



KONGSBERG

INSTALLATION MANUAL

K-Sync



PUBLIC



KONGSBERG

KONGSBERG K-Sync
Synchronization system
Installation manual

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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 Kongsberg Maritime's support organisation. You can also contact us using the following address: km.hydrographic.support@kongsberg.com. If you need information about our other products, visit <https://www.kongsberg.com/maritime>.

KM Support is also available in the KM-App.

The KM-Support App is available for free in the App Store and Google Play. The use of the KM-Support App is free of charge. The user's mobile phone provider may charge the costs of the phone call communication to the caller.

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About this manual

The purpose of this manual is to present the descriptions and drawings required to install the K-Sync Synchronization system.

Target audience

The manual is intended for technical personnel, such as skilled shipyard workers, electricians, qualified engineers and naval architects. It is assumed that you understand the general principles of marine electronic equipment. You must also be familiar with computer hardware, interface technology and installation of electronic and mechanical products.

We assume that you are familiar with the basic acoustic principles of sound in water.

Online information

For information about the K-Sync and other products from Kongsberg Maritime, see the KONGSBERG website:

- <https://www.kongsberg.com/maritime/>

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KONGSBERG K-Sync

Topics

[System description, page 7](#)

[System diagram, page 9](#)

[Concept description, page 10](#)

[Main system units, page 11](#)

[Scope of supply, page 12](#)

[Network security, page 13](#)

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System description

The K-Sync is a compact synchronization system designed to support all types of echo sounders, sonars and other hydroacoustic instruments provided with an external transmission trigger option. The K-Sync Synchronization Unit can control up to 16 hydroacoustic systems.

The K-Sync synchronization system consists of the following main components:

- Synchronization Unit
- Application software

Note

The Synchronization Unit is available in two physical versions; a cabinet version for bulkhead installation, and a 19" rack version.



19" rack version - V1



Cabinet version - V1



19" rack version - V2

The K-Sync synchronization system is controlled from a commercial computer running the K-Sync application software. The software provides the user interface, which allows you to monitor status and transmit trigger schedule, and menus for **Settings** and **Tools** for **Diagnostic display**.

V1

The computer running the K-Sync application software needs to interface the Synchronization Unit for the system to initialize. This interface is made using an Ethernet line. Once the K-Sync system is running, the application software can be closed, and the computer disconnected from the Synchronization Unit. The K-Sync

Synchronization Unit will then continue to control the transmission of the hydroacoustic systems as a stand-alone unit.

The Synchronization Unit can receive depth data from an echo sounder or another external source. This interface is also made using Ethernet, and an additional network switch is then required. The depth information is used by the K-Sync to establish the trigger sequence for hydroacoustic systems that do not return any "ready to transmit" information.

V2

In the K-Sync V2 it is not necessary to run the software. When you start up the Synchronization Unit with the on/off button, it will start working with its latest configuration.

The PLC of the K-Sync V2 has two Ethernet ports. One is used to communicate with the computer and the other can be used for depth interface, so no Ethernet switch is required.

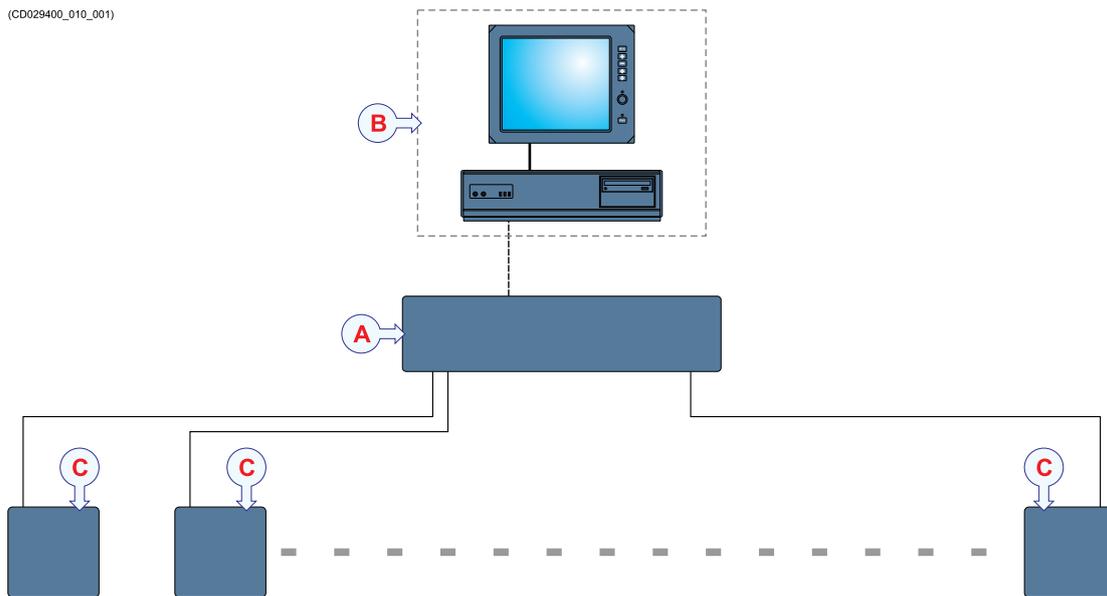
Both Ethernet ports are switched, meaning both share the same IP and MAC address.

System diagram

The system diagram identifies the main components of a basic K-Sync system. Only the main connections between the units are shown. Detailed interface capabilities and power cables are not shown.

The K-Sync synchronization system consists of the Synchronization Unit and a computer.

Figure 1 System diagram



A *Synchronization Unit*

B *Computer*

C *Hydroacoustic systems (sonars, echo sounders) controlled by the K-Sync*

The K-Sync Synchronization Unit can control up to 16 hydroacoustic systems.

Unless otherwise specified in a contract, the computer and the display are not included in the standard delivery from Kongsberg Maritime. These are commercial items that can be purchased locally. A laptop computer can be used if it meets the technical requirements.

Concept description

The K-Sync synchronization system offers a highly adjustable timing of transmissions (pinging) when multiple echo sounders, sonars or other hydroacoustic instruments are employed on a vessel.

The K-Sync synchronization system controls and optimizes the timing for each transmission from each hydroacoustic system. This timing ensures that systems that may interfere with each other do not transmit simultaneously, as this could result in acoustic interference and degraded data.

The K-Sync provides flexible control of the transmit scheduling. The trigger schedule can be tailored to the particular type of survey you are about to perform. Any echo sounder, sonar or other hydroacoustic system that has an input for external transmit triggering can be controlled.

The K-Sync schedules the hydroacoustic systems to transmit according to trigger groups. There is a total of 16 trigger groups. Any number of hydroacoustic systems (or none) can be assigned to a group. Each group is triggered one by one, while the systems assigned to a group are triggered simultaneously. Once it is determined (by reading feedback signals) or estimated (based on input depth and/or your parameter settings) that all the hydroacoustic systems in the current group have completed their transmission cycle, the next group is triggered. All groups are triggered in a circular order. The duration allocated to each group is not fixed and depends on the maximum active period defined for the hydroacoustic systems in that group.

Systems can be taken out of the schedule without changing the group schedule. This is done by simply disabling them. If a group does not contain any available hydroacoustic systems, that group is skipped.

If the "ready to transmit" feedback signal is available from a specific hydroacoustic system, the duration of the active period allocated to the group is set to the time it takes for the signal to become active after the hydroacoustic system has been triggered.

If the transmitting feedback signal is available, the K-Sync will automatically check that a transmit occurred after each trigger. If the hydroacoustic system fails to transmit three times in a row, it is assumed that it has been turned off. It is then taken out of the schedule.

Ready to transmit signal is ignored when Calculated and Fixed Period are used in runtime settings, but transmitting signal is taken into account.

Main system units

Topics

[Synchronization Unit description, page 11](#)

[Computer description, page 11](#)

Synchronization Unit description

The Synchronization Unit consists of a programmable logic controller (PLC) and other electronic circuitry that provide the synchronized trigger signals.

The Synchronization Unit is available in two different versions, based on different versions of the programmable logic controller (PLC) inside. The functionality of the two versions are the same, but the power requirements and dimensions are different.



The K-Sync Synchronization Unit can control up to 16 hydroacoustic systems.

Related topics

[Synchronization Unit description for installation, page 23](#)

Computer description

The K-Sync synchronization system is controlled from a commercial computer running the K-Sync application software.

The software provides the user interface, which allows you to monitor status and transmit trigger schedule, and menus for **Settings** and **Tools** for **Diagnostic display**.

Unless otherwise specified in a contract, the computer and the display are not included in the standard delivery from Kongsberg Maritime. These are commercial items that can be purchased locally. A laptop computer can be used if it meets the technical requirements.

Scope of supply

The main units you need are provided with the standard delivery.

Note

Spare parts and additional services provided by Kongsberg Maritime are not listed. For a list of spare parts and services, refer to the contract and/or the order confirmation.

Basic items provided with a standard delivery

Table 1 19" rack version V1

Item	Part number	In the box
4 channels	322402	Synchronization Unit Software Power cable
8 channels	365578	
12 channels	365582	
16 channels	365588	

Table 2 Cabinet version V1

Item	Part number	In the box
4 channels	322405	Synchronization Unit Software Power cable
8 channels	407254	
12 channels	407256	

Table 3 19" rack version V2

Item	Part number	In the box
4 channels	110-0013983	Synchronization Unit Software AC/DC Power supply
8 channels	110-0014277	
12 channels	110-0014873	
16 channels	110-0014876	

Operational software

Operational software is provided on a suitable media. If the computer is purchased from Kongsberg Maritime, the operational software is pre-installed and ready for use.

End-user documentation

End-user documentation is provided on digital formats.

All documentation related to operation and installation can be downloaded from <https://www.kongsberg.com/maritime/>

Network security

If a K-Sync 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 behavior 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 computer will do any of the above.
- 2 The damage done if a remote computer 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 Kongsberg Maritime computers. The computers are therefore not protected against viruses, malware or unintentional access by external users.

Securing the K-Sync 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-Sync 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 of or access to the K-Sync system.

If you wish to connect the K-Sync system to the ship's local area network, you must implement the same security mechanisms on the K-Sync 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-Sync system you must contact a Kongsberg Maritime office. A list of all our offices is available on our website. You can also contact our main support office in Norway.

A 24 hour telephone support service may also be available depending on your Service Level Agreement.

- **Company name:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3183 Horten, Norway
- **Website :** <https://www.kongsberg.com/maritime/>
- **Email address:** km.hydrographic.support@kongsberg.com

KM Support is also available in the KM-App.

The KM-Support App is available for free in the App Store and Google Play. The use of the KM-Support App is free of charge. The user's mobile phone provider may charge the costs of the phone call communication to the caller.

Preparations

Topics

[Tools, equipment and consumables required for installation, page 15](#)

[Personnel qualifications, page 15](#)

Tools, equipment and consumables required for installation

To install the K-Sync system, all necessary tools and equipment for mechanical work, cabinet installation and electrical wiring must be available.

It is not practical to provide a detailed list of all necessary tools and equipment. You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Note

If you need specific consumables, or if special tools and/or test instruments are required, these are identified in the relevant procedure(s).

Personnel qualifications

The installation of the K-Sync system is a demanding task.

Electrical connections can only be made by skilled personnel (ship electricians, technicians or engineers).

As a minimum, a technician trained for or experienced with electronic or electric installation work.

Installing the software

Topics

[Read this first, page 17](#)

[Installing the K-Sync application software, page 18](#)

[Configuring the network address - Synchronization Unit V1, page 19](#)

[Configuring the network address - Synchronization Unit V2, page 21](#)

Read this first

Caution

Always power up the Synchronization Unit before other echo sounders are turned on to avoid accidental pinging. Trigger outputs are undefined during power-up (first 20 seconds) and signal levels could potentially be interpreted as trigger pulse by the echo sounders until signal levels have settled.

Tip

Read through all the instructions before doing the installation.

Taking the time to do necessary preparation before you start installation will greatly aid in assuring a smooth setup of hardware and software.

Note

The K-Sync application may be run on a portable PC for configuration only, or you may run the K-Sync application from a permanently installed Workstation that can be used both for start-up configuration and for monitoring.

Main installation steps

- 1 Install the K-Sync application software on designated workstation
- 2 Install the K-Sync cabinet and perform the system cabling
- 3 Perform the start-up and configuration of the K-Sync software

Installing the K-Sync application software

Set up of Workstation includes configuration of the network card and installing the K-Sync application software.

Prerequisites

The Workstation must be set up with an address in the 157.237.60.xxx (255.255.240.0) subnet.

The Synchronization Unit IP address is **157.237.60.169**.

Note

*If you can't contact the Synchronization Unit you may have to change the IP address of your local computer to **157.237.60.160***

Context

Note

The K-Sync application may be run on a portable PC for configuration only, or you may run the K-Sync application from a permanently installed Workstation PC that can be used both for start-up configuration and for monitoring.

Procedure

- 1 Turn on the computer.
- 2 Insert the software media.
- 3 Use a file manager application on the computer to access the software files.
- 4 Run *setup.exe* from the K-Sync installation media
- 5 Follow the system messages.
 - a Click **Next** to select installation directory
 - b Read and accept the licence agreement and then click **Next**
 - c Click **Next** to start installation
 - d Click **Finish** when the installation is completed
Restart the computer to finalize the installation

Configuring the network address - Synchronization Unit V1

Description on how to change the network address of the Synchronization Unit.

Prerequisites

- This procedure assumes that the subnet for the network interface is the same as the existing configuration of the Synchronization Unit (otherwise you will not be able to connect to it).
- The K-Sync must be turned on.
- The computer must be set up with an address in the 157.237.60.xxx (255.255.240.0) subnet.
- The Synchronization Unit IP address is **157.237.60.169**.

Note

*If you can't contact the Synchronization Unit you may have to change the IP address of your local computer to **157.237.60.160***

Procedure

- 1 Close K-Sync Application, if running.
- 2 Via Windows Start menu navigate to **Kongsberg Maritime**, click **Upgrade Synchronization Unit**.
- 3 When the **Upgrade Unit application** has started, click **Search** under **Select Synchronization Unit**.
- 4 Select the Synchronization Unit from drop down.
- 5 Click **Reconfigure IP**
If need for reconfigure the subnet, it is recommended to add this subnet to the Windows configuration now for the network interface so that the application can still access the Synchronization Unit after the reconfiguration is complete. Note that it is possible to configure multiple subnets for a single network interface.
- 6 Edit IP address and subnet.
- 7 Click **Apply**.
- 8 After a couple of minutes the operation should provide a confirmation that the reconfiguration succeeded.
- 9 Exit **Installation and Upgrade Utility**.
- 10 Reset the IP-address and subnet on the application PC if needed.
- 11 Open the K-Sync Application and reconfigure the K-Sync Application System Settings
 - a Open K-Sync Application

- b Select **Settings** and **System Settings**
- c Configure the Synchronization Unit IP address to match the new IP address of the Synchronization Unit.

Configuring the network address - Synchronization Unit V2

Description on how to change the network address of the Synchronization Unit.

Prerequisites

- This procedure assumes that the subnet for the network interface is the same as the existing configuration of the Synchronization Unit (otherwise you will not be able to connect to it).
- The K-Sync must be turned on.
- The computer must be set up with an address in the **157.237.60.xxx (255.255.0.0)** subnet.
- The Synchronization Unit IP address is **157.237.60.169**.

Note

*If you can't contact the Synchronization Unit you may have to change the IP address of your local computer to **157.237.60.160***

Procedure

- 1 Open the K-Sync Application and reconfigure the K-Sync Application System Settings.
 - a Open the K-Sync Application.
 - b Select **Settings** and **System Settings**.
 - c Configure the Synchronization Unit IP address to the desired one.
- 2 Close the K-Sync Application.
- 3 Open the web browser on the computer and write the IP of the PLC **157.237.60.169**
- 4 When the PLC website shows up, select **Easy Configuration** in the lower left corner. Use username **simrad** and password: **simradkm** to access the PLC.
- 5 In the PLC website, select **Network** in the **Configuration** menu on the left side of the window.
You can see the current IP address in the **Status** column.
- 6 Enter the new IP address in the column **Configuration**.
- 7 Select **Apply and reboot**.
After a couple of minutes, the PLC will start again with the new IP address.
- 8 Edit the IP address and subnet in the network interface of the computer so the computer can have access to the new IP address of the PLC.

Result

When you open the K-Sync application it should start working with the new configuration.

Installing the Synchronization Unit

Topics

[Synchronization Unit description for installation, page 23](#)

[Installing the rack mounted version, page 24](#)

[Installing the cabinet version, page 27](#)

[Synchronization Unit V1 main parts, page 28](#)

[Synchronization Unit V2 main parts, page 29](#)

Synchronization Unit description for installation

The Synchronization Unit consists of a programmable logic controller (PLC) and other electronic circuitry that provide the synchronized trigger signals.

The Synchronization Unit is available in two different versions, based on different versions of the programmable logic controller (PLC) inside. The functionality of the two versions are the same, but the power requirements and dimensions are different.

The K-Sync Synchronization Unit can control up to 16 hydroacoustic systems.

Version 1 (V1)

- 19" rack version 4U / Cabinet version
- Voltage requirement: 110 to 240 VAC
- PLC: NI sbRIO-9603 (Compact RIO Single-Board Controller)



Version 2 (V2)

- 19" rack version 3U
- Voltage requirement: 10 - 32 VDC
- PLC: Phoenix AXC F 2152



Related topics

[Synchronization Unit V2 main parts, page 29](#)

[Synchronization Unit V1 main parts, page 28](#)

Installing the rack mounted version

The Synchronization Unit is designed to be mounted in a 19-inch rack.

Prerequisites

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment. Depending on the tasks at hand, additional tools may be required.

Context

The rack mounted Synchronization Unit is easily mounted inside a 19" rack. It should be mounted with sufficient cable slack to allow for lifting the unit out of the rack without disconnecting the cables. Make sure that adequate ventilation is available to avoid overheating. Make sure that the installation method allows for the physical vibration, movements and forces normally experienced on a vessel.

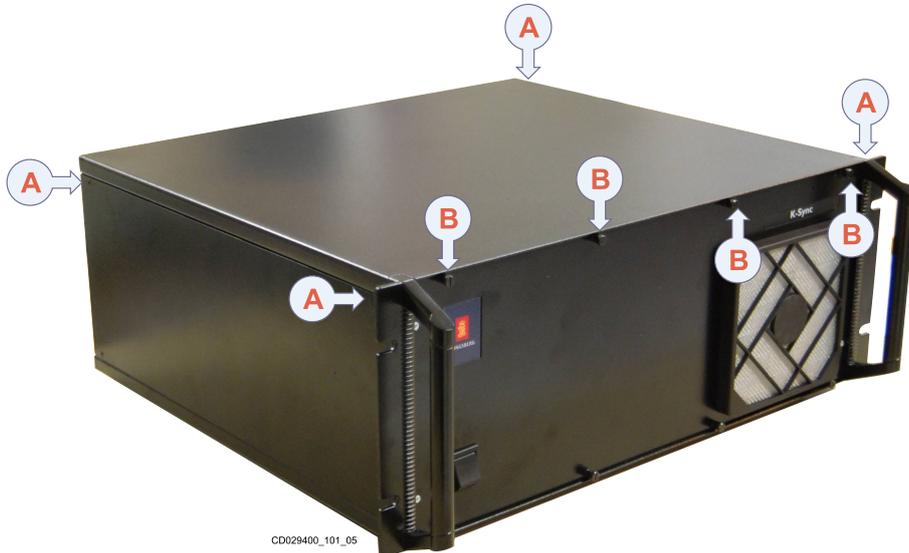
It is advised to mount the rack version using sliding drawer. It will make access for servicing the unit easy, and it will support its weight.

Procedure

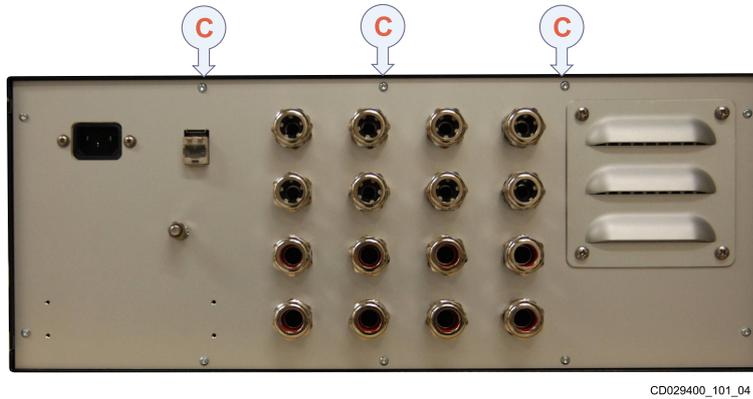
- 1 Prepare the location and the necessary tools.
- 2 Observe the installation requirements.
To allow future maintenance, you must mount the unit with its cables and connectors available for easy access. Mount the unit with sufficient cable slack to allow for lifting the unit out of the rack without disconnecting the cables.
- 3 Make sure that the chosen location meets the installation requirements.
- 4 Attach the rack unit to the sliding rail or sliding drawer.
- 5 Slide the Unit on the sliding rails or sliding drawer to its outer position.
- 6 Open the unit.

a Version 1 (V1)

Unscrew four screws (A) on each side of the rack unit. Unscrew four thumb screws (B) in front

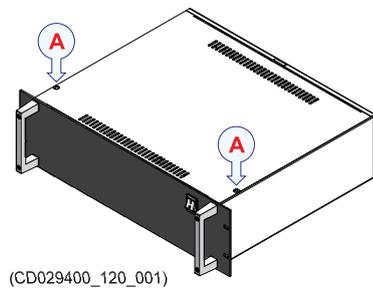


Unscrew three screws (C) on the back side of the rack unit.



b Version 2 (V2)

Unscrew two screws (A) on top of the rack unit.



7 Lift the top cover off the rack unit.

Result

The unit is now ready for connection of the cables.

Related topics

[324131 Synchronization Unit dimensions \(19" rack version\) - V1, page 82](#)

[110-0010683 Synchronization Unit dimensions \(19" rack version\) - V2, page 84](#)

[Installing the K-Sync cables, page 52](#)

Installing the cabinet version

The cabinet is designed for installation in a technical room or a sheltered environment. Make sure that the location offers ample space around the cabinet to allow for cables, maintenance and parts replacement.

Prerequisites

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment. Depending on the tasks at hand, additional tools may be required.

Context

Make sure that the installation method allows for the physical vibration, movements and forces normally experienced on a vessel. Make sure that adequate ventilation is available to avoid overheating.

Note

Make sure that sufficient space is provided around the unit to allow the unit's doors to open fully. Avoid installing the cabinet in locations with heavy vibrations.



Procedure

- 1 Find a suitable location for the cabinet.
- 2 Observe the installation requirements.
To allow future maintenance, you must mount the unit with its cables and connectors available for easy access.
- 3 Open the cabinet door.
- 4 Mount the cabinet on the bulkhead.

Result

The unit is now ready for connection of the cables.

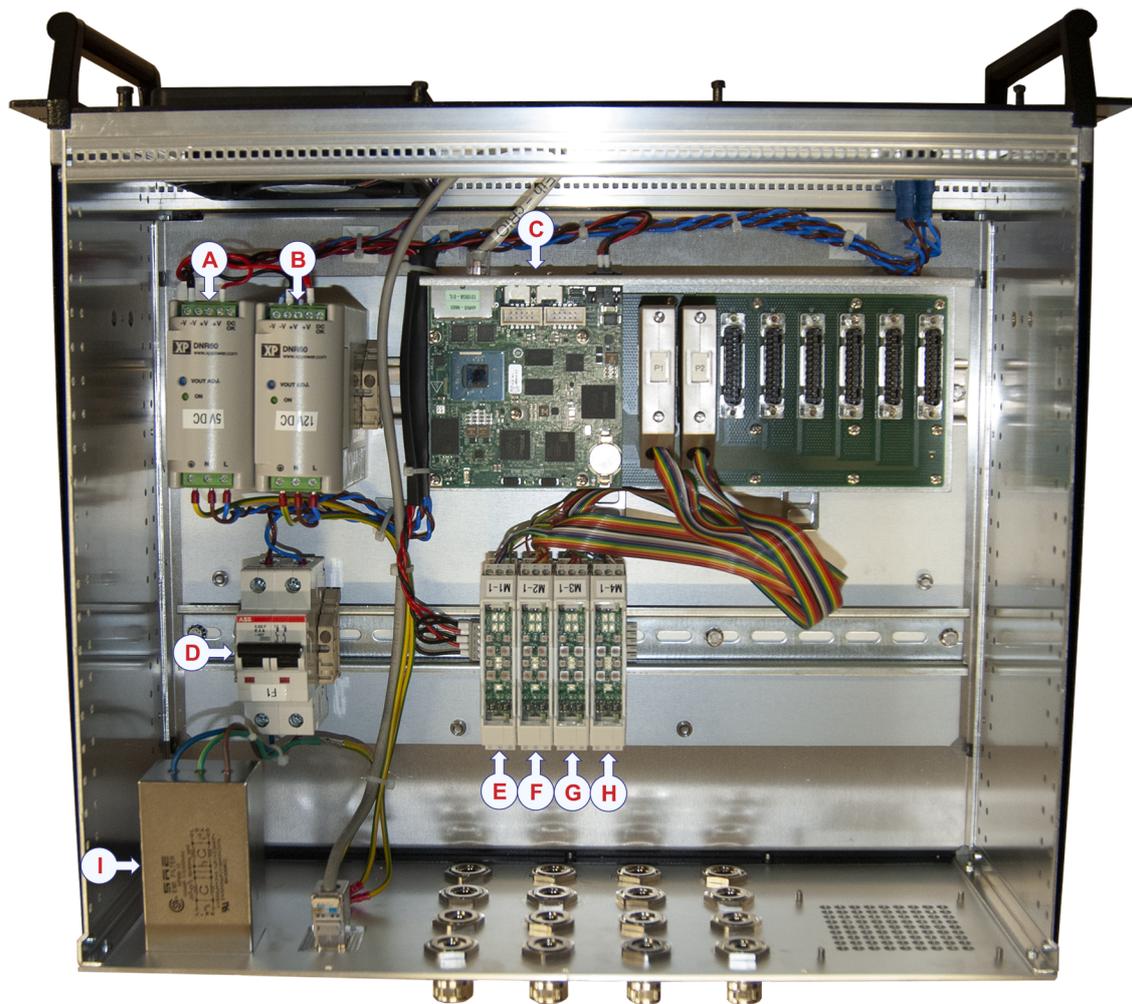
Related topics

[344459 Synchronization Unit dimensions \(Cabinet version\) - V1, page 83](#)

[Installing the K-Sync cables, page 52](#)

Synchronization Unit V1 main parts

The main parts of the Synchronization Unit include three power supplies, the programmable logic controller (PLC) with its associated devices, as well as the terminal board.



- A *Power supply module (+5 VDC)*
- B *Power supply module (+12 VDC)*
- C *PLC (Programmable logic controller)*
- D *Circuit breaker*
- E *I/O module 1*
- F *I/O module 2*
- G *I/O module 3*
- H *I/O module 4*
- I *EMI filter*

Synchronization Unit V2 main parts

The main parts of the Synchronization Unit include three power supplies, the programmable logic controller (PLC) with its associated devices, as well as the terminal board.



- A** *Circuit breaker (24 VDC input)*
- B** *Power supply module (+5 VDC)*
- C** *Power supply module (+12 VDC)*
- D** *EMI filter*
- E** *Power supply module (+24 VDC)*
- F** *PLC (Programmable logic controller)*
- G** *Analogue I/O module (PLC)*
- H** *Digital I/O module (PLC)*
- I** *I/O module 1*
- J** *I/O module 2*

K *I/O module 3*

L *I/O module 4*

M *Solid-state relay module*

Echo Sounder Signal characteristics

This chapter describes the definitions and characteristics of the signals that are used in the K-Sync system.

Topics

[Signal naming conventions, page 32](#)

[K-Sync Signal Interface, page 32](#)

[Logic states and their corresponding voltage levels, page 34](#)

[Signals timing specification, page 36](#)

[I/O module configuration, page 37](#)

Signal naming conventions

Manufacturers use several names to denote the various signals. The first column in the table below shows the signal name that has been adopted for the K-Sync application. The second column shows the typical names used for the corresponding signal of the sonar. These are names used by the Kongsberg echo sounders

Table 4 Signal naming convention

K-sync signal	Connects to	Direction	Description
Ready to transmit (RTT)	Sync out or Ready to Send (RTS)	To K-sync	Signal is active when sonar is ready to transmit; inactive while the echo sounder is transmitting, receiving or processing samples. Signal may also go inactive whenever pinging for the particular echo sounder is turned off, which will be properly interpreted by K-Sync.
Transmitting	Trig out	To K-sync	Signal is active (by default) for the duration of the transmit pulse.
Trigger	Sync in or CTS	From K-sync	Signal causes sonar to ping.

RTT - Ready to transmit

RTS - Ready to send

CTS - Clear to send

K-Sync Signal Interface

K-Sync controls pinging and receives status from the echo sounders via the signal interface and provides one output and two inputs for each echo sounder:

- **Trigger** output: tells the echo sounder when to transmit/ping
- **Ready to transmit (RTT)** input: communicates when the echo sounder is ready for next trigger
- **Transmitting** input: tells the Synchronization Unit when the echo sounder has started and is in the process of transmitting

Feedback signals from the echo sounder

Feedback signals are not required but will be used when available. If feedback signals are not available, the Synchronization Unit can estimate the waiting period required for the echo sounder to become ready.

The feedback signals communicate whether an echo sounder is ready to be triggered, and if transmit occurred.

When the **Ready To Transmit** signal is active, the Synchronization Unit can trigger the echo sounder. Once the ping cycle starts, it is required that the signal go inactive. Once ping cycle is complete and echo sounder is ready again, the signal must once again become active. It also works well if echo sounders keep this signal inactive when they are not configured for external pinging as they will instantly be placed into standby mode.

The **Transmitting** signal goes active at the instant when the transmit pulse starts. It is not required that the pulse length of this signal is the same as the transmit pulse itself.

If the signal is available, the trigger display will show a red pulse whenever the echo sounder transmits. Even if the echo sounder is not controlled by the Synchronization Unit, a red pulse will appear whenever the transmitting signal is set by echo sounder.

Note

The red visualization of the pulse is not identical to the actual pulse.

If an echo sounder fails to transmit three times in a row upon being triggered, the echo sounder will assume that the echo sounder is no longer available. The echo sounder is assumed to not be responding if it has not transmitted within 512 ms of trigger. In this case it will be put into standby and the system will not be triggered by the Synchronization Unit until the operator disables and re-enables the system in echo sounder status.

If an echo sounder fails to transmit three times in a row upon being triggered, the echo sounder will assume that the echo sounder is no longer available. The echo sounder is assumed to not be responding. In this case it will be put into standby and the system will not be triggered by the Synchronization Unit until the operator disables and re-enables the system in echo sounder status.

Trigger output to the echo sounder

The trigger output is a pulse generated by the Synchronization Unit to signal the echo sounder to ping. The pulse width can be specified in 1 ms increments.

Note

There are wide differences among echo sounders in their implementation of the signal interface. Consult the product manual for the individual systems for specific information on timing and signal specification.

Logic states and their corresponding voltage levels

Note

In this manual Signal active refers to a particular voltage level which is present for a specific state, but does not imply whether this voltage is negative, 0 or positive. Using this generic terminology avoids confusion. For example, RS-232 signals that are between -12 and -3 V is considered a logic "high" and +3 to +12 V is considered a logic "low."

To configure K-Sync you must specify whether the input/output is active high or active low. See table below for the actual voltage levels associated with this setting. The level also depends on whether the input has been configured for TTL or RS-232 from the factory.

Table 5 Logic states, voltage levels

Signal type	Logic state	Active low	Active high
TTL	Inactive	+5V	0V
	Active	0V	+5V
RS232 *	Inactive	<-3V (-12V)	>+3V (+12V)
	Active	>+3V (+12V)	<-3V (-12V)

* For trigger outputs the RS232 levels are either +12V or -12V.

To illustrate, if the manufacturer specifies that the ready to transmit signal is TTL and active when voltage is +5V, then from the table above, the signal active should be configured as active high. Likewise, an RS-232 signal that is specified to be active when voltage is > + 3V should be configured as active low (as RS-232 signals are inverted internally).

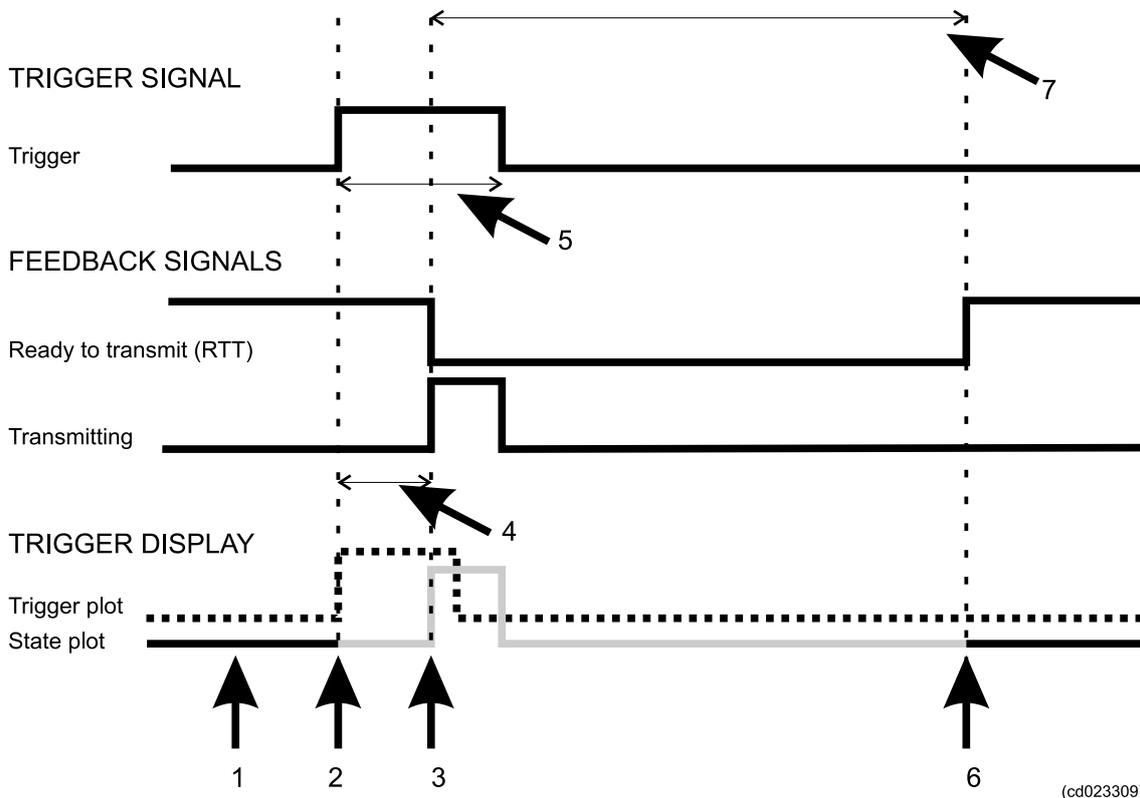
RS-232 and TTL signal active

- Ready to transmit:
 - RS-232; if negative voltage (-12V to -3V) denotes active, then the signal is active high.
 - TTL; if +5V denotes active, then the signal is active high.
- Transmitting:
 - RS-232; if negative voltage (-12V to -3V) denotes active, then the signal is active high.
 - TTL; if +5V denotes active, then the signal is active high.
- Trigger:

- RS-232; if positive voltage (+3V to +12V) to negative voltage (-12V to -3V) causes transmit, then the trigger active level is high (trigger on rising edge).
- TTL; if 0 to +5V causes transmit, then the trigger active level is high (trigger on rising edge).

The following applies if the echo sounder provides Ready to *transmit* as well as *Transmitting* signals:

Figure 2 Signal timing scheme



- 1 Echo sounder is ready to transmit.
Ready to transmit (RTT) signal is active.
- 2 K-Sync triggers echo sounder.
Trigger pulse is generated.
- 3 Echo sounder acknowledges the transmit.
Transmitting goes high.
Transmit is indicated in the trigger plot by the grey spike.
- 4 Ping delay, i.e. time from trigger to actual transmit.
- 5 Pulse width of trigger pulse generated by K-Sync.
- 6 Ready to transmit (RTT) goes high again, i.e. the ping cycle is complete.

The state plot turns dark again.

7 The ping cycle.

For echo sounders that do not have a transmitting signal, the Synchronization Unit will not be able to verify that the transmit occurred. Likewise, if the ready to transmit is not provided, the Synchronization Unit will determine when the ping cycle is complete based on the runtime settings in the K-Sync Application, i.e. calculated or fixed period is selected.

Signals timing specification

Some of the timing and signal specifications with respect to the Synchronization Unit are listed below.

Synchronization Unit V1 and V2 has different specifications.

Table 6 Signals timing specification

	V1	V2
Trigger display resolution (horizontal)	50 ms	1, 2, 6 or 12 ms **
Trigger display width	10, 30 or 60 seconds	5, 10, 30 or 60 seconds
Max. trigger groups	16	
Signal latency (feedback signal to trigger output)	40 μ s	35 μ s
Timing resolution of synchronization (calculated or fixed trigger mode)	4 ms	1 ms
Available signal inputs	12, 24, 36 or 48 *	8, 16, 24 or 32 *
Max systems/trigger outputs	4, 8, 12 or 16 *	4, 8, 12 or 16 *
Supported signal levels (inputs and outputs)	TTL and RS-232	TTL and RS-232
Supported depth datagram input	<ul style="list-style-type: none"> • Kongsberg EM: D, X, and E • Kongsberg EA 500 • NMEA: DPT and DBS 	<ul style="list-style-type: none"> • Kongsberg EM: D, X, and E • Kongsberg EA 500 • NMEA: DPT and DBS

* Depending on delivered configuration (4, 8, 12 or 16 systems).

** Depending on the Trigger Display width.

I/O module configuration

The echo sounders can be connected to the I/O modules in any order. The modules configure how the voltage levels are to be interpreted; while the K-Sync Application handles the remaining signal properties and assignments.

Tip

The terminal ID (module and pin number) can be assigned to one or more echo sounders in the software (thus it is possible to use one feedback signal for several systems in special applications).

Tip

It is important to be methodical during installation as there are several steps that needs to be performed and each step needs to be done right for the system to function as a whole. The approach that should be followed is to configure one system at a time then move on to the next. Check your assumptions along the way!

Cable layout and interconnections

Topics

[Read this first, page 39](#)

[Cable plan, page 40](#)

[List of cables, page 41](#)

[Echo sounder trigger interface overview, page 42](#)

[Determine which signals need to be interfaced and their characteristics, page 44](#)

[Techniques for determine signal properties, page 46](#)

[I/O module, adjusting, page 49](#)

[Installing the K-Sync cables, page 52](#)

[Cable drawings and specifications, page 61](#)

Read this first

Detailed information about relevant cable specifications, termination and connectors is provided.

Each drawing provides additional information, and may, when applicable, include minimum specifications, connector terminations and the required number of cores. Drawings are generally not provided for standard commercial cables. Cables fall into three categories.

- 1 **System cables:** System cables are provided by Kongsberg Maritime as a part of the delivery.
- 2 **Shipyard cables:** Shipyard cables must be provided by the shipyard doing the installation, or the shipowner. The cables must meet the minimum specifications provided in this publication.
- 3 **Commercial cables:** Commercial cables may be provided by Kongsberg Maritime as a part of the delivery. The cables may also be included with third party items that are used with the K-Sync system.

All electric installations and corresponding wiring must be in accordance with the vessel's national registry and corresponding maritime authority and/or classification society.

Note

It is very important that all cables are properly installed and correctly terminated. Observe the relevant regulations and work standards. Always leave enough cable slack close to system units and cabinets to allow for maintenance.

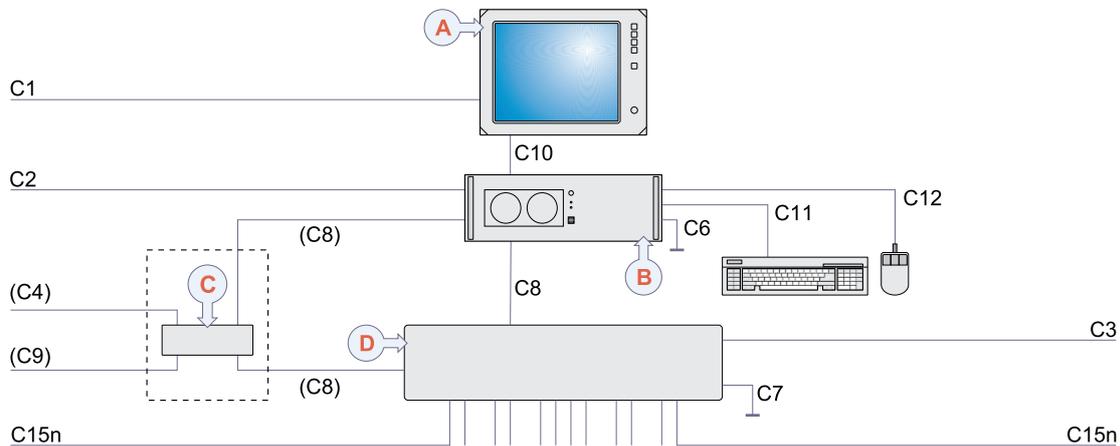
Only skilled and authorized personnel can install the K-Sync cables.

Kongsberg Maritime accepts no responsibility for damage to the system, or reduced operational performance, when this is caused by improper wiring.

Before you install or maintain the system cables, make sure that the AC mains circuit breaker for K-Sync and all system involved are disconnected.

Cable plan

The cable plans shows the Synchronization Unit with the computer and an optional Ethernet switch.



- A *Display*
- B *Computer*
- C *Ethernet switch (Optional)*
- D *Synchronization Unit*

The Ethernet cable between the Synchronization Unit and the computer can either be connected directly between the two units, or via an Ethernet switch.

The Ethernet switch is used if you wish to import depth data to Version 1 of the Synchronization Unit. Version 2 of the Synchronization Unit has two Ethernet ports and no Ethernet switch is required.

Note

The computer is not a standard part of the delivery. The display is not a standard part of the delivery.

List of cables

A set of cables is required to connect the Synchronization Unit to the power source and vessel ground. Additional cables are required to connect the Synchronization Unit to the echo sounders that need to be synchronized.

Cable	Type	From/To	Minimum requirements
C1	AC Power cable	From display to AC power outlet	2 x 1.5 mm ² + 1.5 mm ² Ground
C2	AC Power cable	From computer to AC power outlet	2 x 1.5 mm ² + 1.5 mm ² Ground
C3	Power cable	From Synchronization Unit to AC power outlet	2 x 1.5 mm ² + 1.5 mm ² Ground
		From Synchronization Unit to DC power outlet	2 x 1.5 mm ² + 1.5 mm ² Ground
		V1 of the Synchronization Unit requires AC power supply. V2 of the Synchronization Unit requires DC power supply.	
(C4)	AC Power cable	From Ethernet switch to AC power outlet (Optional)	2 x 1.5 mm ² + 1.5 mm ² Ground
	The power cable on the Ethernet switch may comprise a separate power supply.		
C5	Not used		
C6	Ground cable	From computer to vessel ground	1 x 6 mm ²
C7	Ground cable	From Synchronization Unit to vessel ground	1 x 6 mm ²
C8	Ethernet cable	From computer to Synchronization Unit	Cat 5e STP (Shielded Twisted Pair)
	The Ethernet cable between the Synchronization Unit and the computer can either be connected directly between the two units, or via an Ethernet switch. The Ethernet switch is used if you wish to import depth data to the K-Sync.		
(C9)	Ethernet cable	From the Ethernet switch to the local area network (LAN) (Optional)	Cat 5e STP (Shielded Twisted Pair)
C10	Video cable	From computer to display	
	This is a commercial cable. The display cable is often physically attached to the display, and terminated in the “computer end” with a male connector. If the cable is not attached, it is normally provided with the display.		
C11	Computer cable	From computer to keyboard	
C12	Computer cable	From computer to mouse (or other pointing device)	
C13–14	Not used		
C15n	Control cable	Communication with external hydroacoustic systems	See installation manual of the hydroacoustic sensor system installed

Echo sounder trigger interface overview

The input current must be approximately 10 mA.

Table column definitions

Ready to transmit - Signal Active

This column specifies the output signal from the sensor when the sensor is ready to start the transmit sequence. The signal can either be defined as RS-232 or TTL, and as an active high or low signal.

Transmitting – Signal Active

This column specifies the output signal from the sensor when the sensor is active, meaning it's either transmitting or receiving data. The signal can either be defined as RS-232 or TTL, and as an active high or low signal.

Signal setting – Signal Active

This column specifies the input signal to the sensor that will start the transmit sequence of the sensor. The signal can either be defined as RS-232 or TTL, and as an active high or low signal.

Pulse properties

These settings define the output pulse from K-Sync. The trigger condition selects between rising and falling edge, the pulse length sets the duration of the output pulse.

RS-232 logical level

Follow the sensor specification and use the following table to determine if the RS-232 signal should be set to Active High or Active Low.

Sensor triggers on logical high	Select Active High	Falling Edge
Sensor triggers on logical low	Select Active Low	Rising Edge

See table below to find which entry to select in the K-Sync Installation settings for different types of Kongsberg equipment.

Table 7 Trigger interface overview (KM)

Make and model	Inputs from echo sounder		Trigger output to echo sounder		
	Ready to transmit - Signal Active	Transmitting - Signal Active	Signal setting - Signal active	Pulse properties	
				Trigger condition	Pulse length
Processing Unit (1)	TTL, Active High	TTL, Active Low	TTL, Logical High	Rising Edge	< 10 ms
SBP 27/29	TTL, Active High	TTL, Active Low	TTL, Logical High	Rising Edge	< 10 ms
WBT Auxillary output (2)	TTL, Active Low	TTL, Active High	TTL, Logical High	Rising Edge	N/A
Topas	TTL, Active Low	TTL, Active High	TTL, Active Low	Rising Edge	< 30 ms
SX90, ME70, MS70, EK60, EK80 (3)	RS-232, Active High	RS-232, Active High	RS-232, Active High	Falling Edge	< 10 ms
EA640/660	RS-232, Active High	RS-232, Active High	RS-232, Active High	Falling Edge	< 10 ms
EM 122/302/710/710 MKII	RS-232, Active High	TTL, Active Low	RS-232, Active High	Falling Edge	< 50 ms
EA400/600	No RTT available	TTL, Active Low	TTL, Active High	Rising Edge	< 50 ms
SBP 120/300/300 MKII	RS-232, Active Low	TTL, Active Low	TTL, Active Low	Rising Edge	< 50 ms
EM 3002	RS-232, Active Low	TTL, Active Low	RS-232, Active High	Falling Edge	< 10 ms

(1) Supports all models of EM 2040, EM 712, EM 304 and EM 124

(2) Supports all models of EA 640, EA 660 and EK 80

(3) Sync I/O from PC/Workstation using serial DB9 interface.

Ready to transmit timeout

The timeout is set in seconds and determines how long the system should wait for a “Ready to transmit” signal before timing out and disabling the sonar in question. The value entered here would therefore need to be different depending on the operational depth and the swath width of the system in question.

For example, an EM 124 system operating at 4000m depth is expected to have a swath width of 144 degrees, and so it has a total slant range of approximately 12.900m.

Assuming an average sound velocity of about 1450 m/s through the water column, the total return trip travel time of a single ping is about 18 seconds. So after about 18 seconds, “Ready to transmit” signal would normally become available again. Entering an exact return trip value is not recommended. For any one sonar and system there may be other factors like system latency that will effect the ping cycle of the systems. Make sure to test the calculations with the sonar in question to confirm that the system has the expected ping rate vs depth. Then enter a value that reflects the maximum slant range expected for the survey and then add some seconds to allow for delays and changes in topography.

Why does the system disable the sonar?

Disabling the sonar removes it from the trigger schedule and thus stops it from hindering the triggering of the groups after it in the trigger group schedule.

Determine which signals need to be interfaced and their characteristics

Context

Note

The echo sounders must be powerless during cable connection.

Multiple hydroacoustic systems operating simultaneously on the same vessel may cause interference. In order to minimize this interference, the Synchronization Unit system can be used. All echo sounders that will be synchronized are required to have at least a trigger input signals in order to be controlled by K-Sync.

TTL and RS-232 level signals are supported. Other signal levels are not yet supported.

Procedure

- 1 Use the information available in the manufacturer’s product documentation to complete the table below. This information is required for connecting the cables to the K-Sync I/O modules and for configuration of the software. Items that are uncertain should be left blank.
Refer to Logic states and their corresponding voltage levels for definitions.
A copy of the table below has been completed for the Kongsberg echo sounders. Refer to [Table 7 Trigger interface overview \(KM\), page 43](#)
- 2 Keep a copy of the table with the final setup with the ship’s records for future reference. Refer to [Signal interface overview, page 45](#)

Signal interface overview

Complete the table for synchronization setup configuration. The setting configuration is saved. A backup can be saved by **File** and **Backup config files**

Table 8 Signal interface table

I/O Mo- dule no.	Make and model	Inputs from echo sounder		Trigger output to echo sounder		
		Ready to transmit - Signal Active	Trans- mitting - Signal Active	Signal setting - Signal active	Pulse properties	
					Trigger condition	Pulse length
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Techniques for determine signal properties

Note

This step only needs to be performed for echo sounders where the signal properties are not fully specified.

The signal characteristics of the trigger and the feedback signals can be determined manually if not known. The information gathered during this step should be filled into the Table Signal Overview [Signal interface overview, page 45](#)

The length of the trigger cable affects the signal strength.

Use an oscilloscope for signal determination.

Prerequisites:

- 1 Open the K-Sync Application **Settings**→**Installation**→**Installation Settings** dialog and click *Manage Installed systems*. Check the checkbox for the echo sounder you want to configure and uncheck all other echo sounders.
If the echo sounder you want to configure is not available, see document 342435 - K-Sync Operator Manual for echo sounder setup instructions.
- 2 Verify that the signals to be configured have been set up with the correct terminal ID in the K-Sync Application **Installation Settings** dialog.
- 3 Enable the echo sounder being configured in the K-Sync application.
That is, the Enabled checkboxes in the Echo Sounder States area of the application window should all be unchecked, except for the particular echo sounder being configured.
- 4 Make sure that the hydro acoustic sensor that needs to be configured is assigned to at least one *trigger group*.
In the main application window, under **Trigger group schedule**, click **Configure** to assign the hydro acoustic sensor to a Trigger group .
- 5 The signal type (RS-232/TTL) must be set correctly for each core connection to the I/O module.

Signal LEDs on I/O modules

LEDs on the I/O modules will be used for debugging in this section. There are 4 LEDs that indicate the signal level for trigger and feedback signals, and this is the location:

Note _____

When the LED is flashing it will clearly be visible as long as the pulse length of the signal is at least 10 ms.



Top row	Ready to transmit (in)	Trigger (out)
Bottom row	Not used	Transmitting (in)

Determining signal properties of *Trigger*

- 1 Verify that the echo sounder is powered on and that the echo sounder software is set up and is prepared for external trigger.
- 2 Open the K-Sync application.
- 3 Go to **Settings**→**Installation**→**Installation Settings** and set **Pulse length** to 500 ms in the **Trigger output to echo sounder** dialogue box.
- 4 In **Inputs from echo sounder (feedback signals)**, check off the *Signals is available for Ready to transmit and Transmitting*.
- 5 Configure **Settings**→**Runtime Settings** to use **Trigger mode** = *Fixed period*. And set **Fixed period** to 1000 ms.
- 6 Observe the top-right of the four LEDs, the *Trigger (out)*.

Determine whether the echo sounder pings when the LED turns on or when it turns off (listen for ping if audible).

If the echo sounder provides a transmitting signal (TRIG OUT) then this LED should change state at time of ping if signal has been connected. If the echo sounder pings when the trigger LED turns on, then set the **Settings**→**Installation**→**Installation**

Settings and in **Trigger output to echo sounder** set **Signal active:** level to *Active high* and set the **Trigger condition** to *Rising edge*. Otherwise set the logic level to *Active low* and **Trigger condition** to *Rising edge*.

- 7 Change **Pulse length** and **Is available** settings back to original value in the dialog.

If there is no response to trigger:

- Is the echo sounder set up correctly, e.g. is the external trigger configured on the echo sounder workstation, and is all equipment powered up?
- Is pull-up or pull-down set correctly (if the signal is TTL)?
- Is the pulse length setting within the spec for the echo sounder?
- Is the signal either RS-232 or TTL compatible? Verify voltage for both voltage states using an oscilloscope or a digital volt meter.

Determining signal properties of *Ready to transmit*

- 1 Verify that the echo sounder is powered on and that the echo sounder software is set up and is ready for external trigger.
- 2 Disable the echo sounder in the K-Sync application by unchecking the **Enabled** checkbox so that the system goes into *Standby*.

The echo sounder should now continuously be ready and waiting for a trigger pulse from synchronizing module.

- 3 Observe the top-left of the four LEDs, the Ready to transmit (*in*).
Is the LED on or off? If "on" the echo sounder should be configured as *Active high*, otherwise *Active low*.
- 4 Confirm by setting the system up for transmitting once every second (set the echo sounder up for *Fixed period* trigger every 1000 ms in **Runtime Settings**). Does the LED change state at time of trigger? If so then the signal is behaving as expected.

Determining signal properties of *Transmitting*

- 1 Verify that the echo sounder is powered on and that the echo sounder software is set up and is ready for external trigger.
- 2 Make sure the echo sounder is enabled in the K-Sync Application window found in the **Echo Sounder Status** area.
- 3 Configure **Runtime settings** to use **Trigger mode:** *Fixed period* and set the *Fixed period* to 1000 ms.
- 4 Observe the bottom-right of the four LEDs, the Transmitting (*in*).

Observe that the Transmitting LED blinks each time the echo sounder is being triggered by the Synchronization Unit. The pulse length might be too short to notice, especially if pulse width is less than 10 ms or if the LED is normally on and instead turns off during transmit. If so, connect an oscilloscope to observe the

signal. If the LED is normally off and turns on during transmit, then the signal is *Active high*. If always off, then it is *Active low*.

I/O module, adjusting

Caution

Potentiometer are delicate components; apply gentle pressure when turning.

Each pin of the I/O module must be configure for each signal connection. The I/O module holds a number of dip switches, potentiometers and LED lights that applies to dedicated pin numbers. In general, the dip switches, potentiometers or LEDs are placed in two rows to apply to the following signals (pins):

Caution

Use gentle force when turning the potentiometers. They are delicate and will only turn within a certain range.

Pin 3 (RTT input to K-Sync)	Pin 2 (Ground, no configuration)	Pin 1 (Trigger output from K-Sync)
Pin 6 (Not used)	Pin 5 (Ground, no configuration)	Pin 4 (Transmitting input from K-Sync)

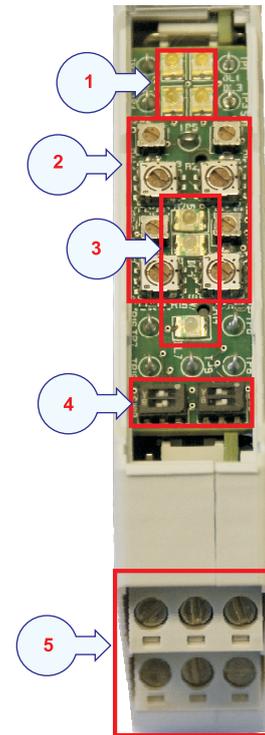
The I/O module contains the following details:

- 1 LED indicators for input/output channels
- 2 Pull-down or pull-up resistance for TTL signals according to whether the signal is active high or low, and
Associated resistor value to be set according to your signal transmission conditions.
- 3 Power lamps
- 4 RS-232 or TTL dip switches
- 5 I/O module signal connection pins

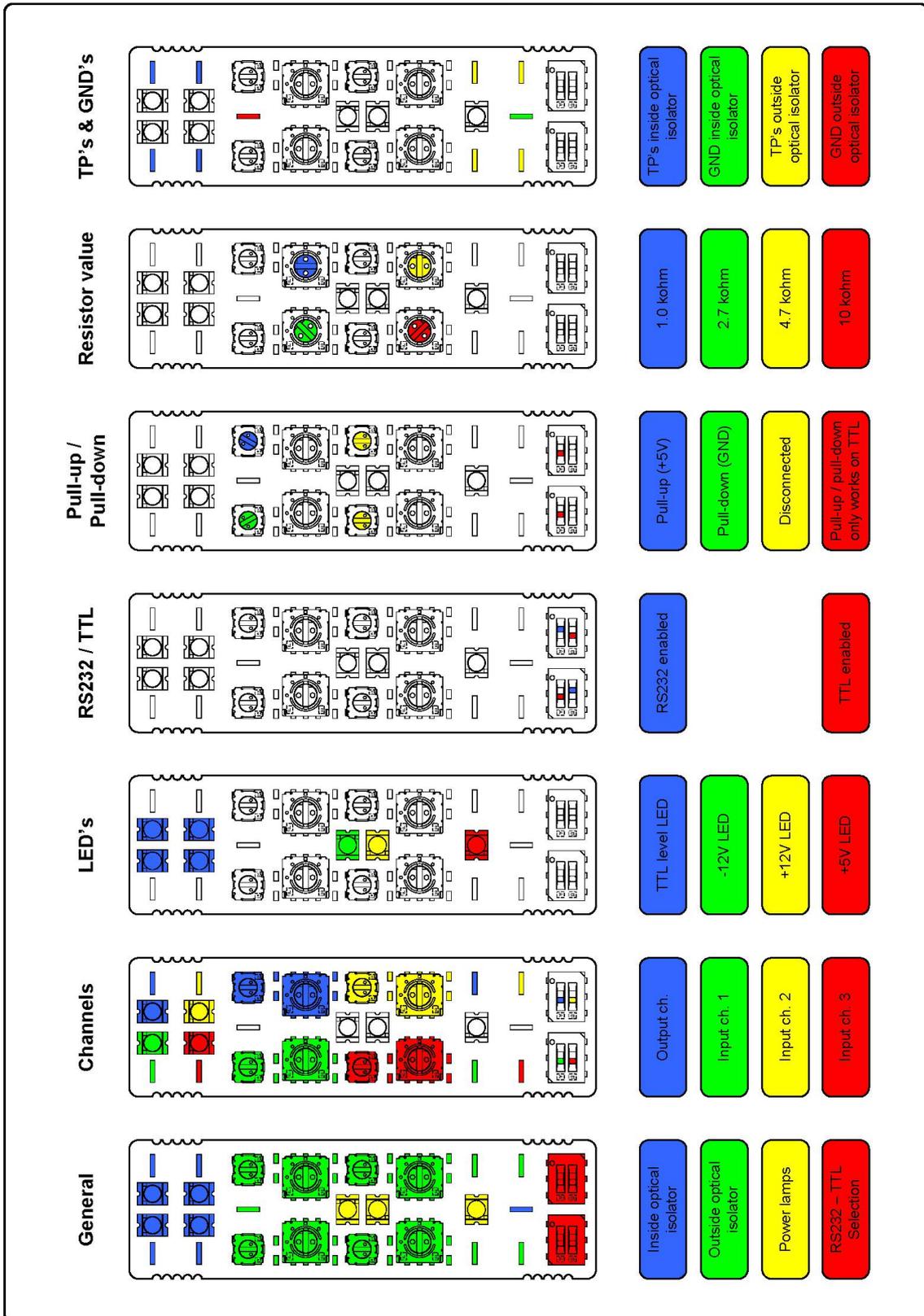
A detailed description of the I/O modules, and the different values that can be applied is found in the following figure. A colour print will be provided with the K-Sync delivery, attached on the inside of the top cover of the K-Sync rack or cabinet.

Default values are:

- TTL (dip switch in left position)
- Pull-down (small pot rotated fully clockwise)
- Resistor value 4.7 k Ohm (large rotary switch in 3rd position, clockwise)



cd923305



CD029400_103_01

Installing the K-Sync cables

Topics

[Connecting the Synchronization Unit to AC mains, ground and Ethernet - V1, page 53](#)

[Connecting the Synchronization Unit to DC mains, ground and Ethernet - V2, page 55](#)

[Connecing K-Sync I/O module to echo sounders, page 58](#)

Connecting the Synchronization Unit to AC mains, ground and Ethernet - V1

The Synchronization Unit V1 must be connected to AC mains, and it must be properly grounded.

Prerequisites

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electromechanical tasks. This includes different screwdriver types, pliers, adjustable spanners, etc. Tools and consumables for electronic work may also be required, such as a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment. Depending on the chosen installation method, additional tools may be required.

Context

Note

When you connect the cables, make sure that they are all properly secured, and able to withstand the vibration and movements of the vessel.

Cables to connect are:

- AC Mains cable: The mains voltage for the unit is 110 to 240 VAC. It is connected to the vessel mains or to an uninterruptible power supply (UPS).

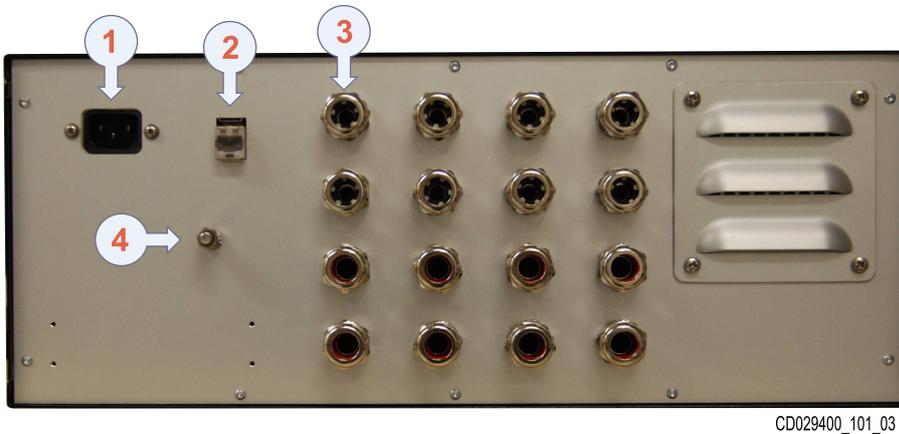
This cable is supplied with the K-Sync delivery.

- Ground cable: The ground connection is made using a thick stranded (or braided) cable making a solid connection between the cabinet and the bulkhead. This cable is supplied with the K-Sync delivery.
- Ethernet cable: This cable must be provided by the shipyard/customer.

Use Cat 5e STP (Shielded Twisted Pair) quality or better. If the length of the Ethernet cable exceeds approximately 60 metres, it is recommended to use an Ethernet switch to maintain the signal strength.

Observe the following connectors on the rear side of the Synchronization Unit:

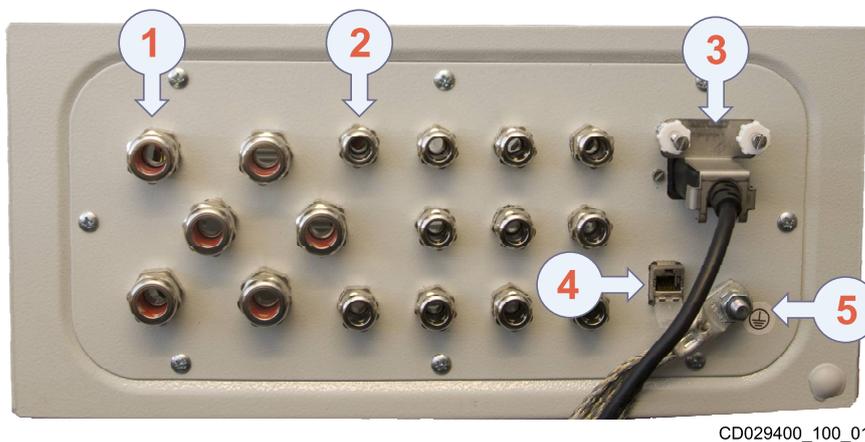
Figure 3 Rack mounted version connectors



- 1 Connector for 110 to 240 Vac power cable
- 2 Connector for RJ45 Ethernet cable
- 3 16 PG nipples for sealed signal cable gland
- 4 Screw for connecting ground cable

Observe the following connectors on the bottom side of the K-Sync cabinet:

Figure 4 Cabinet version connectors



- 1 6 large PG nipples for sealed signal cable gland
- 2 9 small PG nipples for sealed signal cable gland
- 3 Connector for 110 to 240 Vac power cable
- 4 Connector for RJ45 Ethernet cable
- 5 Screw for connecting ground cable

Procedure

- 1 Locate the AC mains connector.
For the cabinet version, disconnect the support bracket.
- 2 Connect the Synchronization Unit to a power outlet or to an Uninterrupted Power Supply.
- 3 Locate the connection for the grounding.
For the cabinet version, connect the support bracket.
- 4 Connect the Synchronization Unit to vessel ground.
- 5 Locate the Ethernet connector.
- 6 Connect the Ethernet cable from the Synchronization Unit to the Ethernet socket on the computer.
If the optional Ethernet switch is used, make the Ethernet connection between the Synchronization Unit and the computer via this Ethernet switch.

Result

The unit is now ready for connection of the signal cables.

Related topics

[Cable plan, page 40](#)

[Connecting K-Sync I/O module to echo sounders, page 58](#)

[AC power cable using IEC C13 inline socket, page 62](#)

Connecting the Synchronization Unit to DC mains, ground and Ethernet - V2

The Synchronization Unit V2 must be connected to DC mains, and it must be properly grounded.

Prerequisites

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electromechanical tasks. This includes different screwdriver types, pliers, adjustable spanners, etc. Tools and consumables for electronic work may also be required, such as a cable stripper, a soldering iron, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment. Depending on the chosen installation method, additional tools may be required.

Context

Note

When you connect the cables, make sure that they are all properly secured, and able to withstand the vibration and movements of the vessel.

Cables to connect are:

- DC Mains cable
- Ground cable
- Ethernet cable

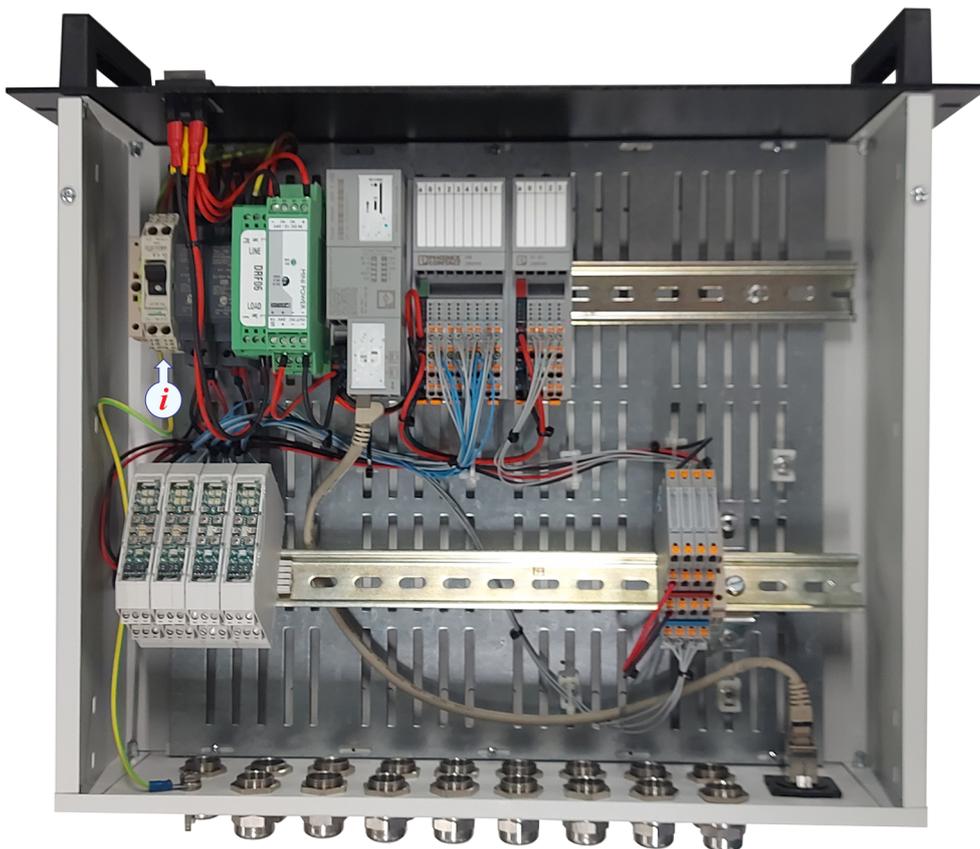
A Screw for connecting ground cable

B Connector for RJ45 Ethernet cable



Procedure

- 1 Open the unit.
- 2 Locate the terminals for DC connection.



- 3 Insert the cable through one of the cable glands delivered with the unit.
- 4 Connect the power cable from the Synchronization Unit to the DC power outlet. (C3)
- 5 Locate the connection for the grounding. (A)

- 6 Connect the ground cable from the Synchronization Unit to vessel ground. (C7)

The ground connection is made using a thick stranded (or braided) cable making a solid connection between the cabinet and the bulkhead. This cable is supplied with the K-Sync delivery.

- 7 Locate the Ethernet connector. (B)

- 8 Connect the Ethernet cable from the Synchronization Unit to the Ethernet socket on the computer. (C8)

If the length of the Ethernet cable exceeds approximately 60 metres, it is recommended to use an Ethernet switch to maintain the signal strength. If the optional Ethernet switch is used, make the Ethernet connection between the Synchronization Unit and the computer via this Ethernet switch.

This cable must be provided by the shipyard/customer. Use Cat 5e STP (Shielded Twisted Pair) quality or better.

Result

The unit is now ready for connection of the signal cables.

Further requirements

Connect the cables from the Synchronization Unit to each external hydroacoustic system to be controlled. (C15)

Related topics

[Cable plan, page 40](#)

[Connecing K-Sync I/O module to echo sounders, page 58](#)

[DC Power cable - V2, page 64](#)

Connecing K-Sync I/O module to echo sounders

19" rack version

- A 16 PG nipples for sealed cable gland
- B 16 Digital **I/O modules** numbered from left to right when seen from rear side of the cabinet

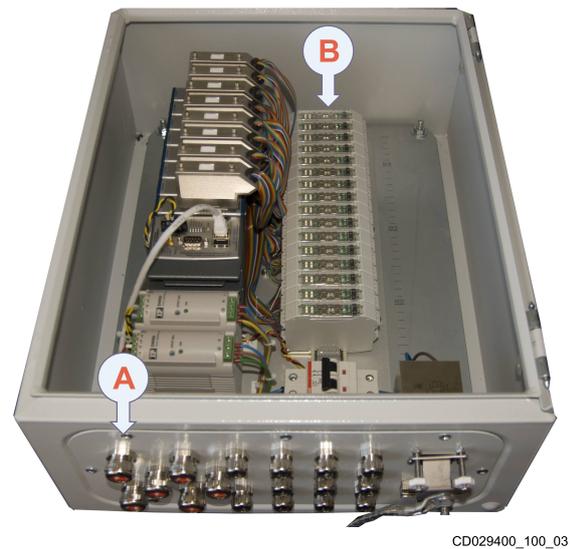


Cabinet version

- A 6 large and 11 small PG nipples for sealed cable gland
- B 16 Digital **I/O modules** numbered from bottom to top

The K-Sync cabinet holds up to 16 digital **I/O modules** and 16 cable gland PG nipples, thus 16 systems can be synchronized using K-Sync.

Each I/O module holds two 3 pin connectors with two termination blocks attached. The termination blocks can be disconnected for easy access to terminate the signal cables. The pins are numbered as shown in the following figure and described in

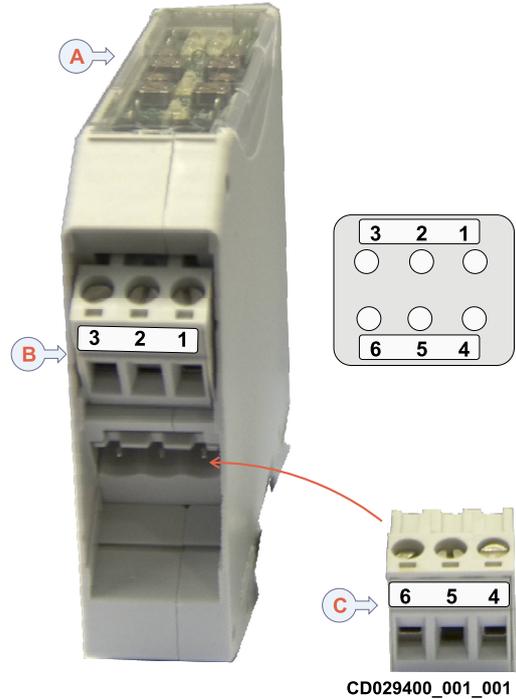


I/O module

The K-Sync cabinet holds up to 16 digital **I/O modules** and 16 cable gland PG nipples, thus 16 systems can be synchronized using K-Sync.

Each I/O module holds two 3 pin connectors with two termination blocks attached. The termination blocks can be disconnected for easy access to terminate the signal cables. The pins are numbered as shown in the following figure and described in the table below.

- A I/O module configuration board
- B Terminal block terminal 1, 2 and 3
- C Terminal block terminal 4, 5 and 6



Pin no	Signal	Description
1	Trigger	Mandatory – output from K-Sync to the echo sounder, telling the echo sounder when to transmit
2	Ground	Mandatory
3	RTT/CTS	If available – input to K-Sync from the echo sounder when the echo sounder is ready for next trigger
4	Transmitting	If available – input to K-Sync from the echo sounder when it is transmitting
5	Ground	Mandatory
6	On/Off	Not used

RTT - Ready to transmit

CTS - Clear to send

Note

Feedback signals (RTT and Transmitting) are not required, but will be used when available. If feedback signals are not available, the Synchronizing module can estimate the waiting period required for each echo sounder to become ready for transmitting again.

Note

Ground on pin 2 and 5 are physically connected.

For each interfaced echo sounder

- 1 Prepare the appropriate signal cable from the echo sounder.
See [Echo sounder trigger interface overview, page 42](#), for trigger signal specifications for the Kongsberg Maritime echo sounders.
- 2 Enter the signal cable through the PG nipple at the back side of the cabinet.

Note

Remove the cable insulation from the termination block up to the PG nipple.

The cable must be shielded. The shield must be terminated in one end only, normally at the echo sounder side. If you decide to terminate at the K-Sync end, the shield must be terminated in the PG nipple.

- 3 Tighten the PG nipple.
- 4 Terminate the signal cable using the termination blocks attached to the I/O module.
- 5 Plug the termination block into the I/O module.

Cable drawings and specifications

Topics

[AC power cable using IEC C13 inline socket, page 62](#)

[DC Power cable - V2, page 64](#)

[Ground cable, page 65](#)

[RJ45 High speed Ethernet cable \(1000Base-t\), page 66](#)

[K-Sync interface to EM Processing Unit, page 67](#)

[K-Sync interface to EA400 and EA600 interface, page 68](#)

[K-Sync interface to EA440 and EA640 interface, page 70](#)

[K-Sync interface to generic RS-232 synchronization input, page 72](#)

AC power cable using IEC C13 inline socket

This cable is used to connect any unit or device to AC mains supply. The power cable is commercial. It is normally used for 115 and 230 VAC. The inline socket and the plug both comply to the IEC60320 standard.



- A *IEC13 line socket - may be fitted with a locking device*
- B *CEE 7/7 male power plug*
- C *Live (normally identified with Blue insulation)*
- D *Neutral (normally identified with Brown insulation)*
- E *Ground (normally identified with Yellow or Yellow/Green insulation)*

A standard commercial AC mains power cable is used. The power cable is normally terminated with a female IEC C13 inline socket. The AC mains end is terminated in an AC connector suitable for the local standard and/or the output sockets on an uninterruptible power supply (UPS). If this is not the case, you must replace the AC connector.

The typical length of a power cable is between 1.5 and 2.5 metres. If the power cable provided is too short you must use an extension cable (not recommended), mount a new power outlet within range, or make your own power cable with sufficient length. If you use an uninterruptible power supply (UPS), you can also move the UPS to a different location within range.

Note

There are substantial differences between countries nomenclature related to power plugs and sockets. Observe local standards and regulations.

Minimum cable requirements

- **Conductors:** 2 x 1.5 mm² + 1.5 mm² Ground
- **Screen:** None
- **Voltage:** 750 V
- **Maximum outer diameter:** Defined by the plugs and/or the cable gland

DC Power cable - V2

DC mains is connected to the circuit breaker in the Synchronization Unit.

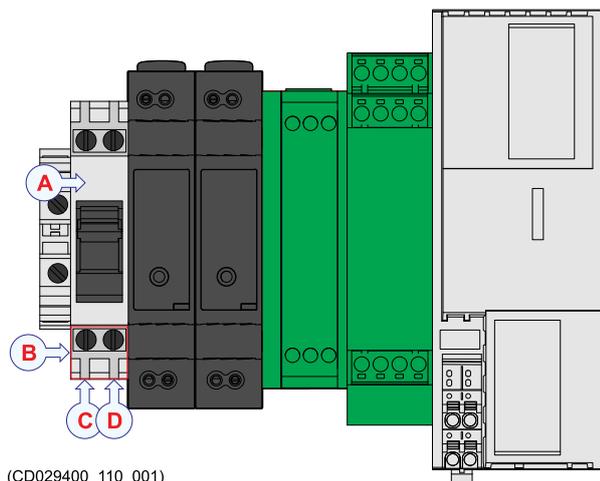


- A *Circuit breaker (24 VDC input)*
- B *Make the connections here.*
- C *X2.3 - Positive*
- D *X2.4 - Negative*

A standard commercial power supply providing 24 VDC 6A can be used.

Minimum cable requirements

- **Conductors:** 2 x 1.5 mm² + 1.5 mm² Ground
- **Screen:** None
- **Voltage:** 750 V
- **Maximum outer diameter:** Defined by the plugs and/or the cable gland



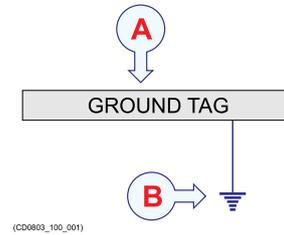
Ground cable

Correct grounding is essential for safe operation and maximum performance.

A *Ground tag on unit*

B *Vessel ground*

The ground connection is made using a thick stranded (or braided) cable making a solid connection between the cabinet and the bulkhead. It is normally provided with a green/yellow colour. The grounding cable must be connected to vessel ground in the fuse box, or other common grounding point.



Minimum cable requirements

- **Conductors:** 1 x 6 mm²
- **Screen:** None
- **Voltage:** 60 V
- **Maximum outer diameter:** Not applicable

RJ45 High speed Ethernet cable (1000Base-t)

Most high speed data connections between the K-Sync system units are made using Ethernet cables. These cables may also be used between the K-Sync and peripheral equipment.



A *Local Ethernet connection*

B *Connection on external network device*

Ethernet cables are available commercially in different lengths, colours and categories. Normally, CAT-5E and CAT-6 cables are used in local area networks with bandwidths exceeding 100 Mbit.



Minimum cable requirements

It is very important that high-quality Ethernet cables are used. You must use Cat 5e quality or better. Using cables with lower bandwidth capacity will reduce performance.

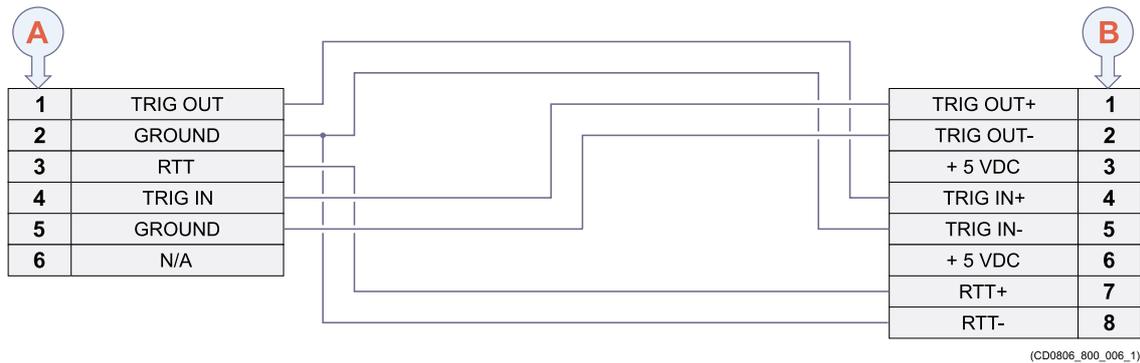
It is important that the cable has shielded twisted pair.

K-Sync interface to EM Processing Unit

This connection allows synchronisation of the following Kongsberg Maritime echo sounders:

- EM 124 / EM 304 / EM 712
- EM 2040

The cable is not included with the delivery, and must be provided by the installation shipyard.



A Connections on the K-Sync IO Module

B Connections on the EM Processor Unit interface, RJ45 connector

Note

Pin 3 and 6 is used by Kongsberg Maritime only.

The pin configuration on the K-Sync IO Module follows:

Table 9 K-Sync interface to EM Processing Unit

K-Sync		EM x
Pin no.	Signal / Type	Pin no.
1	Trig out -> / RS232	4
2	Ground	5, 8
3	<- CTS (Clear to send) / RS232	7
4	<- Trig in / TTL	1
5	Ground	2
6	Not used	

Cable specifications

Cable requirements may vary depending on the specific sonar you interface. Please consult the installation manual of the equipment for specific cable requirements.

K-Sync interface to EA400 and EA600 interface

This connection allows synchronisation of the following Kongsberg Maritime echo sounders:

- EA 400 / EA 600

The cable is not included with the delivery, and must be provided by the installation shipyard.

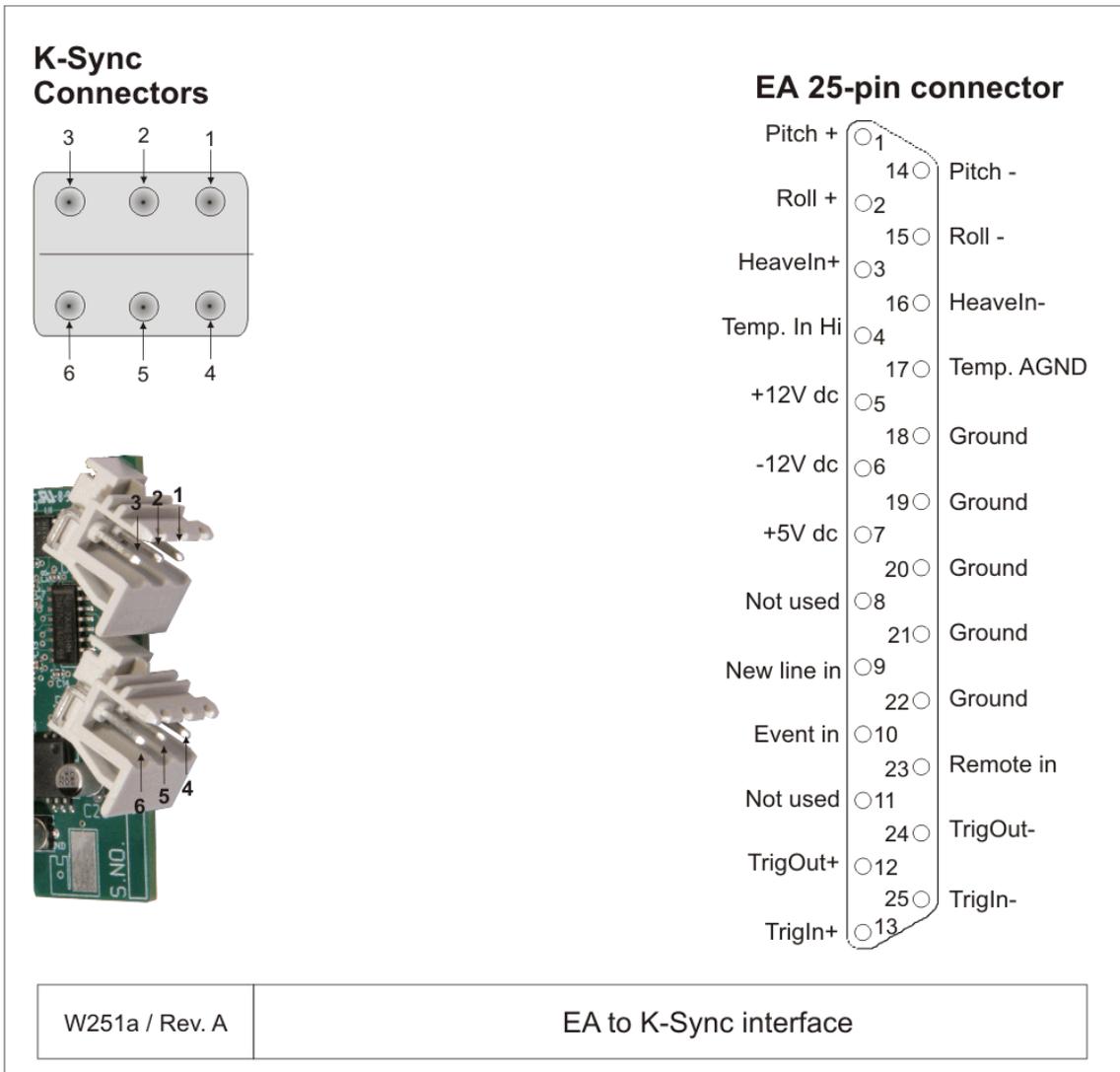


Table 10 K-Sync interface to EA400 and EA600 interface

K-Sync		GBT I/O card AUXILIARY
Pin no.	Signal / Type	Pin no.
1	Trig out -> /RS232	13

2	<- Gnd	20
3		
4	<- Trig in / TTL	12
5	<- Gnd	20
6	Not used	

Cable specifications

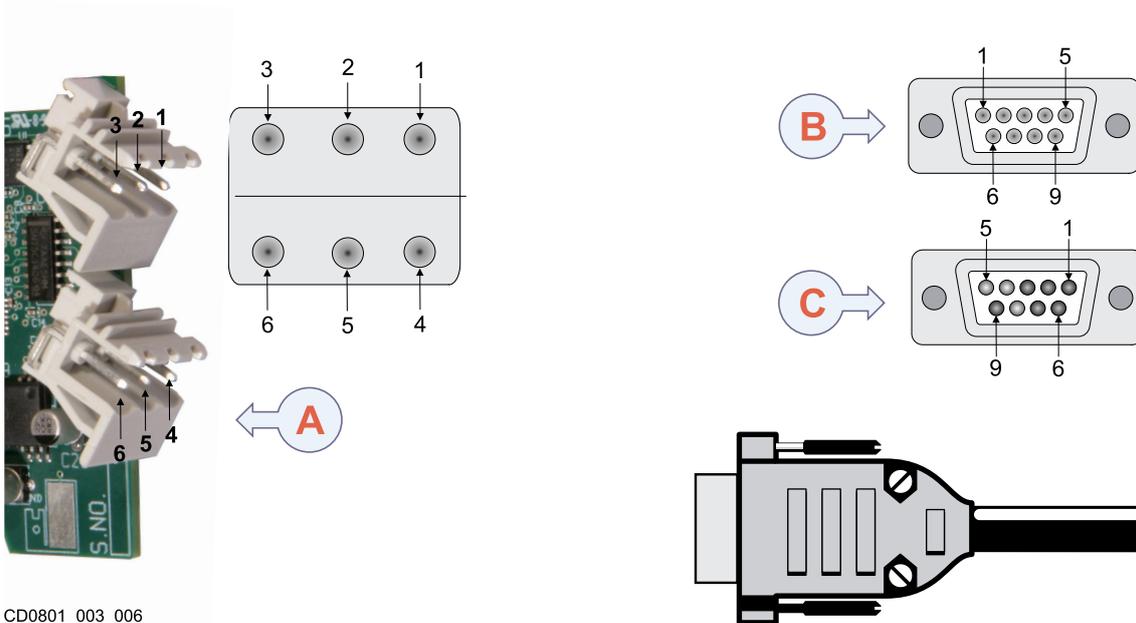
Cable requirements may vary depending on the specific sonar you interface. Please consult the installation manual of the equipment for specific cable requirements.

K-Sync interface to EA440 and EA640 interface

This connection allows synchronisation of the following Kongsberg Maritime echo sounders:

- EA 440 / EA 640

The cable is not included with the delivery, and must be provided by the installation shipyard.



CD0801_003_006

- A K-Sync connectors
- B Looking into Male 9-pin D-Subminiature connector
- C Looking into Female 9-pin D-Subminiature connector

Table 11 K-Sync interface to EA440 and EA640 interface

K-Sync		WTB I/O card AUXILIARY
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
6	Not used	

Cable specifications

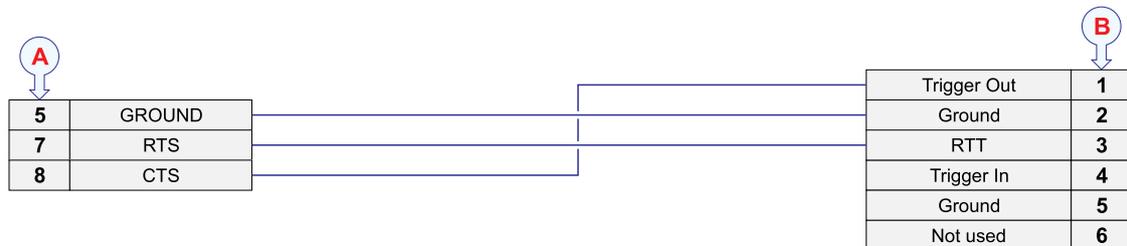
Cable requirements may vary depending on the specific sonar you interface. Please consult the installation manual of the equipment for specific cable requirements.

K-Sync interface to generic RS-232 synchronization input

For transmission synchronization purposes, the K-Sync will interface a generic RS-232 serial line communication port using the CTS (Clear To Send) and RTS (Request To Send) signals.

The synchronized product is connected to the IO Module inside the K-Sync Synchronization Unit. Each IO Module in the K-Sync Synchronization Unit provides six connectors and a configuration board for physical adjustments of the communication parameters.

Pin number	Signal	Signal description
1	Trigger Out	This signal is transmitted to the system that needs to be synchronized. Trigger Out allows the system to transmit ("ping").
2	Ground	Mandatory! This ground is connected to pin 5 inside the IO Module.
3	RTT	Ready to Transmit: Ready to Transmit (RTT) is a return signal from the hydroacoustic system that is synchronized. The Ready to Transmit (RTT) signal means that the hydroacoustic system is ready for the next trigger.
4	Trigger In	This signal is received from the system that needs to be synchronized. Trigger In is "active" while the system is transmitting.
5	Ground	Mandatory! This ground is connected to pin 2 inside the IO Module.
6	Not used	



A Local connection on the computer

B Connections on the K-Sync IO Module

A *Connectors 1 through 6 as indicated by the arrows.*

Note that each of the two connector elements can be pulled out of the IO Module for easy access.

B *Configuration board*

Unless otherwise specified, this cable must be provided by the installation shipyard.

Cable specifications

Cable requirements may vary depending on the specific sonar you interface. Please consult the installation manual of the equipment for specific cable requirements.



CD029400_102_04

Cable gland procedure

Cable glands are used whenever a cable passes through a water-tight bulkhead or into a cabinet, to seal the opening through which the cable passes and to protect the cable from abrasion on the edges of the hole. Follow the guidelines detailed here when installing cables through cable glands.

Prerequisites

Ensure that all the cables to be connected are completely isolated from any power sources.

Verify that no safety interlocks have been bypassed. A minimum of 5 to 10 cm of slack cable must be allowed (depending on the cable diameter and arrangement), both inside and outside the cabinet, when installing cables. This is to allow for vibration damping, maintenance and measurement errors. Always double-check your measurements before taking any irreversible actions.

With a steel conduit the installation will satisfy the European Union regulations for electromagnetic compatibility (EMC) interference. Without a steel conduit, there is a risk of reduced performance.

Context

Note

The screen in cables must never be connected to ship's ground in the cable glands!

Tag out the system properly.

Procedure

- 1 Select the cable to be connected, and select the cable gland to use. Make sure you use the correct size cable gland according to the cable size. The cable glands are included in the delivery.

- 2 Slacken and remove the compression nut from the cable gland, and extract the compression seal and the screen collar from the body of the gland.



- 3 Depending on whether the cable has already been installed in conduits, either:
 - (Installed) measure the maximum length of cable required to reach from the final cable clip outside the cabinet to the terminal blocks inside the cabinet, add 20 cm, then remove the excess cable,
 - (Loose cable) measure the maximum length of wire required to reach from the cable gland to the terminal blocks inside the cabinet, add 20 cm. and mark the cable
- 4 Pull the cable through the steel conduit.



- 5 Carefully remove the outer insulation from the required cable length. Do not damage the screening. Leave 12 mm of the screen exposed from the insulation, cut off the remainder.
- 6 Make sure that an ample length of the cable is available for maintenance and replacement.
- 7 Cut the cable.
- 8 Remove the insulation on the shield in the cable.
- 9 Cut the shield, to just cover the seal.



- 10 Remove the insulation on the wires in the cable.
- 11 Add an end sleeve to the wires.
- 12 Fit the cable gland into the unit cabinet.
- 13 Connect the cable cores to the appropriate terminals within the cabinet.

Further requirements

Use a blind plug to cover the points not in use.

Configuration of the K-Sync application

Configuration of K-Sync is described in *K-Sync Operator Manual*, reg.nr. 342435.

Technical specifications

Topics

[Weights and outline dimensions, page 79](#)

[Power requirements, page 79](#)

[Environmental requirements, page 80](#)

Weights and outline dimensions

19" rack version - V1

- **Make and model:** K-Sync (19" rack version)
- **Outline dimensions**
 - **Height:** 177.25 mm (4U)
 - **Width:** 482 mm (19" rack)
 - **Depth:** 400 mm (Approximately)
- **Weight:** 15 kg (Approximately)

Cabinet version - V1

- **Make and model:** K-Sync (Cabinet version)
- **Outline dimensions**
 - **Height:** 521 mm (with connectors)
 - **Width:** 400 mm
 - **Depth:** 210 mm
- **Weight:** 15 kg (Approximately)

19" rack version - V2

- **Make and model:** K-Sync (19" rack version V2)
- **Outline dimensions**
 - **Height:** 132.5 mm (3U)
 - **Width:** 482 mm (19" rack)
 - **Depth:** 433 mm (Approximately)
- **Weight:** 9 kg (Approximately)

Power requirements

19" rack version / Cabinet version - V1

- **Make and model:** K-Sync
- **Voltage requirement:** 110 - 240 VAC
- **Power consumption:** 80 W (Typical)
- **Power interrupts:** The use of uninterruptible power supply (UPS) is highly recommended

19" rack version - V2

- **Make and model:** K-Sync (19" rack version V2)
- **Nominal voltage:** 12 - 24 VDC
- **Voltage requirement:** 10 - 32 VDC
- **Power consumption:** 55 W (Typical)

Environmental requirements

19" rack version / Cabinet version - V1

- **Make and model:** K-Sync
- **Operating temperature:** 0 to +40 °C
- **Storage temperature:** 0 to +40 °C

19" rack version - V2

- **Make and model:** K-Sync V2
- **Operating temperature:** -25 to 60 °C
- **Storage temperature:** -25 to 60 °C
- **Ingress protection (IP) code:** IP20
- **Relative humidity:** 5 to 95%

Drawing file

Topics

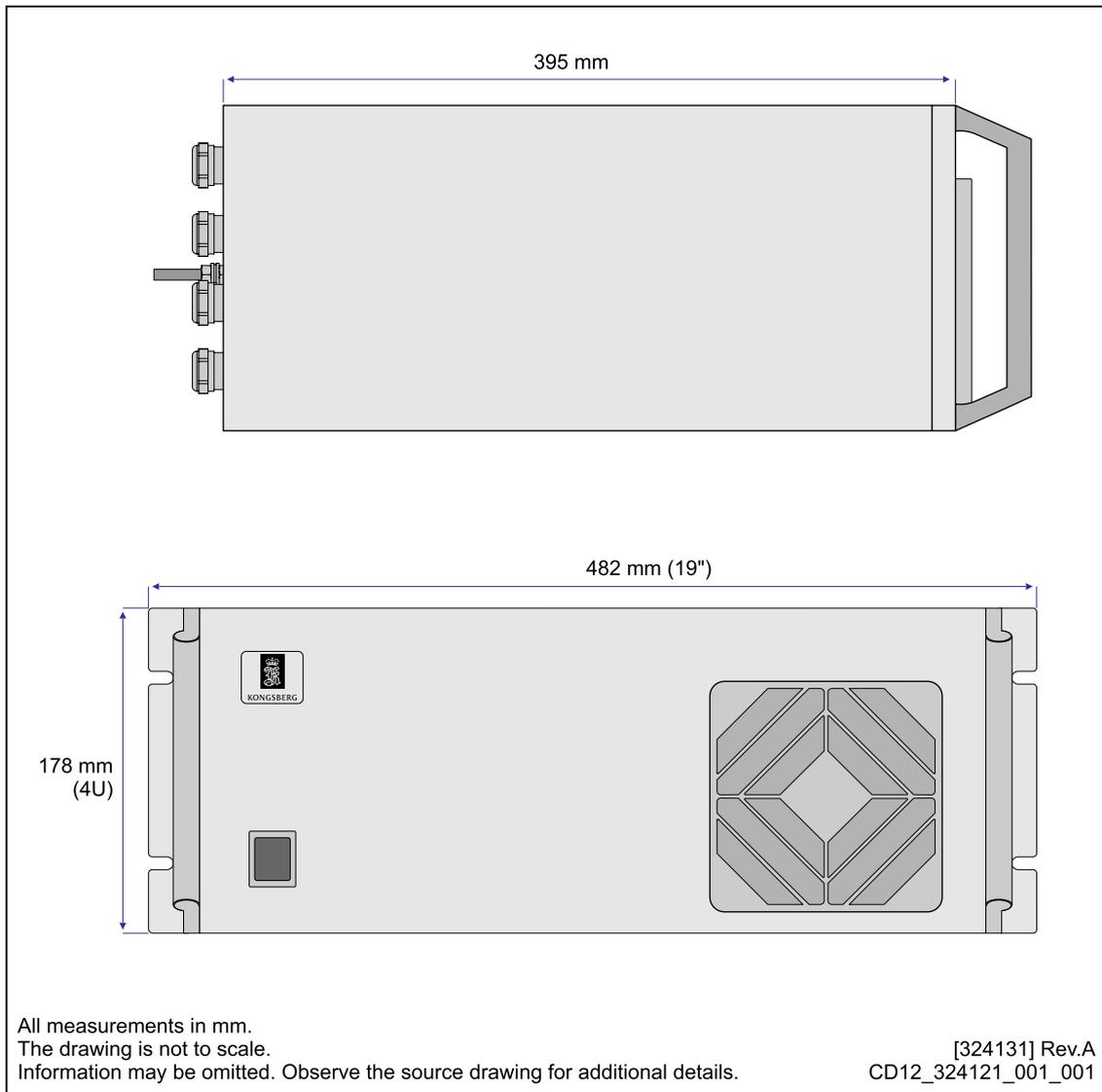
[324131 Synchronization Unit dimensions \(19" rack version\) - V1, page 82](#)

[344459 Synchronization Unit dimensions \(Cabinet version\) - V1, page 83](#)

[110-0010683 Synchronization Unit dimensions \(19" rack version\) - V2, page 84](#)

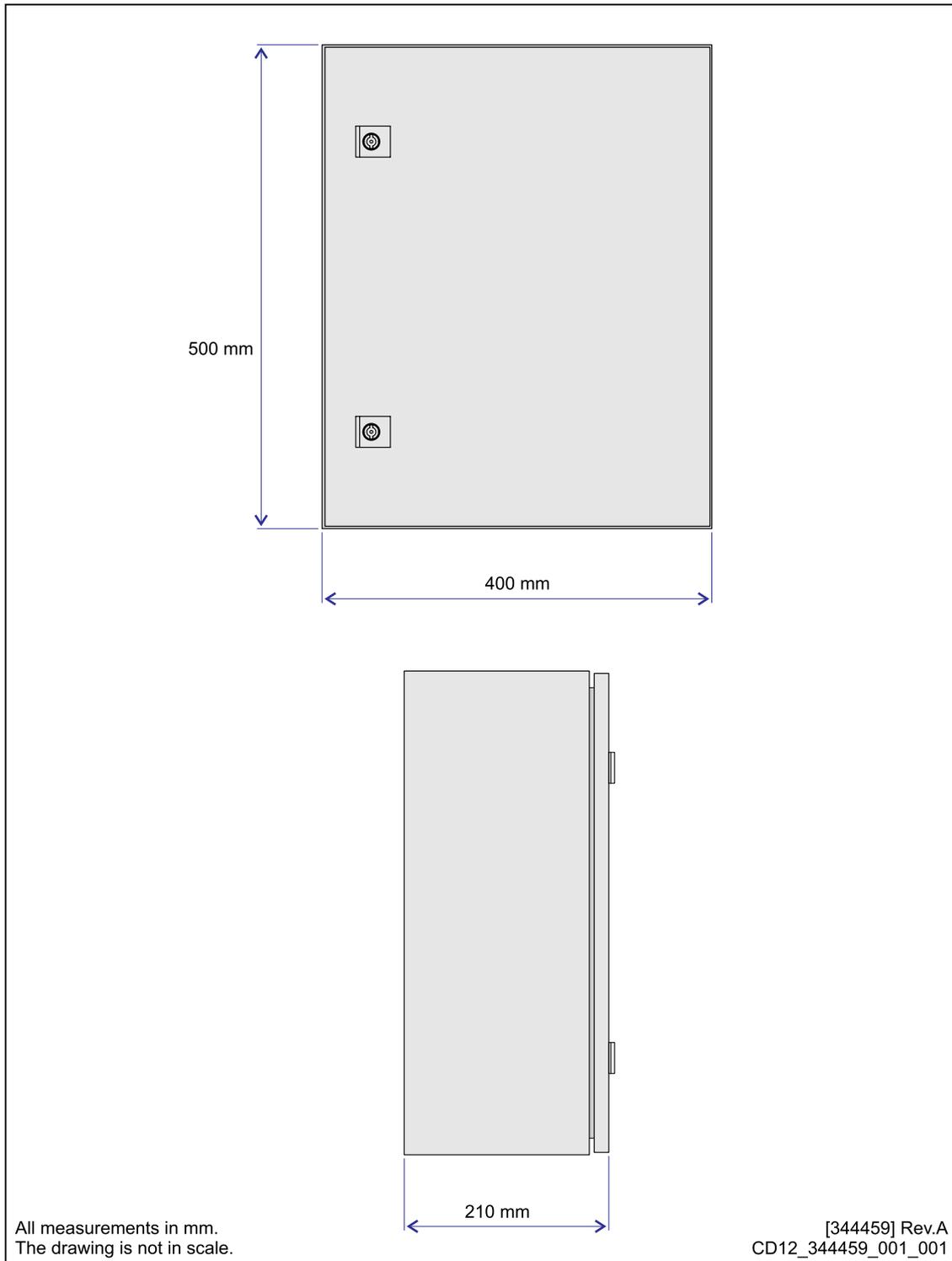
324131 Synchronization Unit dimensions (19" rack version) - V1

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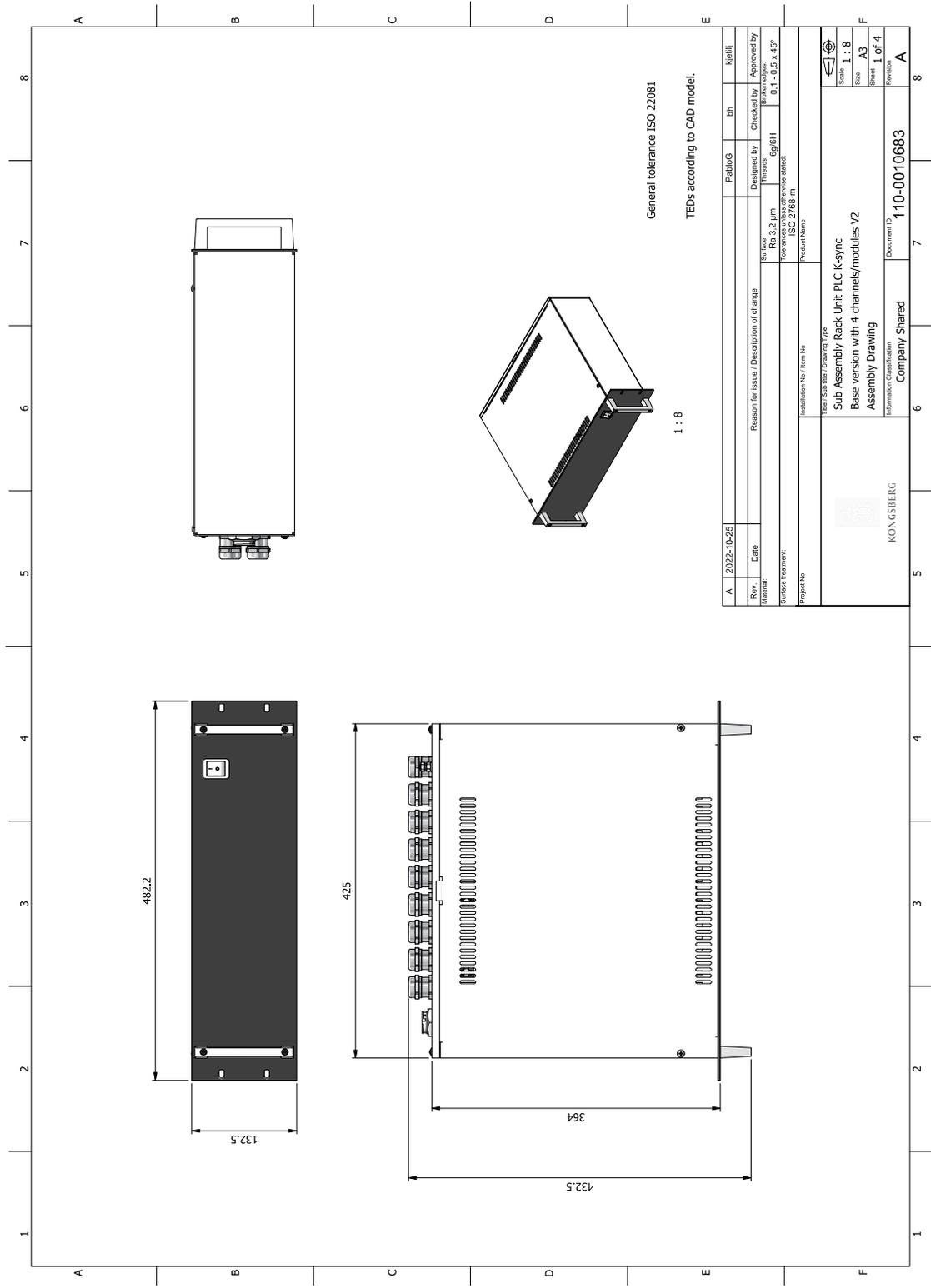


344459 Synchronization Unit dimensions (Cabinet version) - V1

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110-0010683 Synchronization Unit dimensions (19" rack version) - V2



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