computer. You need this to install the software.

Procedure

- 1 Turn on the Computer.
- 2 Insert the K-Controller software media.
- 3 Use a file manager application on the Computer to access the software files.
- 4 Find and run the file K-CtrlInstall.exe.
- 5 Follow the system messages.

Turning on the K-Controller

In order to use the K-Controller, you must first turn it on. You must power up the display, the computer, the processing unit, and the echo sounders. After this you can start the K-Controller program.

Context

The K-Controller program is not automatically started when the Computer is turned on. Once the operating system has started, select the K-Controller program icon on the desktop.

Caution

You must never power up the K-Controller when the ship is in dry dock. The transducer(s) may be damaged if the K-Controller transmits in open air.

Procedure

- 1 Turn on the display.
- 2 Turn on the Computer.
- 3 Turn on the Processing Unit.
- 4 Double-click the K-Controller icon on the Computer desktop to start the program.

- 5 Let the system find all components.
- 6 Select an echo sounder from the list in **Select a sounder to start**.
- 7 Check and set all installation parameters.
- 8 Check and set all runtime parameters.
- 9 Start pinging and logging.

Functions and dialog boxes

Topics

[Top bar description, page 13](#)

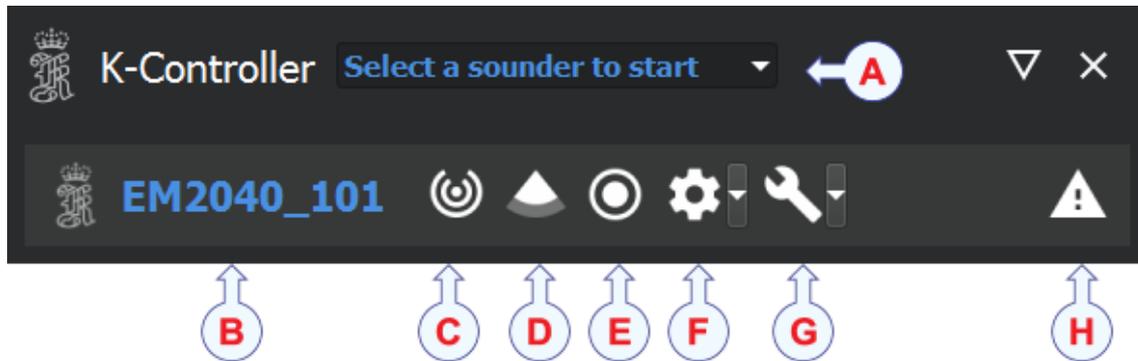
[Runtime dialog box, page 14](#)

[Runtime Mini dialog box, page 26](#)

[Installation Parameters dialog box, page 29](#)

Top bar description

The K-Controller top bar is located on the top of the display presentation, and stretches from the far left to the far right side.



A Echo sounder

All the available echo sounders detected on the network at start-up are listed. To start an echo sounder you need to select it from the list.

B Echo sounder

The selected echo sounder is shown.

C Ping

The purpose of the **Ping** function is to start and stop the echo sounders transmissions into the water. Such transmissions are often referred to as "pinging".

D Water column data generation

Start reading data from the water column.

E Logging

Select this button to start and stop logging. When the logging is on, data is stored to disk.

F Runtime Mini

In **Runtime Mini** you find the main parameters you can change during operation.

G Installation Parameters

The **Installation Parameters** dialog box defines fixed installation parameters, such as communication parameters, installation offset angles and physical locations.

H Messages

The messages offer information about the operational status, alarms and other messages.

Runtime dialog box

In **Runtime** you find the parameters you can change during operation.

Description

The runtime parameters can be modified during operation to change information such as ping rate, coverage and sound speed profiles.

Select the cog symbol to see the dialog boxes.

- Sector coverage
The **Sector coverage** dialog box allows you to define the swath width for each ping as well as the spacing between the depth points within this swath.
- Depth settings
Depth settings allows you to specify that the echo sounder listens for echoes between a defined depth range, and ignore echoes outside of this range.
- Transmit control
The transmit control configuration parameters are used to ensure an even distribution of depth soundings.
- Sound Velocity
The **Sound Velocity** dialog box lets you to select a sound velocity profile, or to manually enter a sound velocity.
- Filter and gains
The **Filter and gains** dialog box lets you define values to ignore certain echoes, to clean the measurements and remove false sea floor detection.
- Simulator
The **Simulator** dialog box defines the parameters for the simulator.

Sector coverage dialog box

The **Sector coverage** dialog box allows you to define the swath width for each ping as well as the spacing between the depth points within this swath. The more narrow the coverage angle, and the higher the number of depth points within the coverage sector, the greater the resolution.

How to open

Select the **Runtime Parameters** icon and select **Sector Coverage**.

Description

The sector coverage dialog box is used to define the sector coverage and the beam spacing. The sector coverage/swath width and the beam spacing option are used together in order to achieve the most detailed seafloor information for each swath. The beam spacing options allows you to define how to distribute the retrieved echoes.

Initially, all the parameters have a value which depends on the active echo sounder.

If the coverage is too wide this may result in the echoes received by the outer beams being too weak. As a result these are rejected, resulting in poor seafloor information, that is, low resolution. To avoid this, the sector coverage area must be reduced.

By setting the coverage mode to automatic, the system will automatically decrease the sector coverage/swath width before the next ping, increasing the chance that the signals detected by each beam is approved, thus rendering detailed information for the sector.

Note

*The **Auto** option is selected by default.*

Details

Maximum angle (deg)

The maximum angle coverage in degrees.

Maximum coverage

Define the maximum swath width to each side by selecting values in metres. The port and starboard angles will be adjusted accordingly by the system if the **Angular coverage mode** is set to auto.

Angular coverage mode

Select Auto or Manual.

When angular coverage is set to manual, the values defined as Max port and starboard angle above (in degrees) are used directly. The Max coverage port and starboard settings are not used. The outermost beams may be lost if the angular coverage set is larger than the coverage capability at the current depth.

When the angular coverage is set to auto, the maximum coverage and the maximum angles will set the swath width limit. The most limiting of the two

criteria is used. If the system is not able to fulfil the above, it will reduce the swath width further and as a consequence nearly all the beams will be valid. The number of beams accepted should be almost equal to the numbers of beams available in the **Numerical display**.

Beam spacing

Depending on the purpose of the survey, you may define the distribution of the beams on the seafloor. Select equidistant, equiangle or high density equidistant.

Equidistant

This setting gives a uniform distribution of soundings on the seafloor, and it is the normal mode for a bathymetric survey.

Equiangle

The beams are distributed with an equal angular spacing based on the angular coverage used. This gives many soundings close to the centre of the survey line, and few on the edge of the swath.

High density equidistant

In this mode the number of soundings are increased. This is achieved by directing some of the beams closer to the centre of the survey line and performing several soundings per beam on the edge of the swath. This results in an equidistant distribution of the soundings.

Depth settings dialog box

Depth settings allows you to specify that the echo sounder listens for echoes between a defined depth range, and ignore echoes outside of this range.

How to open

Select the **Runtime Parameters** icon and select **Depth Settings**.

Description

You can define the depth range in which the echo sounder will listen for echoes, and ignore echoes outside of this range. You can also choose the frequency and the length of the pulse emitted, the higher the frequency and the shorter the wavelength, the better the resolution.

Details

Force depth

If there is a lot of acoustic interference or if the water is very aerated, the echo sounder may not find the correct depths. In order to help, you can then enter the approximate depth. This depth may be taken from your navigational charts, or from a navigation sounder elsewhere on the vessel. Forcing the depth will cause the system to set its gain and range windows accordingly.

Minimum depth

This is the minimum depth in metres at which the echo sounder starts listening for bottom echoes.

Maximum depth

This is the maximum depth in metres where the echo sounder stops listening for bottom echoes.

Dual swath mode

Two pings are transmitted simultaneously. The intention is to obtain a more dense coverage of the sea floor without decreasing vessel speed. Select Off, Fixed or Dynamic.

Select off to disable dual swath.

Select fixed and the alongship angle between the two transmit fans is equal to the alongship TX opening.

Select dynamic and the alongship angle between the two transmit fans is determined based on vessel speed, ping rate and depth in order to provide uniform alongship sampling of the sea floor.

Detector mode

Select detector mode to optimise the systems ability to recognize the bottom, wreck or structures, depending on water condition. Select Normal, Waterway, Tracking, or Min. depth.

Select normal for the normal bottom detection mode.

Select waterway for shallow channels and rivers.

Select tracking for a shallow water mode for tracking of targets and sudden depth changes

Select minimum depth for detecting wrecks.

FM disable

Turn off the use of FM pulses. It is recommended to keep this button off.

Select on to stop using FM pulses, CW only.

Select off to use FM pulses as well as CW.

Extra detection

Select Extra detection to make sure echoes from depth points that deviate noticeably from its adjacent depth points, are displayed on the screen and logged. This is useful when surveying wrecks as this ensures that, for instance, echoes from a mast, are displayed.

Transmit control dialog box

The transmit control configuration parameters are used to ensure an even distribution of depth soundings.

How to open

Select **Runtime Parameters** in the **View** menu. Select the **Runtime Parameters** icon and select **Transmit control**.

Description

The maximum electronic tilt is limited to ± 10 degrees. The ship's attitude and the applied transmitter tilt is always used to calculate the x, y and z parameters for each bottom detection. This assures that the x, y and z values are correctly calculated, even if more tilting was needed to do a full pitch and yaw stabilisation.

Details

Pitch stabilisation

At open sea, the swath area of the bottom will move back and forth following the vessel pitch. This will lead to loss of sampling regularity, and limit the vessel speed at which 100 % bottom coverage is possible. To account for this effect the system's transmit angle may be set to vary with the pitch in order to stabilise the direction of the emitted vertical transmit ping. This option should normally be ON.

Transmit angle along

Transmit angle along is used to tilt the transmit sector forward and backwards. This can be used to avoid a too strong echo at the normal incidence.

Yaw stabilisation mode

The yaw stabilisation creates an even alongship sounding spacings when the vessel's course is variable. The parameter has variable tilt angles on the individual transmitter beams. Select Off, Relative mean heading or Manual.

Select off and no stabilisation takes place. The transmitter sector follows the current heading of the vessel and unless the vessel's heading is 100% straight, you may experience blind zones on the survey coverage when you operate in deeper waters (exceeding 300 to 500 metres).

Relative mean heading places the transmitter sector perpendicular to a filtered course corresponding to the vessel's current mean heading. The course input is then taken from the gyro, and filtered with the Heading filter parameter. Relative mean heading is the recommended yaw stabilization mode. Selecting Relative mean heading will make sure the average yaw steering will be close to zero, avoiding an offset caused by, for example, a crab angle. Also the operator does not have to remember to set the course.

Select manual and the transmit beams are placed perpendicular to a manually selected course. This option should only be selected for long and straight survey

lines. It is also useful if you need to compensate for a crab angle caused by current or wind.

Manual heading

Manual heading allows you to enter the vessel's heading manually.

Heading filter

Heading filter specifies the level of filtering of the heading. The heading filter will even out minor course adjustments due to wind, waves or current. The filter strength required depends upon the vessel properties, and how well the vessel is steered. The heading filter controls how fast the filtered heading used during logging will follow the actual heading of the vessel. Select Weak, Medium or Hard.

Frequency

Select the transmit frequency. The frequencies available varies depending on the system.

Max ping rate

The ping rate defines the interval between each ping, and the distance between the swaths. The closer the swaths, the more details about the seafloor. To achieve this, several pulses are produced during one ping. The result is that the distances between the consecutive swath decreases.

Min swath distance

The minimum swath distance defines the distance allowed between consecutive swaths in metres. The aim is to ensure that a survey will contain a minimum of, and a constant, data density. To obtain the required data density the ping interval is based on the measured depth and the vessel speed. The default value is 0, indicating not used. The range is 0.1 – 1000.0 metres. The resolution is 0.1 metre. A warning is issued if the required data density can not be obtained. A second warning can be issued if the data density is too high, this warning is disabled by default.

External trigger

Select External trigger when the echo sounder is synchronised with an external trigger pulse.

Note

If no trigger pulse arrives, the echo sounder will never ping.

Sound Velocity dialog box

The **Sound Velocity** dialog box lets you to select a sound velocity profile, or to manually enter a sound velocity. The information is used to give accurate depth in the survey area.

How to open

Select **Runtime Parameters** in the **View** menu. Select the **Runtime Parameters** icon and select **Sound Velocity**.

Description

In order to have accurate depth determination, you must know the sound velocity profile in the survey area. This profile may change with both time and position in the survey area. It may be necessary to determine the profile several times during a survey. The profile is stored as a file and sent to the Processing Unit.

SIS uses the depth information generated in the Processing Unit. This means that the depth points have been generated using the sound speed profile.

The sound speed profile currently used by the Processing Unit is shown in the Sound velocity profile view.

Details

Sound Velocity source

Select the source for the Sound Velocity at the transducer. Select Probe/Sensor, Manual or Profile.

Select Probe/Sensor when you have a probe or sensor available near the transducer.

Select manual to enter a value manually.

Note

The manual setting is only for experienced users.

Select profile to derive the sound velocity near the transducer using applied sound velocity profile at the depth indicated by the motion reference input.

Sound Velocity

Set the sound velocity at the transducer directly to a fixed value. This function is only available if **Manual** is selected.

Water temperature

Set the water temperature at the transducer directly to a fixed value.

Filter and gains dialog box

The **Filter and gains** dialog box lets you define values to ignore certain echoes, to clean the measurements and remove false sea floor detection. It also includes settings for the bottom backscatter measurement and the sea floor imaging.

How to open

Select **Runtime Parameters** in the **View** menu. Select the **Runtime Parameters** icon and select **Filter and Gains**.

Description

There is always a risk of false detections due to schools of fish, acoustical interference from other systems, passing over vessel wakes, soft sediments, bad weather, aeration and so forth. The different filters are used to determine what echoes to detect, and decrease the number of undesired echo detections.

Only apply different filter settings than those recommended if the occurrence of false detections is too high to be acceptable.

The echo signal detection is performed twice during each ping. Filtering is performed after every pass. The first pass is done on all received echoes. The second pass is done only on echoes which lack valid detection. The system uses relaxed acceptance criteria using range information derived from neighbouring echoes, each containing a valid echo detection.

Note

It is always advantageous to eliminate undesired detections prior to post-processing.

Details

Spike filter strength

Spike filter strength defines to what degree a spiky seabed is accepted. The filter removes depth points that deviate too much from their neighbouring beams' depth point, resulting in a graphics that present a seemingly smooth surface. The stronger the filtering, the fewer depth points, or spikes, are shown. Select **Off**, **Weak**, **Medium** or **Strong**.

Select **Off** to have no filtering and all spikes to show. These will be recognized as spikes/peaks of different heights on an otherwise smooth surface.

Select **Weak** and depth points which varies from a certain degree from their adjacent depth points will be displayed.

Select **Medium** and only depth points where the depth varies only slightly from the adjacent depth points are shown in the sea floor graphics, resulting in the near absence of spikes/peaks.

Select **Strong** and only the depth points having the same depth are shown, resulting in a complete absence of peaks.

Range gate size

Range gating is used to detect only the echoes emanating from the desired target range. Consequently, echoes from outside the target range, are ignored. This vastly improves the tracking of the seafloor during bad weather and in situations where aeration occurs. During the survey the depth will vary, and the range gate value defines at which depth the echo sounder will next start to listen for echoes. Depending on the selected option, the depth at which the echo sounder starts listening for echoes from a ping, is increased by a fixed percentage using the depth of the previous ping's echoes as the basis. Select **Small**, **Normal** or **Large**.

Select **Small** to reduce the existence of sidelobe influence.

Selecting **Normal** is recommended.

If the depth varies considerably alongtrack it may be useful to select a **Large** range gate. This may also increase the probability of registering false echoes from side lobes, interference or other sources of noise. Selecting a large range gate may reduce the ping rate slightly.

Phase ramp

Phase ramp is used to specify the range overlap between the detections. Phase detection improves depth resolutions in the outer beams. It specifies how many samples that will be used for the phase detection, for each depth. The shorter the phase ramp, the higher the resolution. This results in increased noise in the data. Select **Short**, **Normal** or **Long**.

Select **Short** and the number of samples used for phase detection will be equal to the range distance between the beam and its neighbours. As a result, there will be no averaging of phase detections between beams. A short phase ramp gives the best resolution, but a side effect can be that the detected bottom will give increased noise. Provided that a minimum number of phase samples are available to do proper phase detection.

The number of samples used for phase detection will normally be equal to twice the range distance between the beam and its neighbours for **Normal** phase ramping. There will be a slight averaging of phase detection between beams. This is the recommended setting

A fixed portion of the phase curve, corresponding to ± 40 degrees phase angle, is used for the **Long** phase detection. This results in an increasing averaging of phase detections between beams with increasing beam angle.

Penetration filter strength

Reduce the chance that the central beams will track sediment layers below the seafloor, in areas where the seafloor is soft and consists of distinct sediment layers. Select **Off**, **Weak**, **Medium** or **Strong**.

Special TVG

Special TVG reduces the problems concerning multipaths, false echoes, in shallow waters.

Slope filter

It is recommended that the slope filter always is enabled. With this filter enabled, the system checks for bottom slopes that tilt inwards. These slant towards the vessel, and they are removed because the filter requires that the athwartships distance increases for every beam from the centre. Such detections are normally false, and after removal, a new bottom detection is performed searching for a value with increased range.

Aeration filter

Air bubbles below the transducer may cause problems for the bottom tracking. In areas with relatively constant depths, performance will be increased. However, if the bottom depth varies considerably, the filter may have an adverse effect. When enabled, the system puts more emphasis on previous pings when tracking the bottom. This results in improved performance and makes the system more stable in conditions where air sweep-downs frequently block the acoustic signals to/from the transducers.

Sector tracking filter

The transmitter operates with several pulses within each ping. Each pulse covers different sectors of the total swath. Sector tracking filter will turn on an automatic gain compensation to avoid amplitude offsets between these sectors. During normal operations, the **Sector Tracking** should be selected. If the survey specifications demand a fully calibrated system for sidescan image, this function should be turned off. This setting does not affect the depth measurements, only the backscatter strengths.

Interference filter

If the vessel is equipped with other echo sounders or sonars operating on frequencies close to the one that the echo sounder uses, you may experience interference. To avoid this situation the most effective solution is to synchronise the operation of the different systems. If synchronisation is not possible, activating this filter may reduce interference problems.

Special amp. detect

An alternative detection mode for beams close to the normal incidence. This detector mode can reduce noise spikes in the data for some bottom types.

Normal incidence corr.

Normal incidence correction is used to define the angle at which the bottom backscatter can be assumed not to be affected by the strong increase at normal incidence. The optimum crossover angle will vary with the seafloor type. For seabed imaging, it is important to adjust this angle so that a minimum of angle dependent amplitude variation is seen. This is to give best use of its dynamic range.

Use Lambert's law

Select to use Lambert's law, which results in the adjustment of backscatter values based on loss due to low incident angle. Using Lambert's law is recommended.

Transmit power level

The maximum power by which the sound is emitted from the transmitter can be decreased by 10 or 20 dB, resulting in a reduced power (dB) used for the emitted sound (ping). The maximum coverage will be reduced when the power is decreased. Select Normal, -10 dB or -20 dB.

Water column X log

Set the range exponent to increase the intensity for a weak echo, or noise, fish and so forth, in the water column. The gain affects water column data only and the changes due to entering a different exponent is seen instantly in the water column view.

Water column TVG offset

The offset is visible in the water column view, the offset is calculated in the Processing Unit prior to displaying the water column. You will typically want to increase the dB offset when objects in the water column are of interest. The amplitude range data of the backscatter changes accordingly.

Sonar mode

Select Off, Sonar active or Sonar passive.

Simulator dialog box

The **Simulator** dialog box defines the parameters for the simulator.

How to open

Select the **Runtime Parameters** icon and select **Simulator**.

Description

The simulation generates range samples only. All other inputs to the Processing Unit must be supplied via the normal Processing Unit input ports. The attitude data, as the position data, roll, pitch and heave is simulated.

Details

Enable simulation

Select **Enable simulation** to enable simulation mode in the echo sounder.

Simulator min depth

Set the minimum depth for the simulation.

Simulator max depth

Set the maximum depth for the simulation.

Simulator slant across

The tilt of the sea bottom across track in degrees.

Simulator step along

The change in depth between each ping given in percent. The depth will vary within the set min/max range.

Runtime Mini dialog box

In **Runtime Mini** you find the main parameters you can change during operation.

Description

The runtime parameters can be modified during operation to change information such as ping rate, coverage and sound speed profiles.

Select the cog symbol to see the dialog boxes.

Port <-> Starboard

This button swaps the settings for the port and starboard sector coverage parameters. This is convenient when logging along a shoreline and the vessel is turning around.

Maximum angle (deg)

The maximum angle coverage in degrees.

Type in the values for starboard and port for all transducers.

Maximum coverage

Define the maximum swath width to each side by selecting values in metres. The port and starboard angles will be adjusted accordingly by the system if the **Angular coverage mode** is set to auto.

Angular coverage mode

Select Auto or Manual.

When angular coverage is set to manual, the values defined as Max port and starboard angle above (in degrees) are used directly. The Max coverage port and starboard settings are not used. The outermost beams may be lost if the angular coverage set is larger than the coverage capability at the current depth.

When the angular coverage is set to auto, the maximum coverage and the maximum angles will set the swath width limit. The most limiting of the two criteria is used. If the system is not able to fulfil the above, it will reduce the swath width further and as a consequence nearly all the beams will be valid. The number of beams accepted should be almost equal to the numbers of beams available in the **Numerical display**.

Force depth

If there is a lot of acoustic interference or if the water is very aerated, the echo sounder may not find the correct depths. In order to help, you can then enter the approximate depth. This depth may be taken from your navigational charts, or from a navigation sounder elsewhere on the vessel. Forcing the depth will cause the system to set its gain and range windows accordingly.

Minimum depth

This is the minimum depth in metres at which the echo sounder starts listening for bottom echoes.

Maximum depth

This is the maximum depth in metres where the echo sounder stops listening for bottom echoes.

Max ping rate

The ping rate defines the interval between each ping, and the distance between the swaths. The closer the swaths, the more details about the seafloor. To achieve this, several pulses are produced during one ping. The result is that the distances between the consecutive swath decreases.

The max ping rate is the limit you set on the ping rate.

Detector mode

Select detector mode to optimise the systems ability to recognize the bottom, wreck or structures, depending on water condition. Select Normal, Waterway, Tracking, or Min. depth.

Select normal for the normal bottom detection mode.

Select waterway for shallow channels and rivers.

Select tracking for a shallow water mode for tracking of targets and sudden depth changes

Select minimum depth for detecting wrecks.

Beam spacing

Depending on the purpose of the survey, you may define the distribution of the beams on the seafloor. Select equidistant, equiangle or high density equidistant.

Equidistant

This setting gives a uniform distribution of soundings on the seafloor, and it is the normal mode for a bathymetric survey.

Equiangle

The beams are distributed with an equal angular spacing based on the angular coverage used. This gives many soundings close to the centre of the survey line, and few on the edge of the swath.

High density equidistant

In this mode the number of soundings are increased. This is achieved by directing some of the beams closer to the centre of the survey line and performing several soundings per beam on the edge of the swath. This results in an equidistant distribution of the soundings.

Installation Parameters dialog box

The **Installation Parameters** dialog box defines fixed installation parameters, such as communication parameters, installation offset angles and physical locations.

Description

Before you can use K-Controller all the communication ports and offsets have to be set up.

Note

The parameters can not be modified during normal operation.

Select the spanner symbol to see the dialog boxes.

- Runtime
In **Runtime** you find the parameters you can change during operation.
- Input Setup
The **Input Setup** dialog box allows you to define the parameters for communication between the sensors (speed, navigational, motion) and the Processing Unit.
- Output Setup
In the **Output Setup** dialog box you define the output setup for broadcasting the *.kmall datagrams from the Processing Unit to the network.
- Transducer setup
The **Transducer setup** dialog box contains all the parameters for the transducers.
- System test
The **System test** dialog box provides several automatic tests to check the operation of the echo sounder system.

Runtime dialog box

In **Runtime** you find the parameters you can change during operation.

Description

The runtime parameters can be modified during operation to change information such as ping rate, coverage and sound speed profiles.

Select the cog symbol to see the dialog boxes.

Sector coverage

Maximum angle (deg)

The maximum angle coverage in degrees.

Maximum coverage

Define the maximum swath width to each side by selecting values in metres. The port and starboard angles will be adjusted accordingly by the system if the **Angular coverage mode** is set to auto.

Angular coverage mode

Select Auto or Manual.

When angular coverage is set to manual, the values defined as Max port and starboard angle above (in degrees) are used directly. The Max coverage port and starboard settings are not used. The outermost beams may be lost if the angular coverage set is larger than the coverage capability at the current depth.

When the angular coverage is set to auto, the maximum coverage and the maximum angles will set the swath width limit. The most limiting of the two criteria is used. If the system is not able to fulfil the above, it will reduce the swath width further and as a consequence nearly all the beams will be valid. The number of beams accepted should be almost equal to the numbers of beams available in the **Numerical display**.

Beam spacing

Depending on the purpose of the survey, you may define the distribution of the beams on the seafloor. Select equidistant, equiangle or high density equidistant.

Equidistant

This setting gives a uniform distribution of soundings on the seafloor, and it is the normal mode for a bathymetric survey.

Equiangle

The beams are distributed with an equal angular spacing based on the angular coverage used. This gives many soundings close to the centre of the survey line, and few on the edge of the swath.

High density equidistant

In this mode the number of soundings are increased. This is achieved by directing some of the beams closer to the centre of the survey line and performing several soundings per beam on the edge of the swath. This results in an equidistant distribution of the soundings.

Depth settings

Force depth

If there is a lot of acoustic interference or if the water is very aerated, the echo sounder may not find the correct depths. In order to help, you can then enter the approximate depth. This depth may be taken from your navigational charts, or from a navigation sounder elsewhere on the vessel. Forcing the depth will cause the system to set its gain and range windows accordingly.

Minimum depth

This is the minimum depth in metres at which the echo sounder starts listening for bottom echoes.

Maximum depth

This is the maximum depth in metres where the echo sounder stops listening for bottom echoes.

Dual swath mode

Two pings are transmitted simultaneously. The intention is to obtain a more dense coverage of the sea floor without decreasing vessel speed. Select Off, Fixed or Dynamic.

Select off to disable dual swath.

Select fixed and the alongship angle between the two transmit fans is equal to the alongship TX opening.

Select dynamic and the alongship angle between the two transmit fans is determined based on vessel speed, ping rate and depth in order to provide uniform alongship sampling of the sea floor.

Detector mode

Select detector mode to optimise the systems ability to recognize the bottom, wreck or structures, depending on water condition. Select Normal, Waterway, Tracking, or Min. depth.

Select normal for the normal bottom detection mode.

Select waterway for shallow channels and rivers.

Select tracking for a shallow water mode for tracking of targets and sudden depth changes

Select minimum depth for detecting wrecks.

FM disable

Turn off the use of FM pulses. It is recommended to keep this button off.

Select on to stop using FM pulses, CW only.

Select off to use FM pulses as well as CW.

Transmit control

Pitch stabilisation

At open sea, the swath area of the bottom will move back and forth following the vessel pitch. This will lead to loss of sampling regularity, and limit the vessel speed at which 100 % bottom coverage is possible. To account for this effect the system's transmit angle may be set to vary with the pitch in order to stabilise the direction of the emitted vertical transmit ping. This option should normally be ON.

Transmit angle along

Transmit angle along is used to tilt the transmit sector forward and backwards. This can be used to avoid a too strong echo at the normal incidence.

Yaw stabilisation mode

The yaw stabilisation creates an even alongship sounding spacings when the vessel's course is variable. The parameter has variable tilt angles on the individual transmitter beams. Select Off, Relative mean heading or Manual.

Select off and no stabilisation takes place. The transmitter sector follows the current heading of the vessel and unless the vessel's heading is 100% straight, you may experience blind zones on the survey coverage when you operate in deeper waters (exceeding 300 to 500 metres).

Relative mean heading places the transmitter sector perpendicular to a filtered course corresponding to the vessel's current mean heading. The course input is then taken from the gyro, and filtered with the Heading filter parameter. Relative mean heading is the recommended yaw stabilization mode. Selecting Relative mean heading will make sure the average yaw steering will be close to zero, avoiding an offset caused by, for example, a crab angle. Also the operator does not have to remember to set the course.

Select manual and the transmit beams are placed perpendicular to a manually selected course. This option should only be selected for long and straight survey lines. It is also useful if you need to compensate for a crab angle caused by current or wind.

Manual heading

Manual heading allows you to enter the vessel's heading manually.

Heading filter

Heading filter specifies the level of filtering of the heading. The heading filter will even out minor course adjustments due to wind, waves or current. The filter strength required depends upon the vessel properties, and how well the vessel is steered. The heading filter controls how fast the filtered heading used during logging will follow the actual heading of the vessel. Select Weak, Medium or Hard.

Frequency

Select the transmit frequency. The frequencies available varies depending on the system.

Max ping rate

The ping rate defines the interval between each ping, and the distance between the swaths. The closer the swaths, the more details about the seafloor. To achieve this, several pulses are produced during one ping. The result is that the distances between the consecutive swath decreases.

The max ping rate is the limit you set on the ping rate.

Min swath distance

The minimum swath distance defines the distance allowed between consecutive swaths in metres. The aim is to ensure that a survey will contain a minimum of, and a constant, data density. To obtain the required data density the ping interval is based on the measured depth and the vessel speed. The default value is 0, indicating not used. The range is 0.1 – 1000.0 metres. The resolution is 0.1 metre. A warning is issued if the required data density can not be obtained. A second warning can be issued if the data density is too high, this warning is disabled by default.

External trigger

Select External trigger when the echo sounder is synchronised with an external trigger pulse.

Note

If no trigger pulse arrives, the echo sounder will never ping.

Filter and gains

Spike filter strength

Spike filter strength defines to what degree a spiky seabed is accepted. The filter removes depth points that deviate too much from their neighbouring beams' depth point, resulting in a graphics that present a seemingly smooth surface. The stronger the filtering, the fewer depth points, or spikes, are shown. Select Off, Weak, Medium or Strong.

Select **Off** to have no filtering and all spikes to show. These will be recognized as spikes/peaks of different heights on an otherwise smooth surface.

Select **Weak** and depth points which varies from a certain degree from their adjacent depth points will be displayed.

Select **Medium** and only depth points where the depth varies only slightly from the adjacent depth points are shown in the sea floor graphics, resulting in the near absence of spikes/peaks.

Select **Strong** and only the depth points having the same depth are shown, resulting in a complete absence of peaks.

Range gate size

Range gating is used to detect only the echoes emanating from the desired target range. Consequently, echoes from outside the target range, are ignored. This vastly improves the tracking of the seafloor during bad weather and in situations where aeration occurs. During the survey the depth will vary, and the range gate value defines at which depth the echo sounder will next start to listen for echoes. Depending on the selected option, the depth at which the echo sounder starts listening for echoes from a ping, is increased by a fixed percentage using the depth of the previous ping's echoes as the basis. Select Small, Normal or Large.

Select **Small** to reduce the existence of sidelobe influence.

Selecting **Normal** is recommended.

If the depth varies considerably alongtrack it may be useful to select a **Large** range gate. This may also increase the probability of registering false echoes from side lobes, interference or other sources of noise. Selecting a large range gate may reduce the ping rate slightly.

Phase ramp

Phase ramp is used to specify the range overlap between the detections. Phase detection improves depth resolutions in the outer beams. It specifies how many samples that will be used for the phase detection, for each depth. The shorter the phase ramp, the higher the resolution. This results in increased noise in the data. Select Short, Normal or Long.

Select **Short** and the number of samples used for phase detection will be equal to the range distance between the beam and it's neighbours. As a result, there will be no averaging of phase detections between beams. A short phase ramp gives the best resolution, but a side effect can be that the detected bottom will give increased noise. Provided that a minimum number of phase samples are available to do proper phase detection.

The number of samples used for phase detection will normally be equal to twice the range distance between the beam and it's neighbours for **Normal** phase ramping. There will be a slight averaging of phase detection between beams. This is the recommended setting

A fixed portion of the phase curve, corresponding to ± 40 degrees phase angle, is used for the **Long** phase detection. This results in an increasing averaging of phase detections between beams with increasing beam angle.

Penetration filter strength

Reduce the chance that the central beams will track sediment layers below the seafloor, in areas where the seafloor is soft and consists of distinct sediment layers. Select Off, Weak, Medium or Strong.

Special TVG

Special TVG reduces the problems concerning multipaths, false echoes, in shallow waters.

Slope filter

It is recommended that the slope filter always is enabled. With this filter enabled, the system checks for bottom slopes that tilt inwards. These slant towards the vessel, and they are removed because the filter requires that the athwartships distance increases for every beam from the centre. Such detections are normally false, and after removal, a new bottom detection is performed searching for a value with increased range.

Aeration filter

Air bubbles below the transducer may cause problems for the bottom tracking. In areas with relatively constant depths, performance will be increased. However,

if the bottom depth varies considerably, the filter may have an adverse effect. When enabled, the system puts more emphasis on previous pings when tracking the bottom. This results in improved performance and makes the system more stable in conditions where air sweep-downs frequently block the acoustic signals to/from the transducers.

Sector tracking filter

The transmitter operates with several pulses within each ping. Each pulse covers different sectors of the total swath. Sector tracking filter will turn on an automatic gain compensation to avoid amplitude offsets between these sectors. During normal operations, the **Sector Tracking** should be selected. If the survey specifications demand a fully calibrated system for sidescan image, this function should be turned off. This setting does not affect the depth measurements, only the backscatter strengths.

Interference filter

If the vessel is equipped with other echo sounders or sonars operating on frequencies close to the one that the echo sounder uses, you may experience interference. To avoid this situation the most effective solution is to synchronise the operation of the different systems. If synchronisation is not possible, activating this filter may reduce interference problems.

Special amp. detect

An alternative detection mode for beams close to the normal incidence. This detector mode can reduce noise spikes in the data for some bottom types.

Normal incidence corr.

Normal incidence correction is used to define the angle at which the bottom backscatter can be assumed not to be affected by the strong increase at normal incidence. The optimum crossover angle will vary with the seafloor type. For seabed imaging, it is important to adjust this angle so that a minimum of angle dependent amplitude variation is seen. This is to give best use of its dynamic range.

Use Lambert's law

Select to use Lambert's law, which results in the adjustment of backscatter values based on loss due to low incident angle.

Transmit power level

The maximum power by which the sound is emitted from the transmitter can be decreased by 10 or 20 dB, resulting in a reduced power (dB) used for the emitted sound (ping). The maximum coverage will be reduced when the power is decreased. Select Normal, -10 dB or -20 dB.

Water column X log

Set the range exponent to increase the intensity for a weak echo, or noise, fish and so forth, in the water column. The gain affects water column data only and the changes due to entering a different exponent is seen instantly in the water column view.

Water column TVG offset

The offset is visible in the water column view, the offset is calculated in the Processing Unit prior to displaying the water column. You will typically want to increase the dB offset when objects in the water column are of interest. The amplitude range data of the backscatter changes accordingly.

Sonar mode

Select Off, Sonar active or Sonar passive.

Simulator

Enable simulation

Select **Enable simulation** to enable simulation mode in the echo sounder.

Simulator min depth

Set the minimum depth for the simulation.

Simulator max depth

Set the maximum depth for the simulation.

Simulator slant across

The tilt of the sea bottom across track in degrees.

Simulator step along

The change in depth between each ping given in percent. The depth will vary within the set min/max range.

Sound Velocity

Sound Velocity source

Select the source for the Sound Velocity at the transducer. Select Probe/Sensor, Manual or Profile.

Select Probe/Sensor when you have a probe or sensor available near the transducer.

Select manual to enter a value manually.

Note _____

The manual setting is only for experienced users.

Select profile to derive the sound velocity near the transducer using applied sound velocity profile at the depth indicated by the motion reference input.

Sound Velocity

Set the sound velocity at the transducer directly to a fixed value. This function is only available if **Manual** is selected.

Water temperature

Set the water temperature at the transducer directly to a fixed value.

Input Setup dialog box

The **Input Setup** dialog box allows you to define the parameters for communication between the sensors (speed, navigational, motion) and the Processing Unit.

How to open

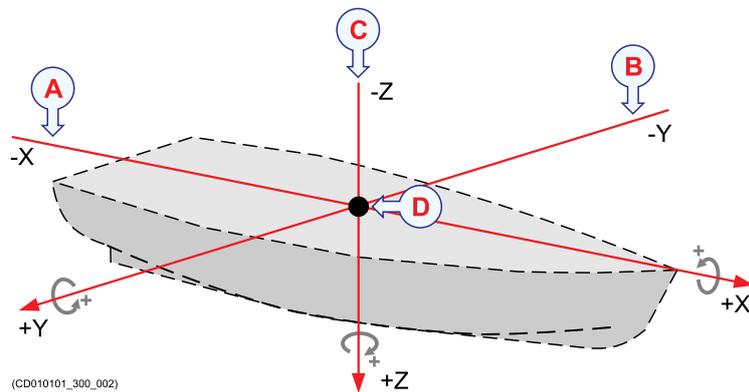
Select the **Installation Parameters** icon and select **Input Setup**.

Description

The input setup page lets you define which type of data to receive on the different serial and Ethernet ports to the Processing Unit. Define the communication parameters for each port.

Note _____

*All sensors, active or not, are logged in the *.kmall format for use in post processing.*



Details

Position system 1

Set up the primary positioning system.

Name

Type in a custom name. The name is saved locally, another computer will not see this.

Location offset

Enter the location offset from the vessel's reference point to the positioning system's reference point.

Position motion correction

When the vessel moves due to roll, pitch and heave, the antenna on the positioning system moves as well. **Position motion correction** allows the system to compensate for this movement by adjusting the values from the positioning system based on current information from the motion sensor(s). Correct timing of the positions is very important to improve position accuracy.

Position delay

Position delay is used to define the age of the position in the position datagrams. The relative timing of vessel position data and system depth data is critical to the total achievable accuracy. The best solution is if it can be assured that the position

datagrams are always received by the system with a fixed and sufficiently constant age with respect to the time of validity of the enclosed positions. This age is the position delay to enter.

Quality indicators

Enter the quality indicator numbers (comma separated) that you want to interpret as accepted height observations. The quality factor applies to GGA and GPK position data only.

The default setting is Off, where the system uses the standard quality indicators. When you use a custom quality indication, you must make sure the quality is good enough.

Time to use

Usually the input datagram's timestamp is used. It is then assumed that the multibeam echo sounders clock is set from External ZDA clock, that both the PU system clock and the positioning system clock are synchronized with the 1PPS signal and that there is no time difference between the two clocks. Select System or Datagram. Both time stamps are stored. The time reference can be changed or corrected in post processing.

Select **System** and the multibeam echo sounder will use its own internal time stamp when applying positions to the real time display.

Datagram is the time of the observation read from the position datagram.

Datum

Datum enables you to set the internal datum identical to what the positioning system sends to the echo sounder. This will also be logged. The projection reference in the survey module must also be set accordingly.

Format

Select the format the sensor uses.

Input

Select the input port the sensor uses and fill in the information about the port.

Position system 2

Set up the secondary positioning system.

Position system 3

Set up the tertiary positioning system.

Attitude system 1

Set up the primary attitude system.

Angular offset

Enter the roll, pitch and heading installation angles of the sensor if not already applied in sensor. It is recommended to configure this in the sensor.

Attitude delay

The expected time delay of the motion data.

If the data from the attitude sensor are delayed with respect to when they were valid, this may be corrected by the system, provided the delay is known. This delay may be due to filtering and/or processing time in the sensor, and should be provided by the manufacturer.

Roll reference plane

The roll reference plane is used to define which roll angle to measure. Select Rotation or Horizontal.

Select Rotation if roll is measured against a plane defined as horizontal in the across-track direction, but following the vessel pitch in the along-track direction, i.e. as a rotation around the forward pointing axis of the vessel coordinate system. This is the convention usually used by inertial systems such as the POS/MV (the Tate-Bryant convention).

Select Horizontal if roll is measured against the horizontal plane, i.e. against the plane normal to the gravity vector. This is the convention used by the Hippy 120, often emulated by other sensors.

Attitude system 2

Set up the secondary attitude system.

Depth/Pressure

Setup the depth sensor for a ROV.

Depth delay

The delay of the depth in seconds.

Depth offset

Enter the Depth of the sensor relative to the ROV's reference point.

Depth scale offset

Enter the scale offset for the depth sensor.

Time system

Set up the time system.

Source

Select which time format to import. Select time datagram or position datagram.

1PPS

Select whether to use the pulse per second synchronisation or not. Select Off, On rising edge or On falling edge.

Set active sensors

Select which position and attitude systems to be active.

Active position system

Select the system you want active.

Active attitude system

Select the system you want active.

Output Setup dialog box

In the **Output Setup** dialog box you define the output setup for broadcasting the *.kmail datagrams from the Processing Unit to the network.

How to open

Select the **Installation Parameters** icon and select **Input Setup**.

Description

Define the addresses to broadcast datagrams to.

Details

Multicast address

Enter the multicast address to broadcast data to.

Multicast port

Enter the port to broadcast to.

Secondary net address

Enter the secondary net's address.

Secondary net subnet

Enter the secondary net's subnet address.

Transducer setup dialog box

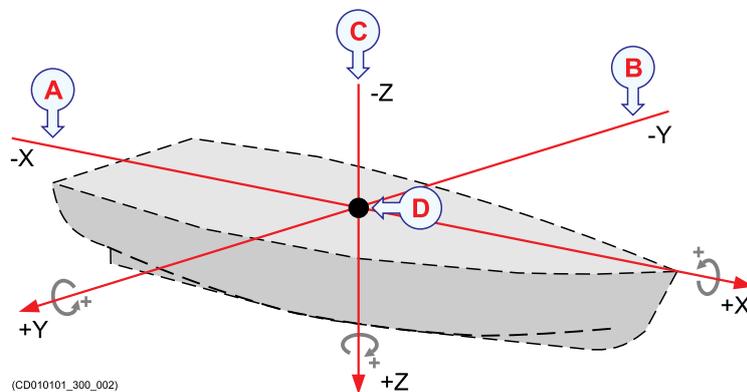
The **Transducer setup** dialog box contains all the parameters for the transducers. Settings for the water line and the ships noise level are also here.

How to open

Select the **Installation Parameters** icon and select **Input Setup**.

Description

In order to make correct computations, SIS must know the physical location of all sensors, including it's transducers. The locations must be referred to the vessel's reference point. The location of each system must therefore be given as a forward (x), downward (z) and



starboard (y) position relative to the reference point. The coordinate system assumes that the x-axis follows the vessel's keel, and that the x-y plane is horizontal while the vessel is in normal trim.

Details

TX Location offset

Enter the location offset from the vessel reference point and the transducer reference point in the x, y and z direction.

TX Angular offset

Enter the installation angular offset for roll, pitch and heave.

TX Size

The size of the beam angle in degrees.

RX Location offset

Enter the location offset from the ship's origin in the x, y and z direction.

RX Angular offset

Enter the angular offset in roll, pitch and heave.

RX BS offset

Enter the backscatter offset in dB.

Water line vertical location

Enter the distance between the vessel reference point and the water level.

System test dialog box

The **System test** dialog box provides several automatic tests to check the operation of the echo sounder system.

How to open

Select **Installation Parameters** on the **View** menu. Select the **Installation Parameters** icon and select **System test**.

Description

Various test are available, depending on what system you have.

Details

Test

Select the test you want to run.

Clear

Select **Clear** to delete the tests already run.

Combine

Select **Combine** to get one text file with all the tests you have run.

PU System test result

All the tests will be listed as they are done.

Time

The time the test was run showing as yyyyymmdd-hhmmss.

Result

The result showing as Passed or Failed.

Description

A short description of the test. Select the description or the text file to get more details.

Index

1PPS		detector mode	17
Input Setup dialog box	39	dual swath mode	17
A		extra detection	18
about		FM disable	18
document downloads	5	force depth	17
online information	5	maximum depth	17
purpose of this manual	5	minimum depth	17
registered trademarks	5	depth/pressure	
software version	5	Input Setup dialog box	39
target audience	5	description	
active attitude system		Depth Settings dialog box	17
Input Setup dialog box	40	Filter and Gains dialog box	22
active position system		Input Setup dialog box	37
Input Setup dialog box	39	Installation Parameters dialog box	29
aeration filter		Output Setup dialog box	41
Filter and Gain dialog box	24	Runtime parameters dialog box	14, 26, 29
angular coverage mode		Sector Coverage dialog box	15
Sector Coverage dialog box	15	Simulator dialog box	26
angular offset		Sound Velocity dialog box	21
Input Setup dialog box	38	system	7
attitude delay		system test dialog box	43
Input Setup dialog box	38	System test dialog box	43
attitude secondary		top bar	13
Input Setup dialog box	39	transducer setup dialog box	41
attitude system		Transmit control dialog box	19
Input Setup dialog box	38	details	
audience		Depth Settings dialog box	17
this manual	5	Filter and Gains dialog box	22
		Input Setup dialog box	37
		Output Setup dialog box	41
		Sector Coverage dialog box	15
		Simulator dialog box	26
		Sound Velocity dialog box	21
		system test dialog box	43
		transducer setup dialog box	42
		Transmit control dialog box	19
		detector mode	
		Depth Settings dialog box	17
		dialog box	
		Depth Settings dialog box description	17
		Filter and Gains dialog box description	22
		Input Setup dialog box description	37
		Installation Parameters dialog box	
		description	29
		Output Setup dialog box description	41
		Runtime parameters dialog box	
		description	14, 26, 29
		Sector Coverage dialog box description	15
		Simulator dialog box description	26
		Sound Velocity dialog box description	21
		system test dialog box description	43
		Transmit control dialog box description	19
		documents	
		download from website	5
		download	
		documents from website	5
		dual swath mode	
		Depth Settings dialog box	17
B			
beam spacing			
Sector Coverage dialog box	16		
book			
purpose	5		
target audience	5		
C			
clear			
System test dialog box	43		
combine			
System test dialog box	43		
D			
datum			
Input Setup dialog box	38		
depth delay			
Input Setup dialog box	39		
depth offset			
Input Setup dialog box	39		
depth scale offset			
Input Setup dialog box	39		
Depth Settings dialog box			
description	17		
details	17		

-
- E**
- enable simulation
 - Simulator dialog box 26
 - external trigger
 - Transmit control dialog box 20
 - extra detection
 - Depth Settings dialog box 18
- F**
- Filter and Gain dialog box
 - aeration filter 24
 - interference filter 24
 - normal incidence corr. 24
 - penetration filter strength 23
 - phase ramp 23
 - range gate size 22
 - sector tracking filter 24
 - slope filter 24
 - sonar mode 25
 - special amp. detect 24
 - special TVG 23
 - spike filter strength 22
 - transmit power level 25
 - use Lambert's law 24
 - water column TVG offset 25
 - water column X log 25
 - Filter and Gains dialog box
 - description 22
 - details 22
 - FM disable
 - Depth Settings dialog box 18
 - force depth
 - Depth Settings dialog box 17
 - format
 - Input Setup dialog box 38
 - frequency
 - Transmit control dialog box 20
- H**
- heading filter
 - Transmit control dialog box 20
 - how to
 - install the operational software 10
 - turn on 10
- I**
- information
 - online 5
 - support 8
 - input
 - Input Setup dialog box 38
 - Input Setup dialog box
 - 1PPS 39
 - active attitude system 40
 - active position system 39
 - angular offset 38
 - attitude delay 38
 - attitude secondary 39
 - attitude system 38
 - datum 38
 - depth delay 39
 - depth offset 39
 - depth scale offset 39
 - depth/pressure 39
 - description 37
 - details 37
 - format 38
 - input 38
 - location offset 37
 - name 37
 - position delay 37
 - position motion correction 37
 - position secondary 38
 - position system 37
 - position tertiary 38
 - quality indicators 38
 - roll reference plane 39
 - set active sensors 39
 - source 39
 - time system 39
 - time to use 38
 - installation
 - software 10
 - Installation Parameters dialog box
 - description 29
 - interference filter
 - Filter and Gain dialog box 24
- K**
- Kongsberg Maritime
 - support 8
- L**
- location offset
 - Input Setup dialog box 37
- M**
- manual
 - purpose 5
 - target audience 5
 - manual heading
 - Transmit control dialog box 20
 - max ping rate
 - Transmit control dialog box 20
 - maximum angle
 - Sector Coverage dialog box 15
 - maximum coverage
 - Sector Coverage dialog box 15
 - maximum depth
 - Depth Settings dialog box 17
 - min swath distance
 - Transmit control dialog box 20
 - minimum depth
 - Depth Settings dialog box 17
 - multicast address
 - Output Setup dialog box 41
 - multicast port
 - Output Setup dialog box 41
- N**
- name

Input Setup dialog box	37	result	
network security	7	System test dialog box	43
normal incidence corr.		roll reference plane	
Filter and Gain dialog box	24	Input Setup dialog box	39
O		Runtime parameters dialog box	
offices		description	14, 26, 29
support	8	RX angular offset	
on		transducer setup dialog box	42
turn	10	RX BS offset	
online		transducer setup dialog box	42
information	5	RX location offset	
operational software		transducer setup dialog box	42
installation	10	S	
Output Setup dialog box		secondary net address	
description	41	Output Setup dialog box	41
details	41	secondary net subnet	
multicast address	41	Output Setup dialog box	41
multicast port	41	Sector Coverage dialog box	
secondary net address	41	angular coverage mode	15
secondary net subnet	41	beam spacing	16
P		description	15
penetration filter strength		details	15
Filter and Gain dialog box	23	maximum angle	15
phase ramp		maximum coverage	15
Filter and Gain dialog box	23	sector tracking filter	
pitch stabilisation		Filter and Gain dialog box	24
Transmit control dialog box	19	set active sensors	
position delay		Input Setup dialog box	39
Input Setup dialog box	37	Simulator dialog box	
position motion correction		description	26
Input Setup dialog box	37	details	26
position secondary		enable simulation	26
Input Setup dialog box	38	simulator max depth	26
position system		simulator min depth	26
Input Setup dialog box	37	simulator slant across	26
position tertiary		simulator step along	26
Input Setup dialog box	38	simulator max depth	
procedure		Simulator dialog box	26
installing the operational software	10	simulator min depth	
turning on	10	Simulator dialog box	26
PU test result		simulator slant across	
System test dialog box	43	Simulator dialog box	26
publication		simulator step along	
purpose	5	Simulator dialog box	26
target audience	5	slope filter	
purpose		Filter and Gain dialog box	24
this manual	5	software	
Q		installation	10
quality indicators		version	5
Input Setup dialog box	38	sonar mode	
R		Filter and Gain dialog box	25
range gate size		sound velocity	
Filter and Gain dialog box	22	Sound Velocity dialog box	21
reader		Sound Velocity dialog box	
this manual	5	description	21
registered trademarks	5	details	21
		sound velocity	21
		Sound velocity source	21
		water temperature	21
		Sound velocity source	
		Sound Velocity dialog box	21
		source	
		Input Setup dialog box	39

special amp. detect		
Filter and Gain dialog box	24	
special TVG		
Filter and Gain dialog box	23	
spike filter strength		
Filter and Gain dialog box	22	
support information	8	
switch		
on	10	
system		
description	7	
system software		
installation	10	
system test dialog box		
description	43	
details	43	
System test dialog box		
clear	43	
combine	43	
description	43	
PU test result	43	
result	43	
test	43	
time	43	
T		
target audience		
this manual	5	
test		
System test dialog box	43	
this manual		
purpose	5	
target audience	5	
time		
System test dialog box	43	
time system		
Input Setup dialog box	39	
time to use		
Input Setup dialog box	38	
top bar		
description	13	
trademarks		
registered	5	
transducer setup dialog box		
description	41	
details	42	
RX angular offset	42	
RX BS offset	42	
RX location offset	42	
TX angular offset	42	
TX location offset	42	
TX size	42	
water line vertical location	42	
transmit angle along		
Transmit control dialog box	19	
Transmit control dialog box		
description	19	
details	19	
external trigger	20	
frequency	20	
heading filter	20	
manual heading	20	
max ping rate	20	
min swath distance	20	
pitch stabilisation	19	
transmit angle along	19	
yaw stabilisation mode	19	
transmit power level		
Filter and Gain dialog box	25	
turn		
on	10	
TX angular offset		
transducer setup dialog box	42	
TX location offset		
transducer setup dialog box	42	
TX size		
transducer setup dialog box	42	
U		
use Lambert's law		
Filter and Gain dialog box	24	
V		
version		
software	5	
W		
water column TVG offset		
Filter and Gain dialog box	25	
water column X log		
Filter and Gain dialog box	25	
water line vertical location		
transducer setup dialog box	42	
water temperature		
Sound Velocity dialog box	21	
website		
download documents	5	
Y		
yaw stabilisation mode		
Transmit control dialog box	19	

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