



KONGSBERG

K-SYNC

PLATFORMS/INSTRUMENT CARRIERS

From gliders through vessels, from
stationary through highly agile

OPTIMIZING THE CONDUCTOR OF HYDRO-ACOUSTICS

BIOMASS

From plankton through fish schools

PHYSIOCHEMICAL TARGETS

Clines, currents, sediment clouds,
seabed classification, gas bubbles

1

System Overview



Course Objectives



Understand K-Sync Capabilities



Identify and describe K-Sync components and integration on vessel



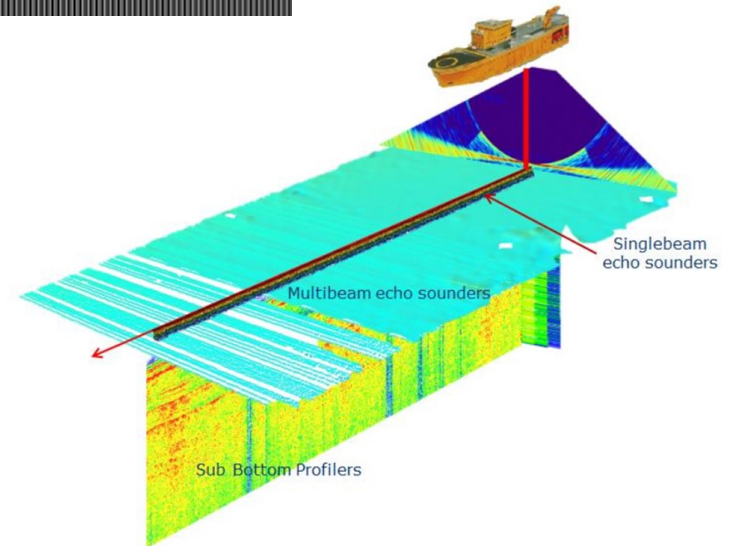
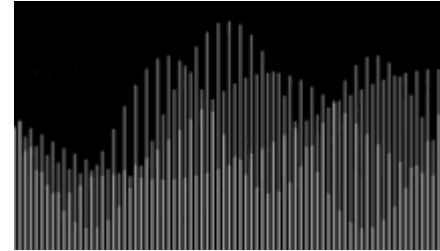
Perform startup, shutdown, and basic operation of K-Sync

System Overview

- K-Sync controls pinging of each echosounder with real-time trigger display.
- Avoids interference from echosounders with similar frequencies or harmonics that will cause bad data collection.
- K-Sync receives ready signals from echosounders
- Supports up to 16 groups in real time or manual depth input
- Trigger from external input, calculated or fixed time

The Problem

EQUIPMENT	FREQUENCY
Sub Bottom Profiler	0.5-30 kHz
HiPAP	20-30 kHz
EM124	10.5-13.5 kHz
EM304/MKII	26-34/20-32 kHz
EM712	40-100 kHz
EM2040	200-400 kHz
EK80	18-333 kHz
ADCPs	38 – 300 kHz
ME 70	70 kHz

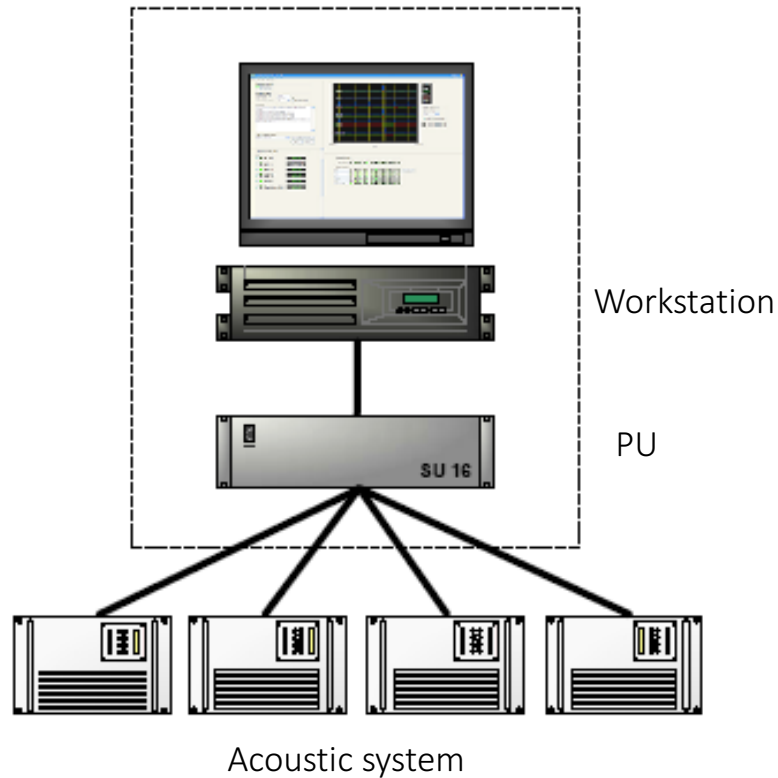


The Solution

Synchronization

Synchronize your systems together!

Note: Using a K-SYNC unit with several active acoustic systems will slow down ping rate and reduce the data density on the sensors involved.



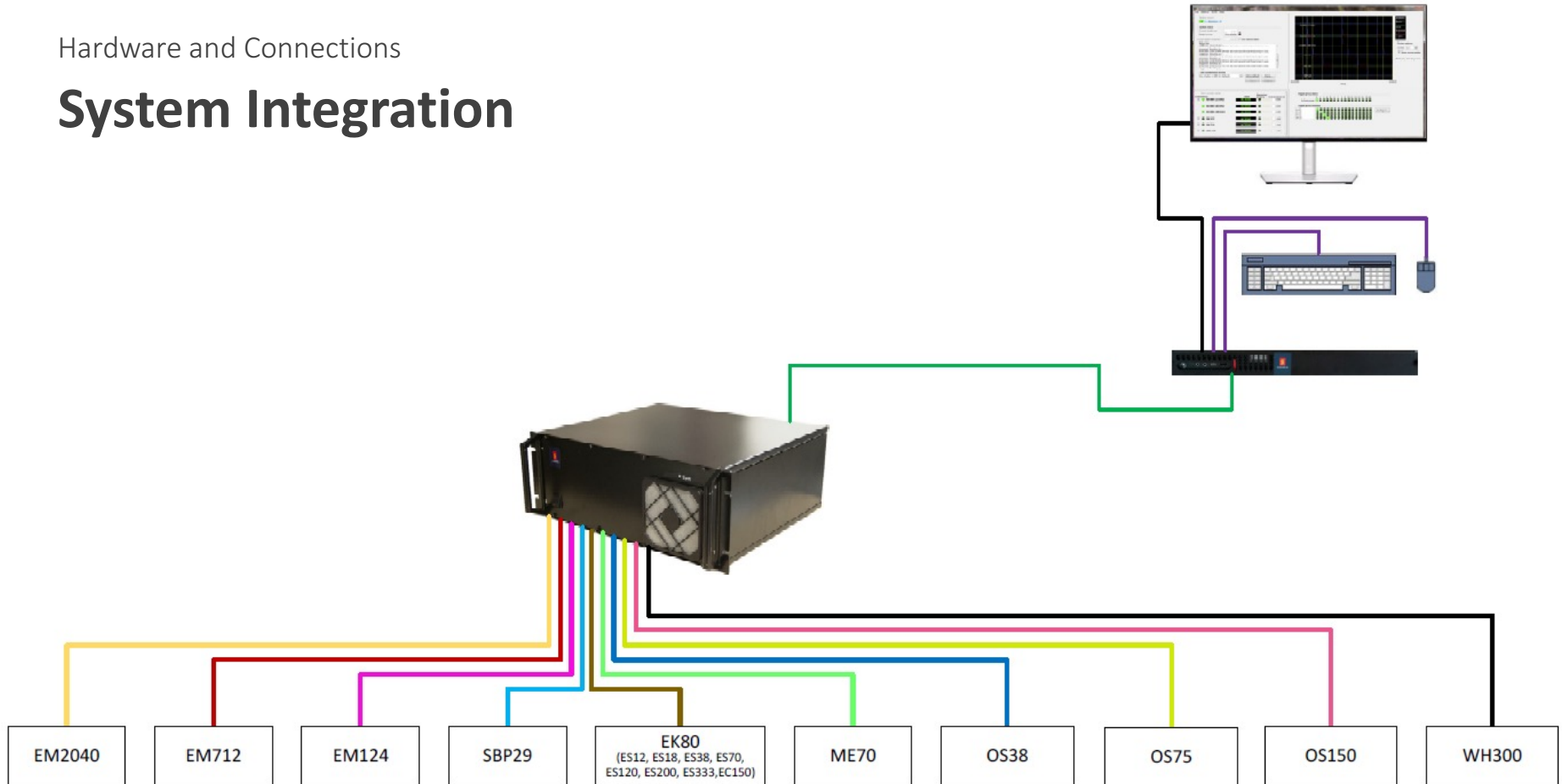
2

Hardware and Connections



Hardware and Connections

System Integration



Processing Units (PU)

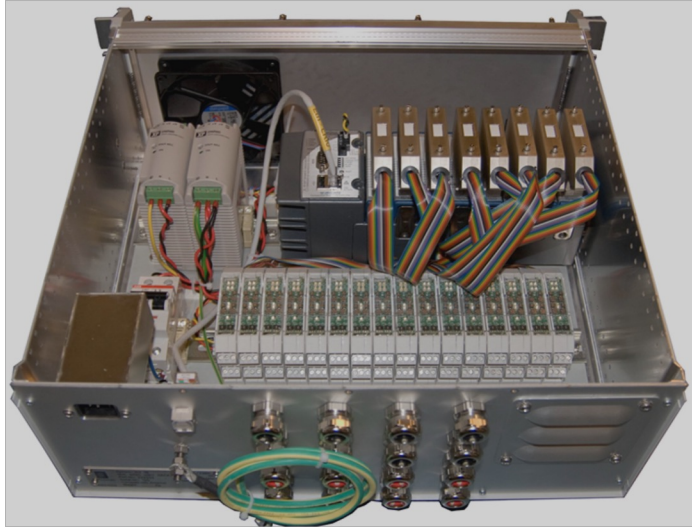


19-Inch rack-mounted K-SYNC PU

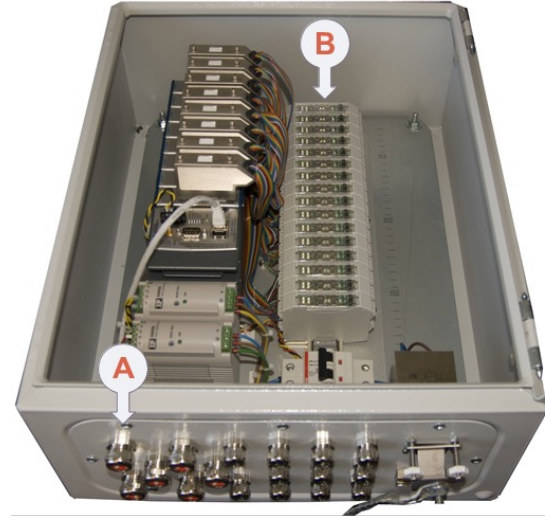


1K-SYNC PU for wall-mount

PU Internal Components



19-Inch rack-mounted K-SYNC PU



1K-SYNC PU for wall-mount

A Power

B 16 modules for
interfacing with
different acoustic
systems

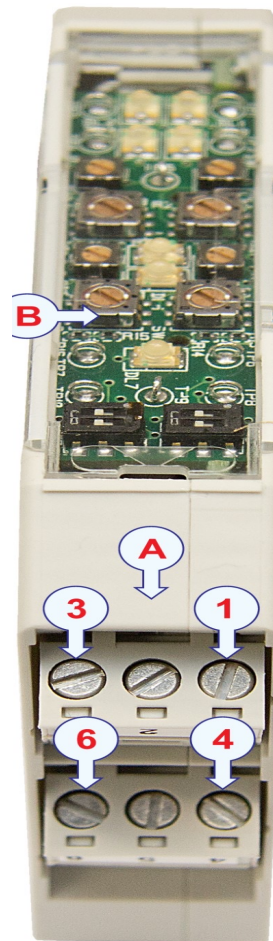
Modules

There are 16 Modules to connect

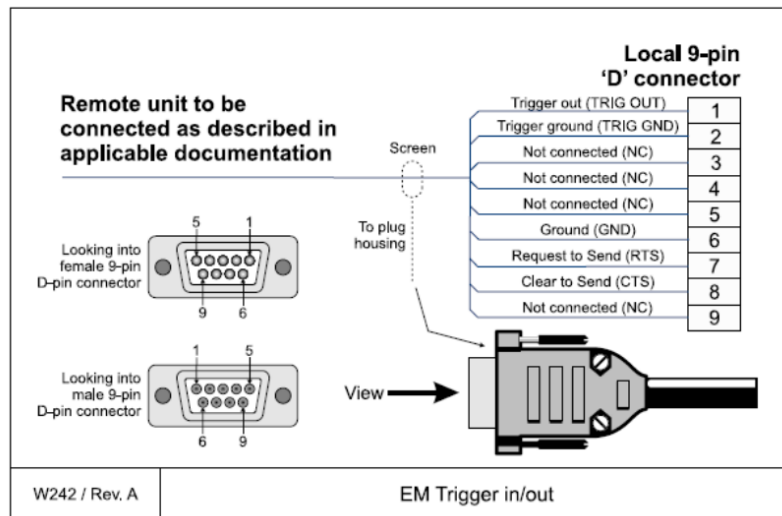
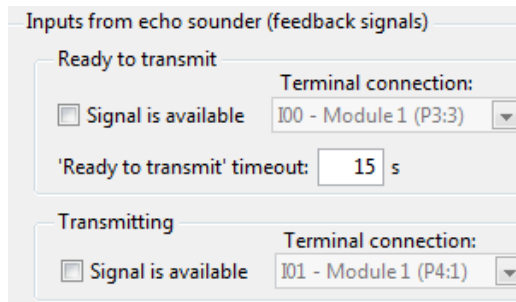
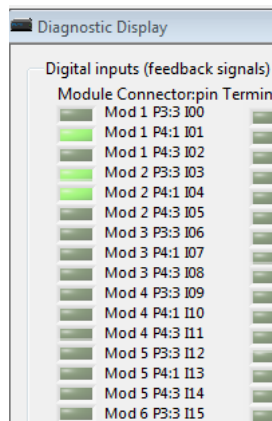
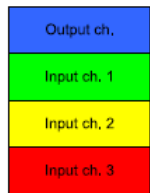
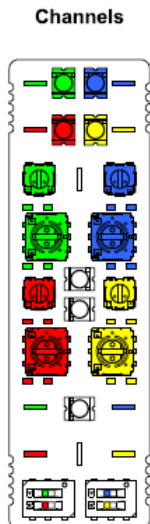
A – Wire terminal connections

1 through 6 as indicated by
the arrows

B – Configuration board



Module Connections



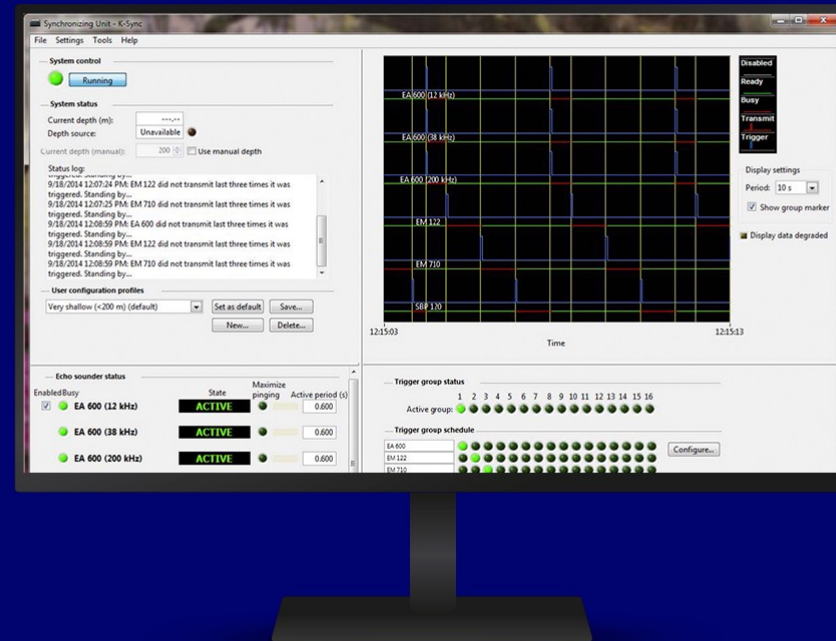
K-SYNC		EM 122 / EM 302 / EM 710 BSP RIO BOARD TRIG IN/OUT
Pin. no	Signal / Type	Pin no.
1	Trig out→ / RS232	8
2	←Gnd	6
3	←CTS (Clear to send) / RS232	7
4	←Trig in / TTL	1
5	←Gnd	6

3

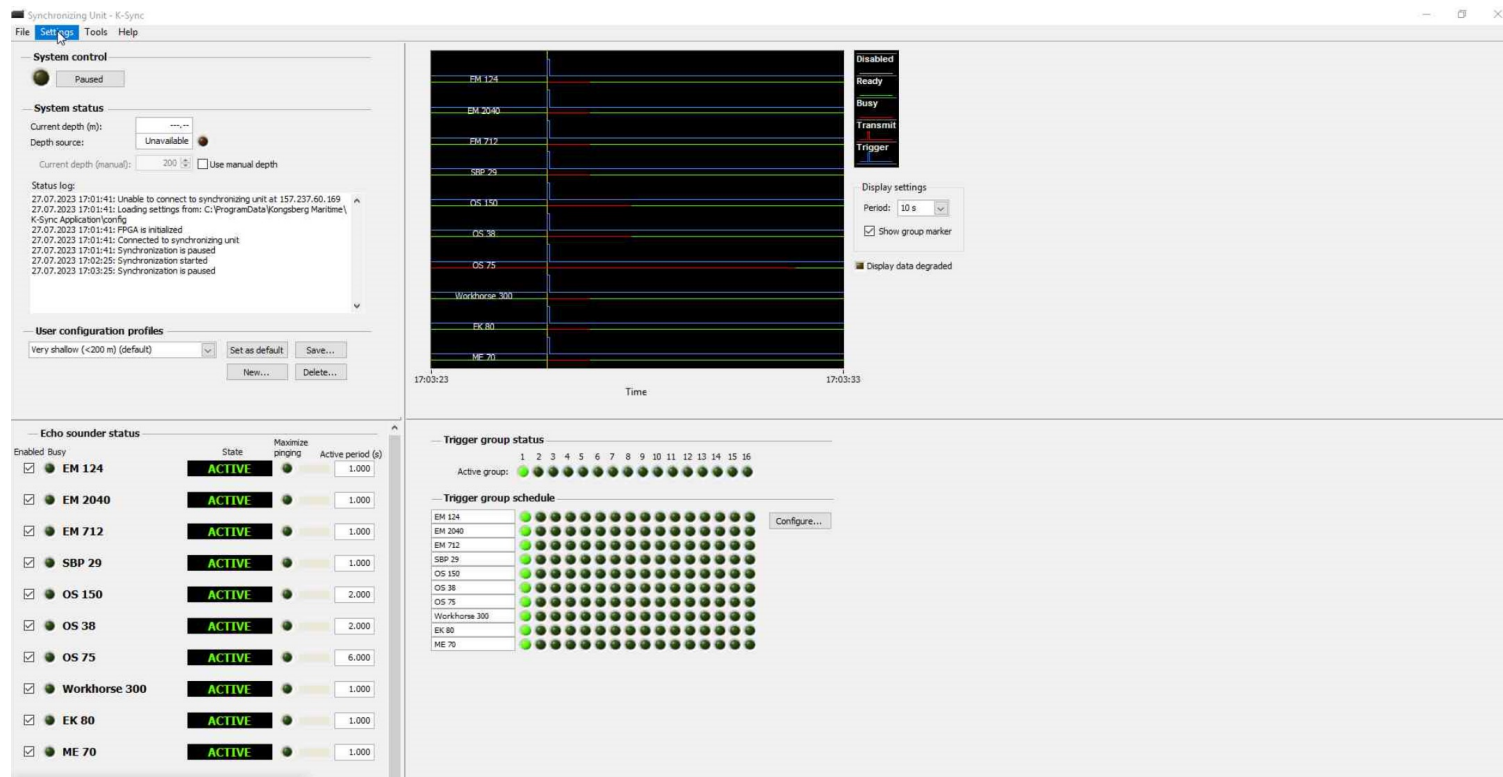
Software Overview



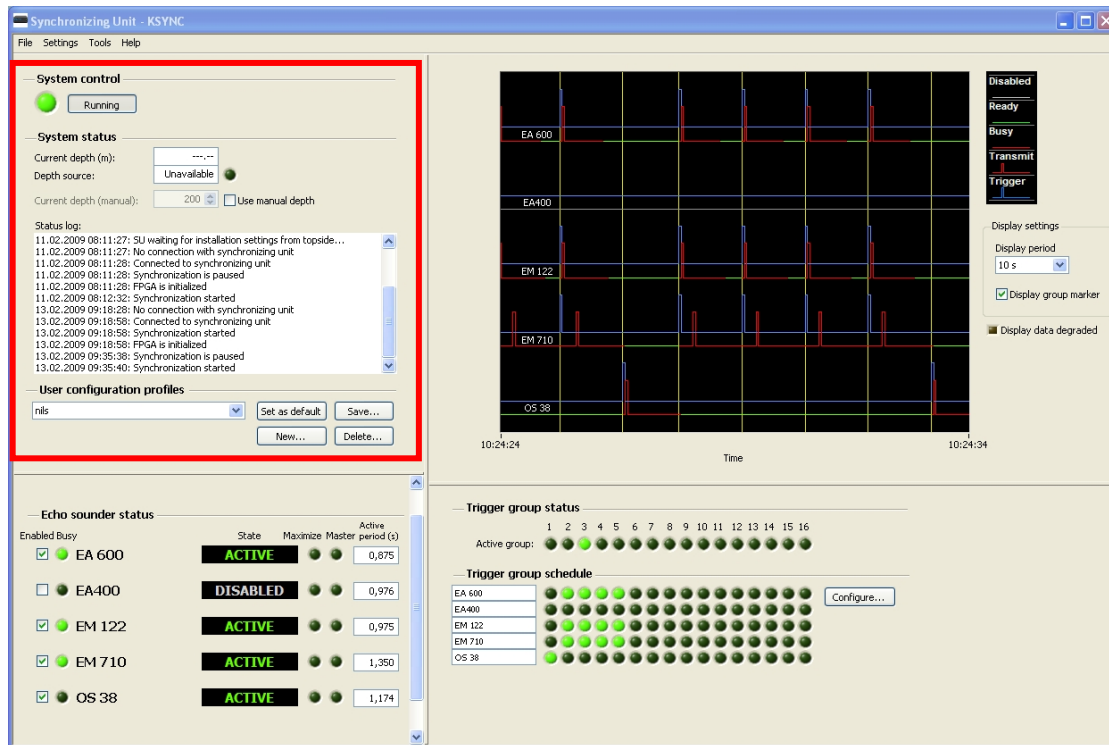
KONGSBERG



Software Overview




Synchronizing Unit Operation




System Control

System control


Running

System status

Current depth (m): ---,--

Depth source: Unavailable 




Current depth (manual): 200 Use manual depth

Status log:

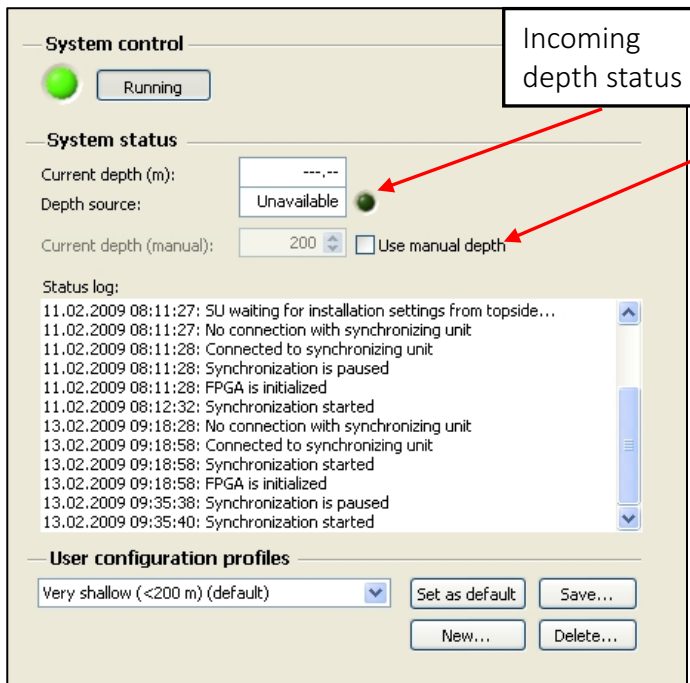
11.02.2009 08:11:27: SU waiting for installation settings from topside...
11.02.2009 08:11:27: No connection with synchronizing unit
11.02.2009 08:11:28: Connected to synchronizing unit
11.02.2009 08:11:28: Synchronization is paused
11.02.2009 08:11:28: FPGA is initialized
11.02.2009 08:12:32: Synchronization started
13.02.2009 09:18:28: No connection with synchronizing unit
13.02.2009 09:18:58: Connected to synchronizing unit
13.02.2009 09:18:58: Synchronization started
13.02.2009 09:18:58: FPGA is initialized
13.02.2009 09:35:38: Synchronization is paused
13.02.2009 09:35:40: Synchronization started

User configuration profiles

Very shallow (<200 m) (default)

System control	System state	Description of state
<div> System control <div>  No connection </div> </div> (LED is red)	Not connected	SU application has not yet connected to the Synchronizing Unit. Status in the user interface is not updating and is grayed out.
<div> System control <div>  Paused </div> </div> (LED is green and blinking)	Paused	Synchronization is paused (green LED is blinking). Trigger display updates current signal levels and echo sounder states, but no echo sounder is being triggered by Synchronizing Unit. Clicking button will go to <i>running</i> state.
<div> System control <div>  Running </div> </div> (LED is green)	Running	System is running and all enabled and scheduled echo sounders are being triggered. Clicking button will go to <i>paused</i> state.

System Status



The main window displays system control and status. It includes a 'Running' status indicator, a 'Current depth (m)' field showing '---,--', a 'Depth source' dropdown set to 'Unavailable', and a 'Current depth (manual)' field set to '200'. A 'Status log' section contains a list of system events. At the bottom, there are 'User configuration profiles' with a dropdown set to 'Very shallow (<200 m) (default)' and buttons for 'Set as default', 'Save...', 'New...', and 'Delete...'.

System control

Running

System status

Current depth (m): ---,--

Depth source: Unavailable

Current depth (manual): 200 ☐ Use manual depth

Status log:

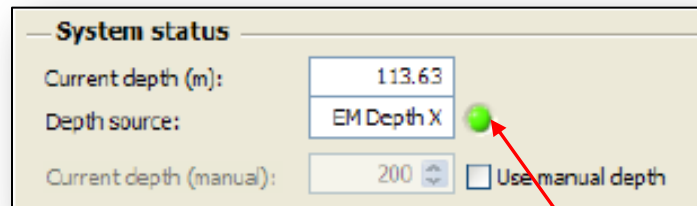
- 11.02.2009 08:11:27: SU waiting for installation settings from topside...
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- 13.02.2009 09:18:28: No connection with synchronizing unit
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- 13.02.2009 09:18:58: Synchronization started
- 13.02.2009 09:18:58: FPGA is initialized
- 13.02.2009 09:35:38: Synchronization is paused
- 13.02.2009 09:35:40: Synchronization started

User configuration profiles

Very shallow (<200 m) (default)

Incoming
depth status

Override incoming depth



This inset window shows the 'System status' section with updated values: 'Current depth (m)' is '113.63', 'Depth source' is 'EM Depth X', and 'Current depth (manual)' is '200'. A green dot next to the 'EM Depth X' dropdown indicates that depth is now available.

System status

Current depth (m): 113.63

Depth source: EM Depth X

Current depth (manual): 200 ☐ Use manual depth

Depth is available

System Status

The screenshot shows the 'System Status' window. It has three main sections: 'System control', 'System status', and 'User configuration profiles'. In the 'System control' section, there is a green status indicator and a 'Running' button. The 'System status' section displays 'Current depth (m): ---,--', 'Depth source: Unavailable', and 'Current depth (manual): 200'. There is a checkbox for 'Use manual depth' which is currently unchecked. A status log at the bottom shows a series of timestamps and events related to system synchronization. The 'User configuration profiles' section shows a dropdown menu set to 'Very shallow (<200 m) (default)' and buttons for 'Set as default', 'Save...', 'New...', and 'Delete...'. Two red arrows point from external text boxes to the 'Unavailable' status and the 'Use manual depth' checkbox.

System control

Running

System status

Current depth (m): ---,--

Depth source: Unavailable

Current depth (manual): 200 ☐ Use manual depth

Status log:

- 11.02.2009 08:11:27: SU waiting for installation settings from topside...
- 11.02.2009 08:11:27: No connection with synchronizing unit
- 11.02.2009 08:11:28: Connected to synchronizing unit
- 11.02.2009 08:11:28: Synchronization is paused
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- 13.02.2009 09:18:28: No connection with synchronizing unit
- 13.02.2009 09:18:58: Connected to synchronizing unit
- 13.02.2009 09:18:58: Synchronization started
- 13.02.2009 09:18:58: FPGA is initialized
- 13.02.2009 09:35:38: Synchronization is paused
- 13.02.2009 09:35:40: Synchronization started

User configuration profiles

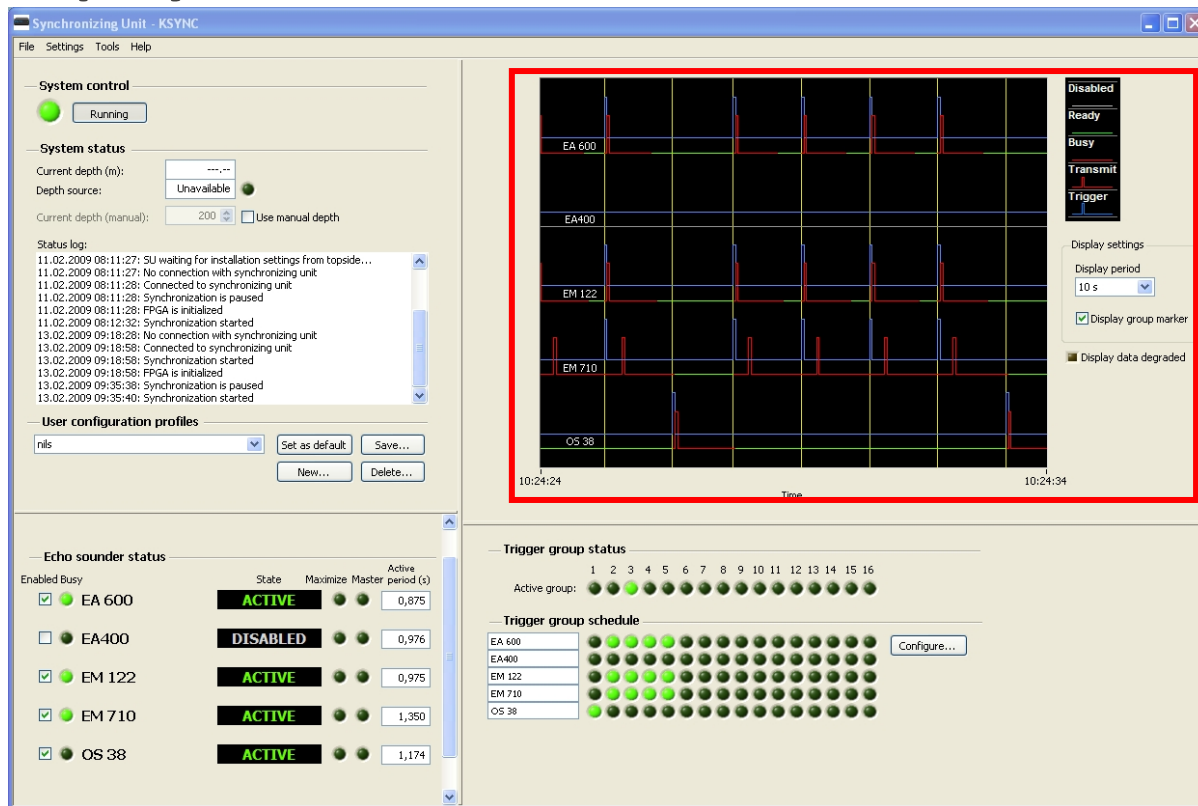
Very shallow (<200 m) (default)

Incoming
depth status

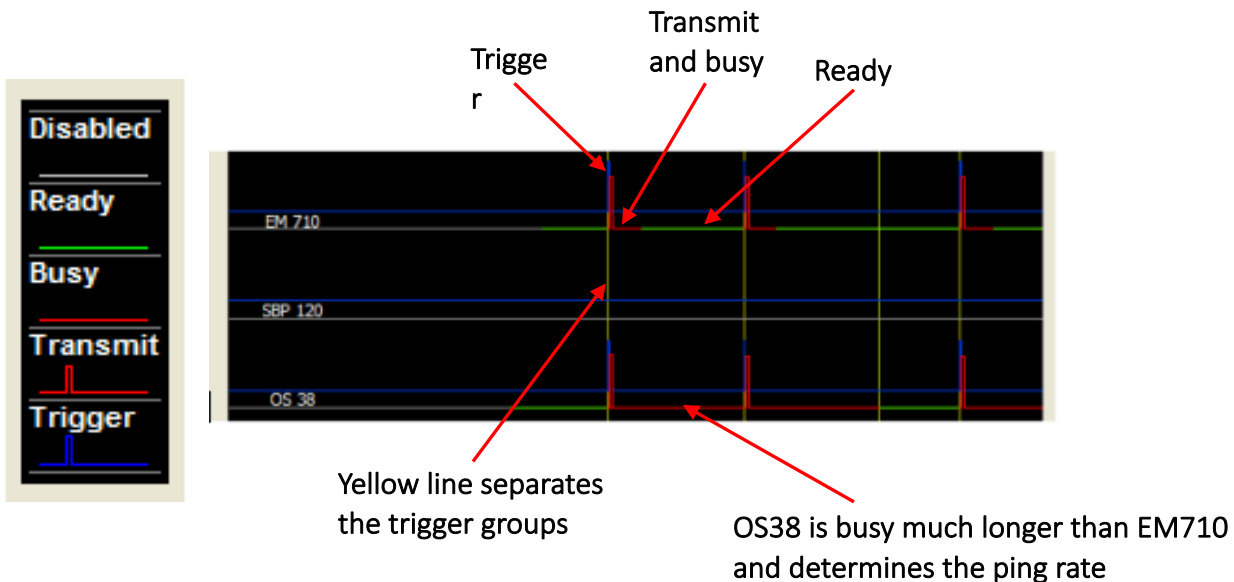
Override incoming depth

Note: Sometimes manual depth is best when doing pelagic sampling in deep water.

Activity Display

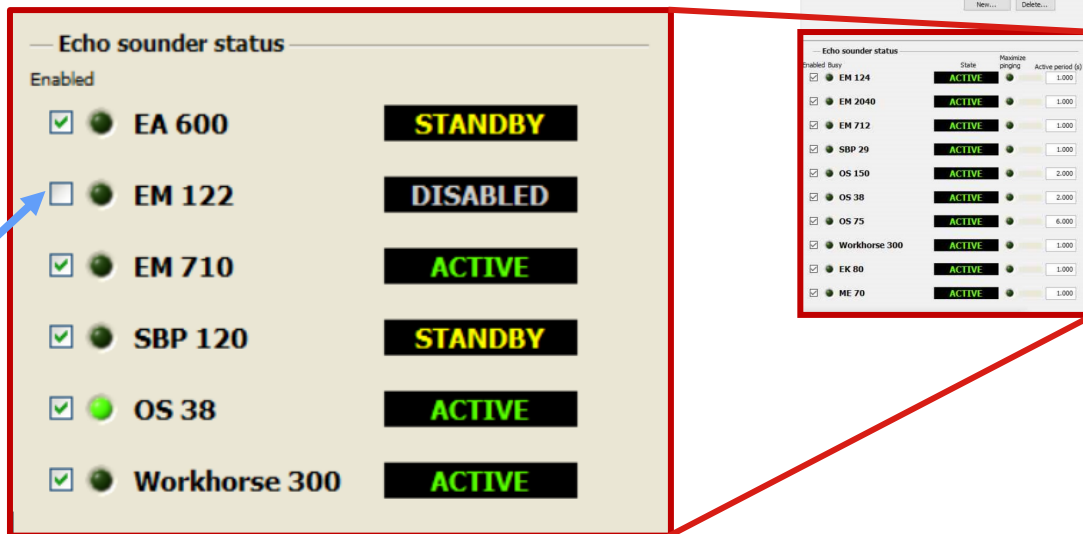


Realtime Trigger Display



Note: The displayed pulses are indicators. They do NOT reflect active high/low settings

Echo Sounder Status



Disabled echosounders will not be triggered - even if they are member of a group

Trigger Group

Active Group

— Trigger group status —

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Active group: ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●

— Trigger group schedule —

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
EA 600	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EA400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 122	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 710	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Configure...

— System control —

Paused

— System status —

Current depth (m): Unavailable

Depth source: Unavailable

Current depth (manual): 200.0

Use manual depth: ☐

Status log:

- 27.07.2023 17:01:41: Unable to connect to synchronizing unit at 157.237.60.169
- 27.07.2023 17:02:41: Loading settings from C:\ProgramData\Kongsberg\Hartnet\KSync\Application\config
- 27.07.2023 17:03:41: FPGA is initialized
- 27.07.2023 17:01:41: Connected to synchronizing unit
- 27.07.2023 17:02:41: Synchronization is paused
- 27.07.2023 17:02:26: Synchronization started
- 27.07.2023 17:03:26: Synchronization is paused

— User configuration profiles —

Very shallow (<200 m) (default) Set as default Save... New... Delete...

— Echo sounder status —

Enabled	Busy	State	Maximize ping	Active period (s)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	2,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	2,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	6,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ACTIVE	●	1,000

— Trigger group status —

Active group: ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●

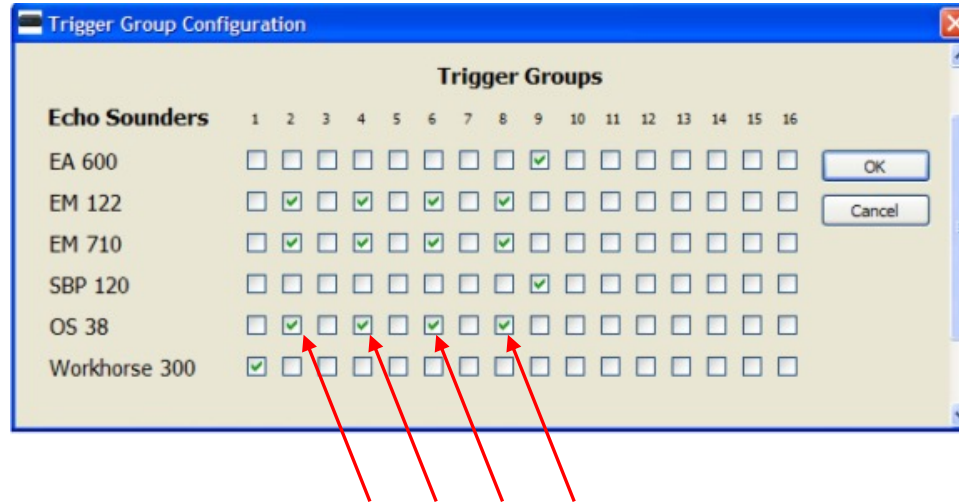
— Trigger group schedule —

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
EM 124	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 2040	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EM 712	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SBP 29	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 150	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OS 75	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Workhorse 300	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
EK 80	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
HE 70	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

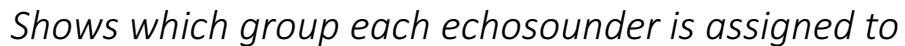
Configure...

Set up groups

Trigger Group Configuration



If some echo sounders can ping several times before next instrument, make many equal groups



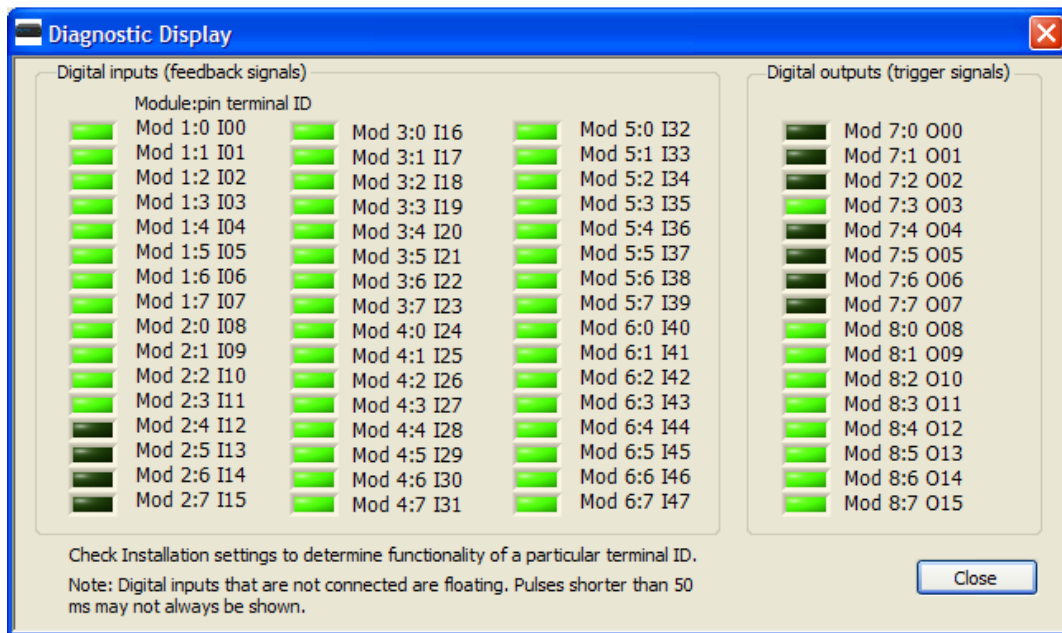
In this case: EM122, EM710 and SBP120 ping 4 times between each Workhorse 300

Diagnostic Tool

Shows signal level and pulses on each I/O
(Green = 5v(high))

Module & pin numbers refer to physical
connections inside the K-Sync

Terminal ID refer to selections in the
installation settings

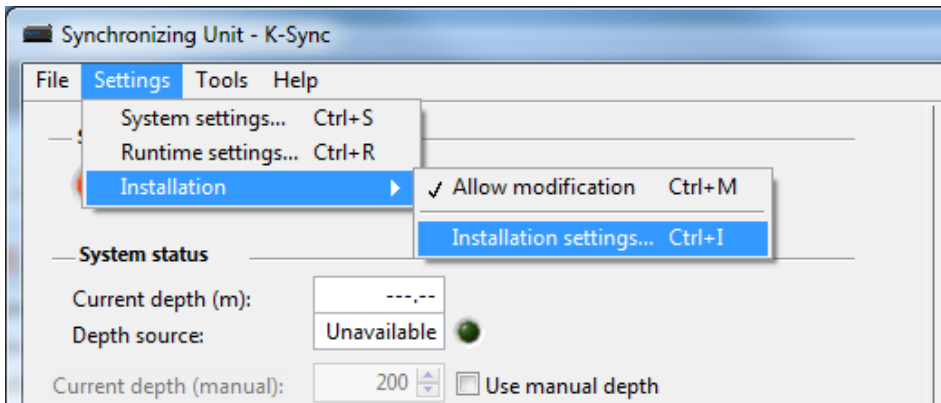


Installation Settings

To be able to change any installation settings:

Press “Allow modification” and input correct password

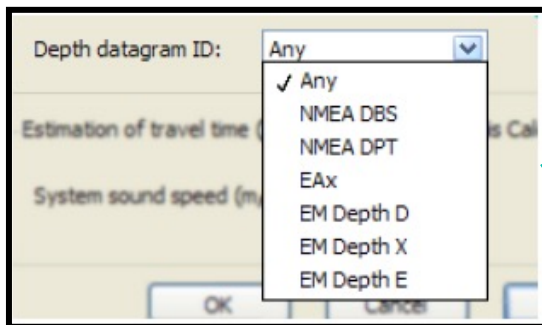
It is helpful to save a backup of all of these settings in a separate location



System Settings

Settings -> System settings

Sync unit's IP address and port number.
Default Subnet mask: 255.255.240.0



The 'System Settings' dialog box is shown. It has a title bar with a Kongsberg logo and the text 'System Settings'. The dialog is divided into two main sections. The top section, titled 'Depth datagram input', contains three fields: 'Sync. unit IP address:' with the value '157.237.60.169', 'UDP receive port:' with the value '4589', and 'Depth datagram ID:' with a dropdown menu set to 'Any'. Below these fields is a note: 'Note: Depth datagrams are received by synchronizing unit.' The bottom section, titled 'Estimation of travel time', contains a field for 'System sound speed (m/s):' with a value of '1500' and a spin button. Below this is another note: 'Note: Only used for round trip time calculations for systems that use 'Calculated' operational mode.' At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'. A blue box with white text is overlaid on the top right of the dialog, containing the text: 'Approximate sound speed: Used for travel time calculations'. A red arrow points from the 'Depth datagram ID' dropdown in the close-up image to the same dropdown in this dialog.

System Settings

Depth datagram input

Sync. unit IP address: 157.237.60.169

UDP receive port: 4589

Depth datagram ID: Any

Note: Depth datagrams are received by synchronizing unit.

Estimation of travel time

System sound speed (m/s): 1500

Note: Only used for round trip time calculations for systems that use 'Calculated' operational mode.

OK Cancel Apply

Approximate sound speed:
Used for travel time calculations

Manage Echosounders

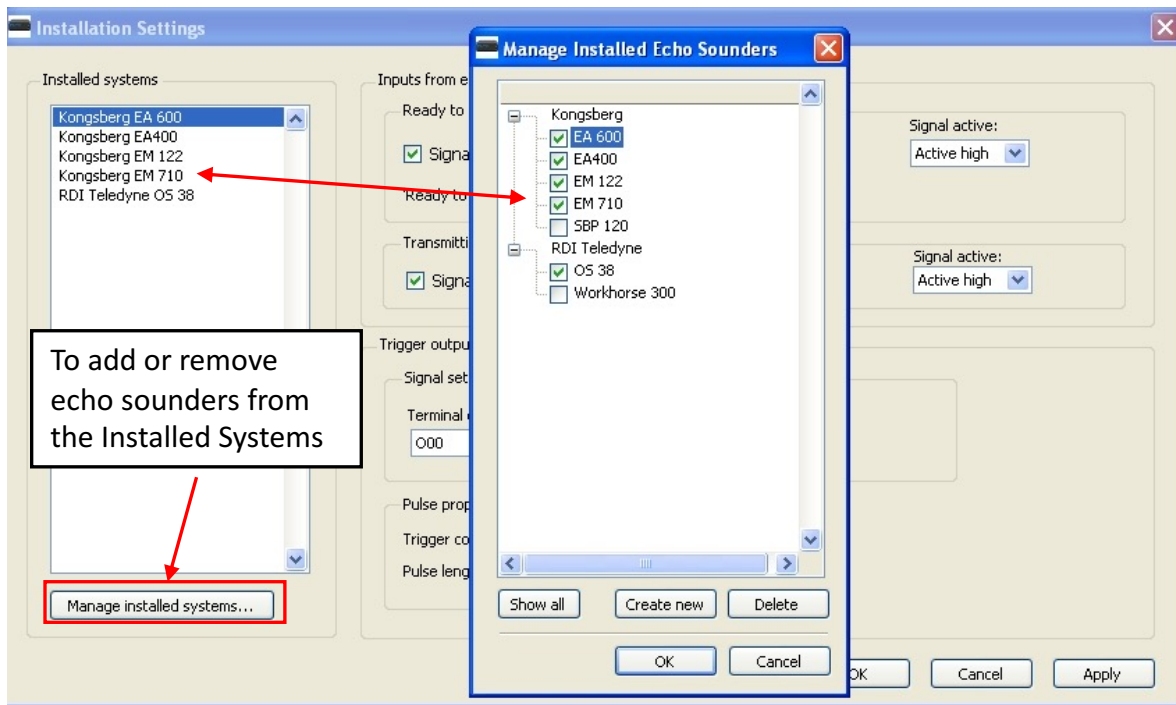
Settings -> Installation -> Installation settings

Manage Installed Echosounders

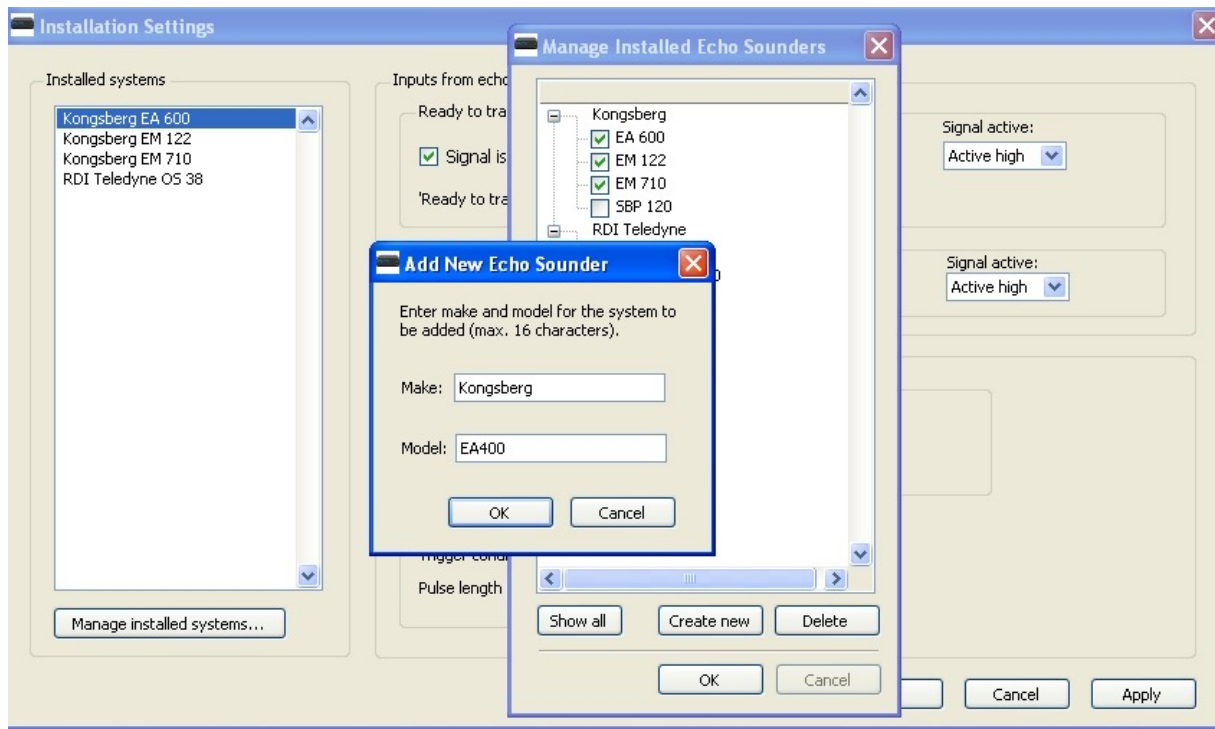
Mark the echosounders that are physically connected.

Add new echosounder if it is not already in the list.

Password: simrad0



Add New Echosounder



Installation Settings

Signal settings

Terminal connection:

O01 - Module 2 (P3:1) ▼

- O00 - Module 1 (P3:1)
- ✓ O01 - Module 2 (P3:1)
- O02 - Module 3 (P3:1)
- O03 - Module 4 (P3:1)
- O04 - Module 5 (P3:1)
- O05 - Module 6 (P3:1)
- O06 - Module 7 (P3:1)
- O07 - Module 8 (P3:1)
- O08 - Module 9 (P3:1)
- O09 - Module 10 (P3:1)
- O10 - Module 11 (P3:1)
- O11 - Module 12 (P3:1)
- O12 - Module 13 (P3:1)
- O13 - Module 14 (P3:1)
- O14 - Module 15 (P3:1)
- O15 - Module 16 (P3:1)
- Unassigned

Installation Settings

Installed systems

- Kongsberg EA 600
- Kongsberg EM 122
- Kongsberg EM 710
- Kongsberg SBP 120

Manage installed systems...

Inputs from echo sounder (feedback signals)

Ready to transmit

Signal is available ☒

Terminal connection: I03 - Module 2 (P3:3) ▼

Signal active: Active high ▼

'Ready to transmit' timeout (s): 90

Transmitting

Signal is available ☒

Terminal connection: I04 - Module 2 (P4:1) ▼

Signal active: Active low ▼

Trigger output to echo sounder

Signal settings

Terminal connection: O01 - Module 2 (P3:1) ▼

Signal active: Active high ▼

Pulse properties

Trigger condition: Rising edge ▼

Pulse length (ms): 10

OK Cancel Apply

Runtime Settings

The screenshot shows the 'Runtime Settings' dialog box. The 'Selected echo sounder' is 'EA 600'. Under 'Trigger mode', 'External input' is selected and highlighted with a red box. 'Calculated' and 'Fixed period' are unselected. Under 'Special trigger settings', 'Maximize pinging' and 'Echo sounder is Master' are unchecked. A note at the bottom states: 'Note: 'External input mode' is only available for systems with 'Ready to transmit' feedback signal enabled in installation settings. 'Echo sounder is Master' is only available if 'Transmitting' signal is enabled.'

External input:
Automatic sequence
calculations

Settings -> Runtime settings

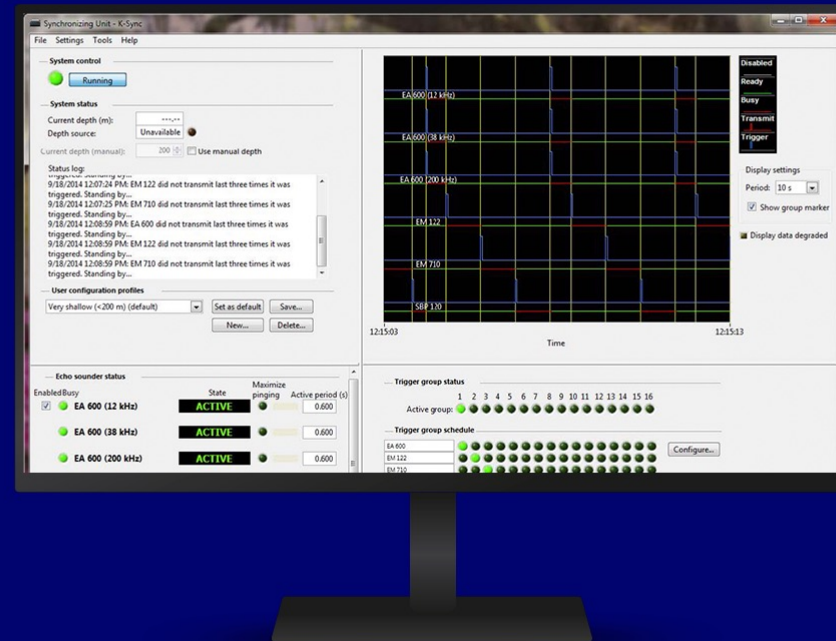
The screenshot shows the 'Runtime Settings' dialog box with 'Calculated' selected under 'Trigger mode' and highlighted with a red box. A callout box points to this selection with the text: 'Calculated: Ping rate is based on depth and sound speed'. The 'Roundtrip time calculation parameters' section shows 'Multiplication factor (MF)' at 0.00 % and 'Fixed delay (FD)' at 800 ms. The 'Resulting rountrip time at current depth' section shows: 'Normal beam r. t. (RT): 0.151 s', 'Percent add-on (RT*MF): 0.000 s', 'Fixed delay (FD): 0.800 s', and 'Total roundtrip time: 0.951 s'. The 'Special trigger settings' section shows 'Maximize pinging' checked and 'Echo sounder is Master' unchecked. The same note about 'External input mode' is present at the bottom.

4

Optimizing Settings

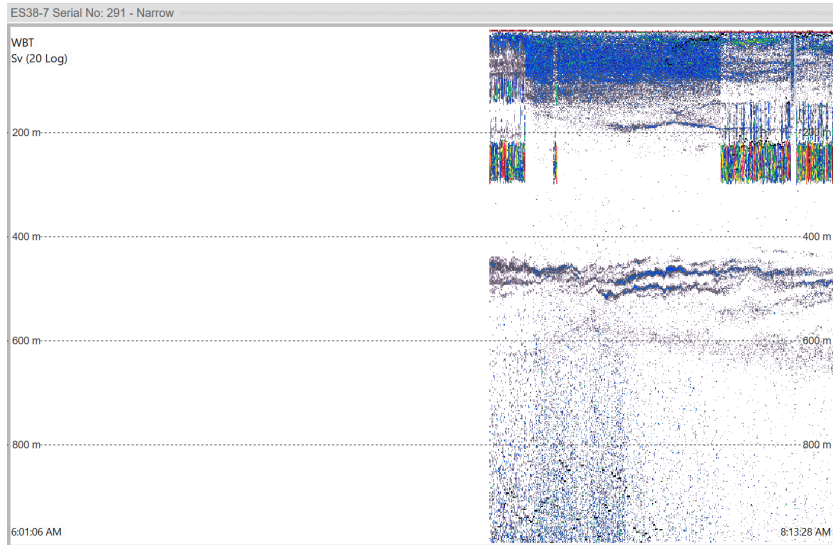


KONGSBERG

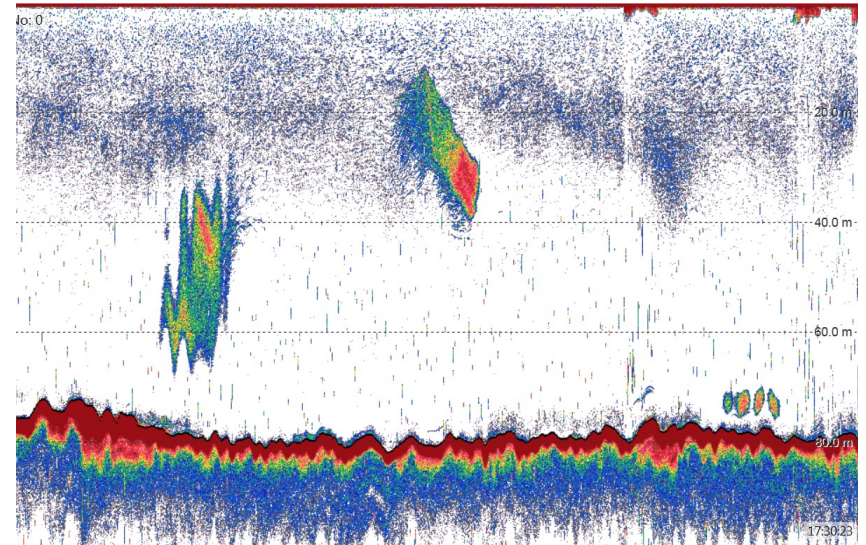


Optimizing Settings

Knowing Crosstalk



Noise at certain depth



“Rainy” Echogram