KONGSBERG

Kongsberg EM 304 MKII Multibeam Echo Sounder

Maintenance manual

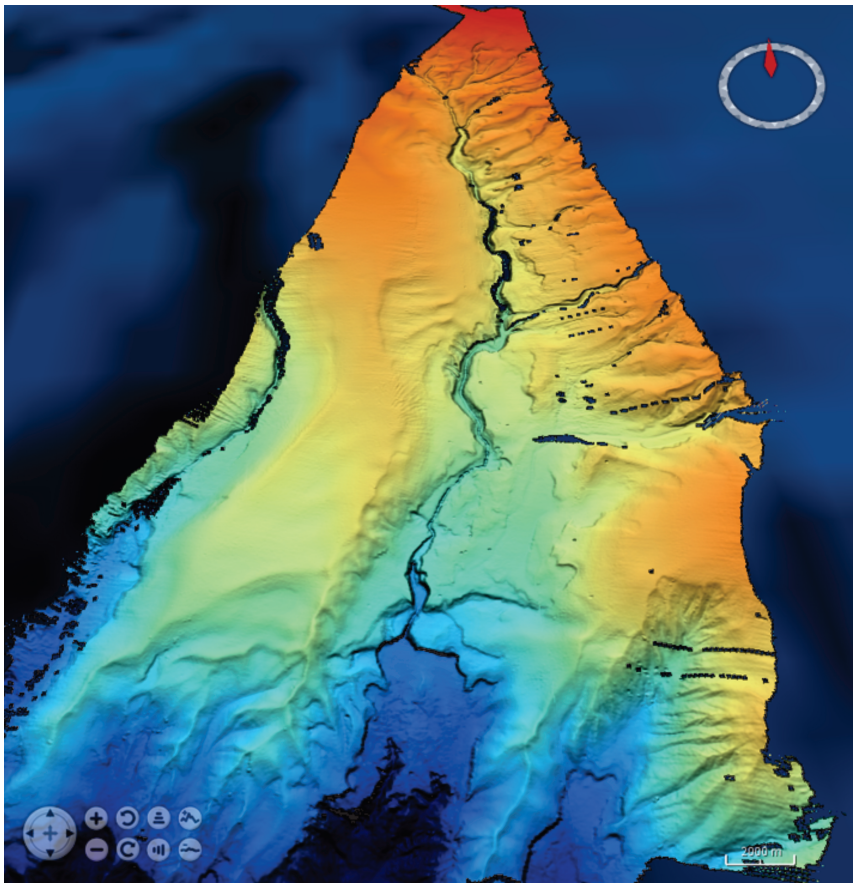

Image: Black Mud Canyon, courtesy of Ifremer.

Kongsberg product: EM 304 bathymetry.

Location: North Atlantic Ocean.

Depth:200 - 4100 m

470434/A

Document information

- **Product**: Kongsberg EM 304 MKII
- **Document**: Maintenance manual
- **Document part number**: 470434
- **Revision**: A
- **Date of issue**: 15 January 2021

Copyright

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.

Table of contents

About this manual

The purpose of this manual is to present the descriptions and drawings required to do basic maintenance tasks on the EM 304 MKII Multibeam Echo Sounder. The equipment described in this manual includes the complete system with associated cabinets, but not those system units provided locally by the customer, installation shipyard or local dealer.

Target audience

The manual is intended for technical personnel; qualified maintenance engineers and technicians. You must understand the general principles of maritime electronic equipment. You must also be familiar with computer hardware, signal processing, interface technology and traditional troubleshooting on electronic and mechanical products.

We assume that you are familiar with the basic acoustic principles of sound in water. We also expect that you have some experience with multibeam, split-beam and/or single-beam echo sounders in scientific applications.

Online information

All relevant end-user documentation provided for your EM 304 MKII can be downloaded from our website.

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

Our website also provides information about other Kongsberg products.

Technical information is available for registered users in our password protected database.

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Kongsberg EM 304 MKII

Topics

System description

The modular, state-of-the-art EM 304 MKII performs accurate, high resolution seabed mapping in shallow to full ocean depth (11000 metres).

The EM 304 MKII is designed to perform seabed mapping with an unsurpassed resolution, coverage and accuracy. The system is cost effective, reliable and easily operated. The design of the EM 304 MKII is based on more than 50 years of hydrographic experience with echo sounders, sonars and underwater positioning for civilian and military use. It is the latest model in a series of deep sea multibeam echo sounders that started with the EM 300 in 1997.

The EM 304 MKII consist of new state-of-the-art electronics and separate transmit and receive transducers in a Mills Cross configuration. It utilizes the same field-proven receive transducer as the EM 302 and a new redesigned wide band transmit transducer increasing the depth and coverage. The new transmit transducer models are designed to fit existing EM 302 and EM 304 casings to accommodate upgrades with a minimum of hull intervention. Care has been taken to design a highly modular and flexible solution with compact electronics for easier and faster installation. Due to a flexible transducer design, the system can be tailored to almost any required size. The largest standard size, 0.3 x 0.5 degrees, gives the ultimate system performance in terms of resolution and range, while a smaller 4.0 x 4.0 degrees solution can be installed on any vessel of opportunity.

The EM 304 MKII multibeam echo sounder consists of the following main units.

- Transducer arrays
- Transmitter Unit(s)
- Receiver Unit(s)
- Processing Unit
- Hydrographic Work Station

To form a complete system it is also required to have sensors providing vessel attitude, velocity, position, sound speed profile of the water column and speed of sound at the transducer depth.

Technical details

The EM 304 MKII operates at sonar frequencies in the 20-32 kHz range.

The transmit fan is divided into 4 sectors in shallow modes (8 sectors in deep modes) to maximize range capability but also to suppress interference from multiples of strong bottom echoes. The sectors are transmitted sequentially within each ping, and uses distinct frequencies or waveforms.

The nominal sonar frequency is 26 kHz with an angular coverage sector of up to 150º and 1600 beams per ping. Achievable swath width on a flat bottom will normally be up to 5.5 times (140º) the water depth. The angular coverage sector is operator controllable or may be set to a fixed range. It may also be set to vary automatically with depth according to achievable coverage. This maximizes the number of usable beams. The beam spacing is normally high density equidistant with equiangle available.

The transmit fan is split in several individual sectors with independent active steering according to vessel roll, pitch and yaw. This place all beams on a “best fit” to a line perpendicular to the survey line, thus ensuring a uniform sampling of the bottom and 100% coverage.

In dual swath mode the transmit fan is duplicated and transmitted with a small difference in alongtrack tilt. The applied tilt takes into account depth, coverage and vessel speed to give a constant beam separation alongtrack.

The sectors are frequency coded or have FM chirps, and they are transmitted sequentially at each ping. The sector steering is fully taken into account when the position and depth of each beam is calculated, as is the refraction due to the sound speed profile, vessel attitude and installation angles. The pulse length and range sampling rate are variable with depth (auto or manual) for best resolution.

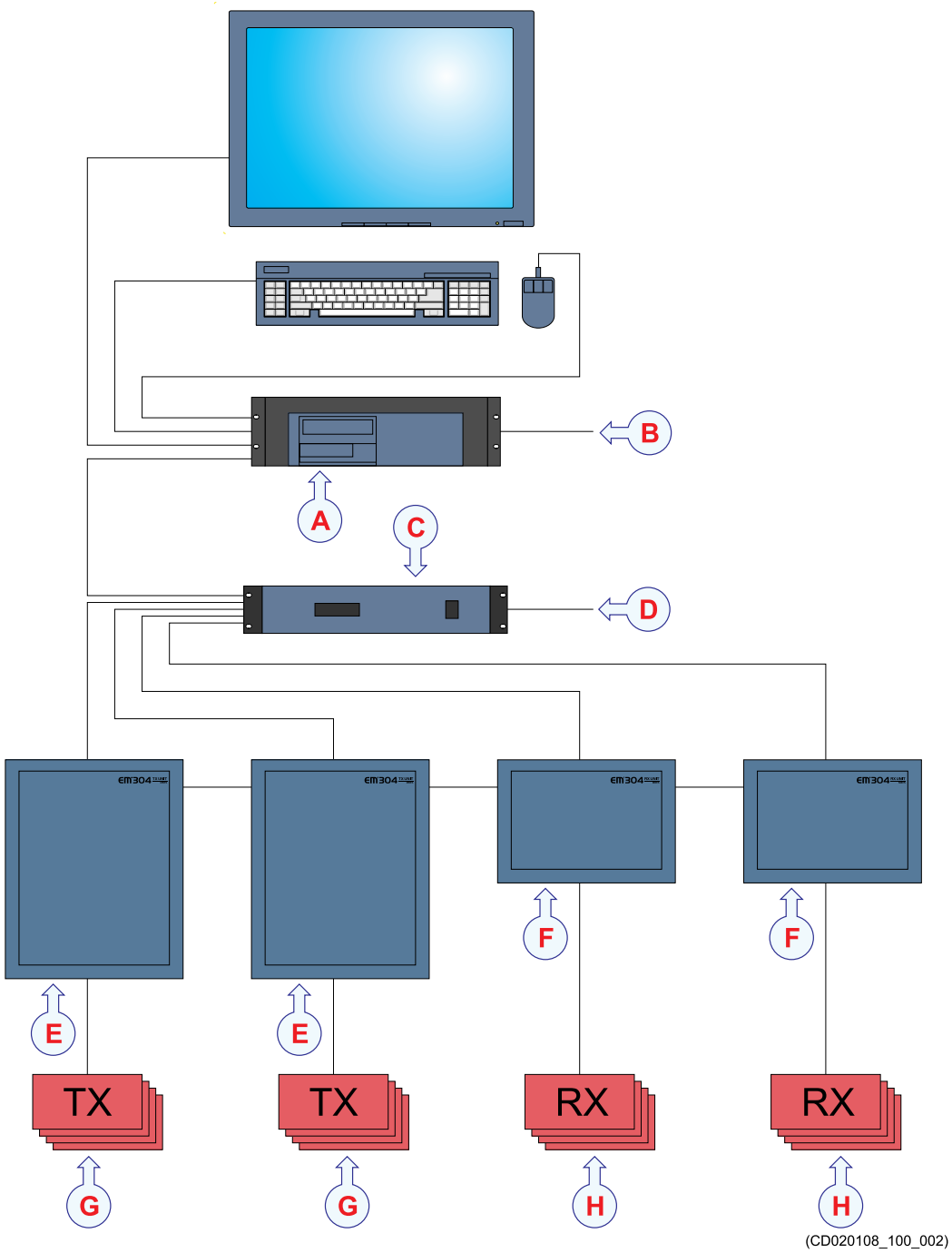
In shallow waters due care is taken to the near field effects through nearfield focusing individually applied in the different sectors.

EM 304 MKII applies one focus range for each of the transmit sectors which are used for shallow water environment. Dynamic beam focusing is used for the reception beams.

The ping rate is mainly limited by the round trip travel time in the water up to a ping rate of more than 5 Hz.

System diagram 0.5 x 0.5 degrees system

The system diagram identifies the main components of a basic EM 304 MKII system. Only the main connections between the units are shown. Detailed interface capabilities and power cables are not shown.



A *Hydrographic Work Station*

B *Interfaces:*

- *Sound speed sensors*
- *Tide*
- *Centre depth output*

C *Processing Unit*

D *Interfaces:*

- *Positioning systems*
- *Attitude (roll, pitch and heave)*
- *Sound speed sensor*
- *Velocity*
- *Clock*
- *Trigger input/output*
- *Clock synchronisation (1PPS)*

E *Transmitter Unit (TXU)*

F *Receiver Unit (RXU)*

G *Transmit transducers*

H *Receive transducers*

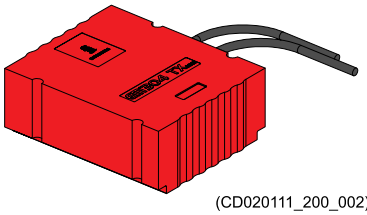
System units

Topics

Transducer description

A transducer is a device that converts one form of energy to another. In an echo sounder system the transducer converts between electric energy and sound.

The EM 304 MKII uses separate transducer arrays for transmitting and receiving sound pulses. Both transducer arrays can have one or more modules which are assembled in mounting frames.

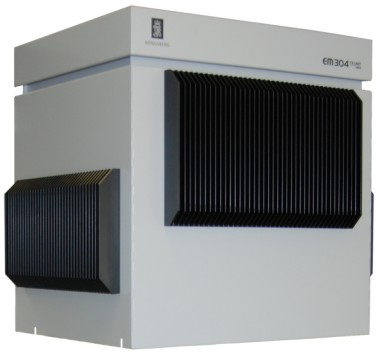


(CD020111_200_002)

The two transducer arrays are normally mounted as “T” or “L” configurations under the vessel’s hull (Mills Cross configuration). The transmit transducer array should be aligned parallel to the vessel’s keel. The receiver transducer array should be aligned 90 degrees on the keel. Both transducer arrays should be horizontal on a plane on the keel.

Transmitter Unit description

The EM 304 MKII Transmitter Unit has all transmit electronics, like control processors, power amplifiers, power supply, capacitor battery and Ethernet interface.



The Transmitter Unit is a wall-mounted steel cabinet with integrated shock and vibration absorbers, designed for bulkhead mounting. One 19 inch sub-rack is contained in the cabinet. The number of circuit boards in the sub-rack will depend on the chosen transducer configuration.

Twisted pair Ethernet is used for data communication with the Processing Unit.

The Transmitter Units are normally located in a "sonar room" close to the transducer arrays.

For systems with more than 12 transmitter modules, two Transmitter Units are used.

Receiver Unit description

The EM 304 MKII Receiver Unit has all receive electronics, like control processor, amplifiers, Analog-to-Digital Converters, power supply and Ethernet interface.

The Receiver Unit is a small wall-mounted steel cabinet with integrated shock and vibration absorbers, designed for bulkhead mounting. The number of circuit boards in the Receiver Unit will depend on the chosen transducer configuration. Twisted pair Ethernet is used for data communication with the Processing Unit.

The Receiver Unit is normally located in a "sonar room" close to the transducer arrays.

For systems with more than 8 receiver modules, two Receiver Units are used.

Processing Unit description

The EM 304 MKII Processing Unit is provided to process the signals to and from the Transmitter and Receiver Units.

The EM 304 MKII Processing Unit is an industrial computer using both COTS (commercial off-the-shelf) components and custom made components. The unit is designed and tested for rugged use.

The Processing Unit performs the receiver beamforming, bottom detection, and motion and sound speed corrections. It contains all interfaces for time-critical external sensors such as vessel attitude (roll, pitch, heading and heave), vessel position and external

clock. More than one sensor of each type may be connected simultaneously, with one in use and all of them logged.

The Processing Unit controls the Transmitter and Receiver units via Ethernet communication, and is also interfaced to the Operator station via Ethernet.

The 48 V output from the Processing Unit can be used for remote on/off control of the Transmitter and Receiver Units.

The Processing Unit is normally located in a "sonar room" close to the transducer arrays. The unit can also be placed in the "survey room" or on the bridge.

Related topics

Processing Unit, page 123

Computer description

The Hydrographic Work Station is the operator station of the EM 304 MKII system.

A dedicated maritime computer is provided with the EM 304 MKII Multibeam Echo Sounder. It is set up with all necessary software.

The Hydrographic Work Station is based on the Microsoft® Windows 10 operating system.

The Hydrographic Work Station is normally mounted near the operator work space.

Support information

Should you need technical support for your EM 304 MKII system you must contact a Kongsberg Maritime office. A list of all our offices is provided on our website. You can also contact our main support office in Norway.

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

Troubleshooting

Topics

Tools for troubleshooting

Efficient EM 304 MKII troubleshooting requires good knowledge of its functionality and design. Specific tools may also be required for certain tasks.

The following tools are relevant for troubleshooting the Kongsberg EM 304 MKII Multibeam Echo Sounder.

- Built-In Self Test (BIST)
- Analysis of the data presentations made by the EM 304 MKII
- Messages
- Visual checks
- Relevant measurements with applicable test instruments
- Test and verification procedures
- Your own knowledge of how the system works

We assume that you are 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 one or more special tools are required for a task, these are specified in the relevant procedure.

It is impossible to create a detailed list of all possible errors and error symptoms in the EM 304 MKII.

However, key components that fail will in most cases be detected by the tools you have available.

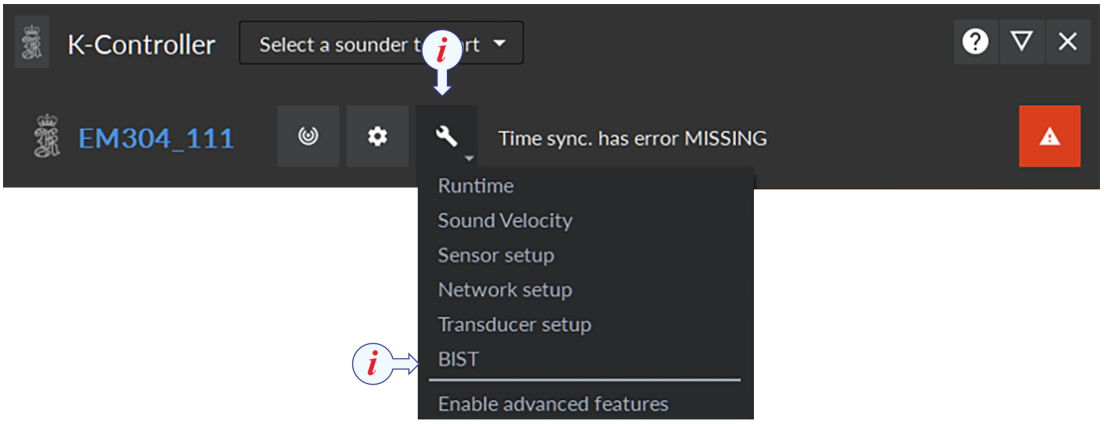
The most important tool is your own knowledge about the EM 304 MKII. Based on a list of the main components in the system, brief descriptions of what they do and how they work, including suggested certain symptoms, you may work out the possible solutions.

BIST (Built-In Self Test) dialog box

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

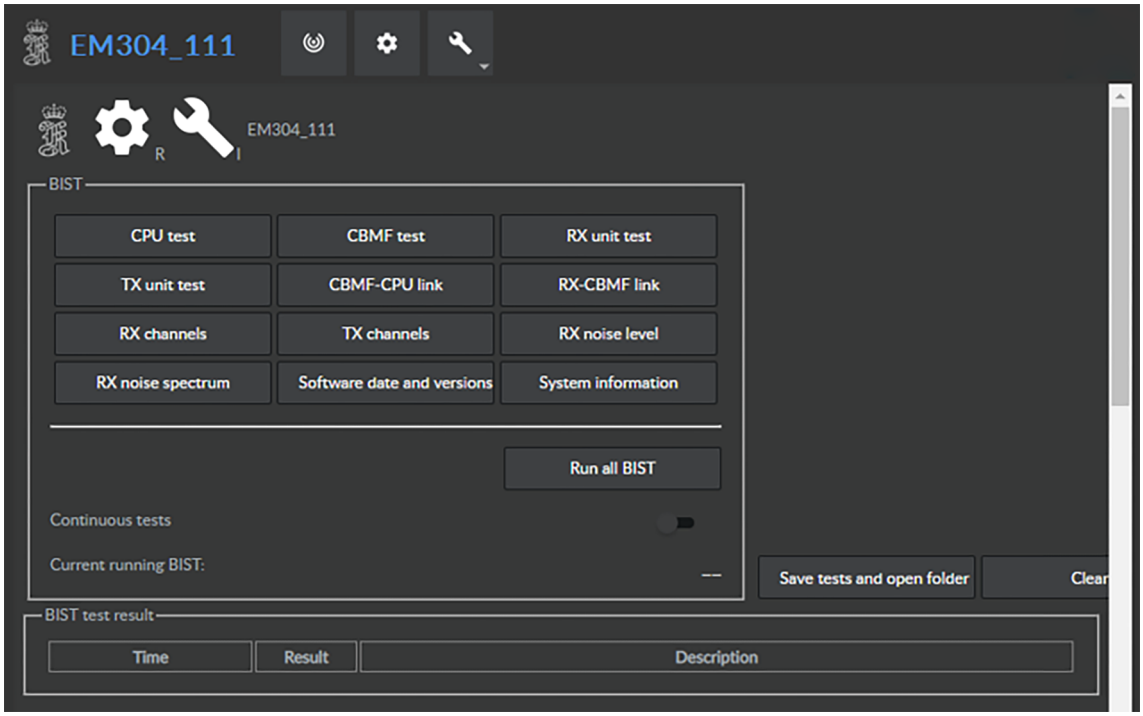
How to open

- **SIS**: Select **Installation Parameters** on the **View** menu. Select the spanner icon, then select **BIST**.
- **K-Controller**: Select the spanner icon, then select **BIST**.



Description

The BIST (Built-In Self Test) options provide a number of automatic tests that may be started to check the operation of the echo sounder system.



Details

CPU Test

This test presents the CPU type, the CPU clock frequency, the current and maximum temperatures for the CPU die and for the CPU board. In addition some key voltages are reported, and finally the network addresses for the board's interfaces.

CBMF test

This test presents the CBMF board temperature, the internal power supply voltages. In addition software and firmware versions are displayed.

RX unit test

This test presents the internal temperatures and voltages in the receiver electronics. In addition software and firmware versions are displayed.

TX unit test

This test presents the internal temperatures and voltages in the transmitter electronics. In addition software and firmware versions are displayed.

CBMF-CPU link

This test checks CBMF board(s), Ethernet connection and the parallel bus interface between the CBMF board(s) and the CPU circuit board. A large set of known data is transferred from the CPU unit on Ethernet via CBMF back to the CPU board. The data received is checked by the CPU board.

RX-CBMF link

This test checks the GBit interface between the RX unit and the CBMF boards. A large set of known data is transferred from RX unit via CBMF to the CPU board on parallel bus. The data received is checked by the CPU board.

RX channels

The Receiver Unit has a programmable signal generator board that is used to inject a test signal at the preamplifier inputs in the Receiver Unit. The BIST report displays the measured RX transducer impedance for all RX channels. This test may fail at very high noise levels.

TX channels

This test checks the impedance of all TX elements. This is done by measuring the voltage and current used by all individual transmitters. This test may fail at very high noise levels or in very shallow water.

RX noise level

This test measures the average isotropic spectral noise level for each receiver channel (in dB rel 1 µPa/Hz) for different frequency bands. The receiver directivity index, the transducer sensitivity and the filter bandwidth is used to convert to isotropic spectral noise level. On a quiet ship away from noise sources, the noise level should normally be below 45 dB at survey speed.

RX noise spectrum

This test measures the isotropic spectral noise level for each receiver channel as done in the RX noise level test. The noise spectrum level is displayed for small frequency bands for groups of 32 channels. In addition the average level for all channels are displayed. This spectrum test can be used to search for external noise sources.

Software date and versions

This test presents the software date and versions for the system components.

System information

This test acquires information needed (serial numbers, software versions, BIST results etc.) for a status report.

Save tests and open folder

Select **Save tests and open folder** to save the test results as a text file.

Clear

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

BIST result

All the tests will be listed as they are done.

Time

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

Result

The result showing as Passed or Failed.

Description

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

BIST (Built-In Self Test) theory

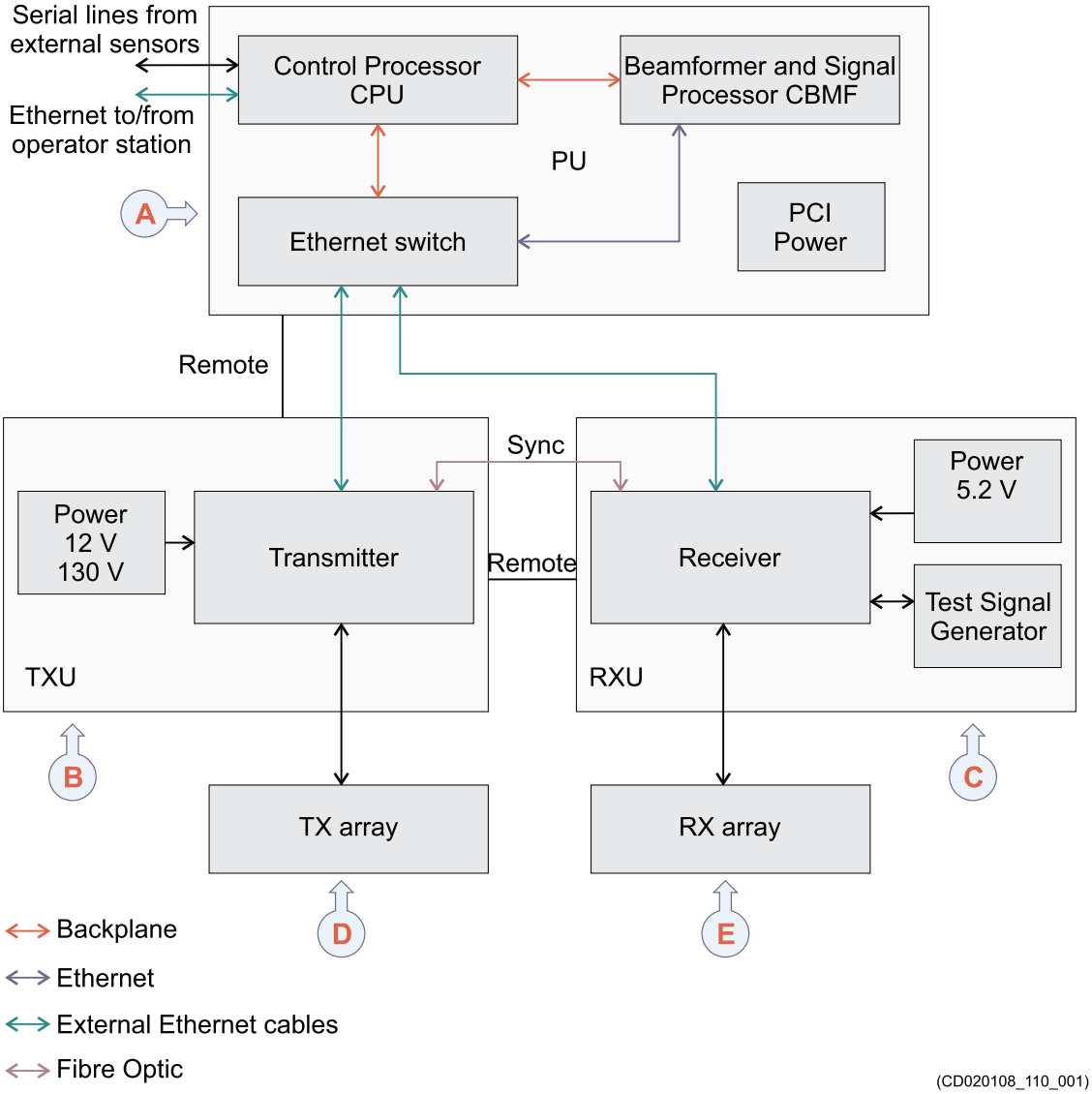
Topics

BIST Introduction

The purpose of the offline BIST system is to detect errors and locate the failed module.

The BIST tests are organized in a sequence, and tests module by module. The CPU executes the BISTs and sends the BIST reply to the operator station.

Temperature, voltage, communication and firmware versions of each board and module are tested.



A *Processing Unit*

B *Transmitter Unit (TXU)*

C *Receiver Unit*

D *Transmit transducer array*

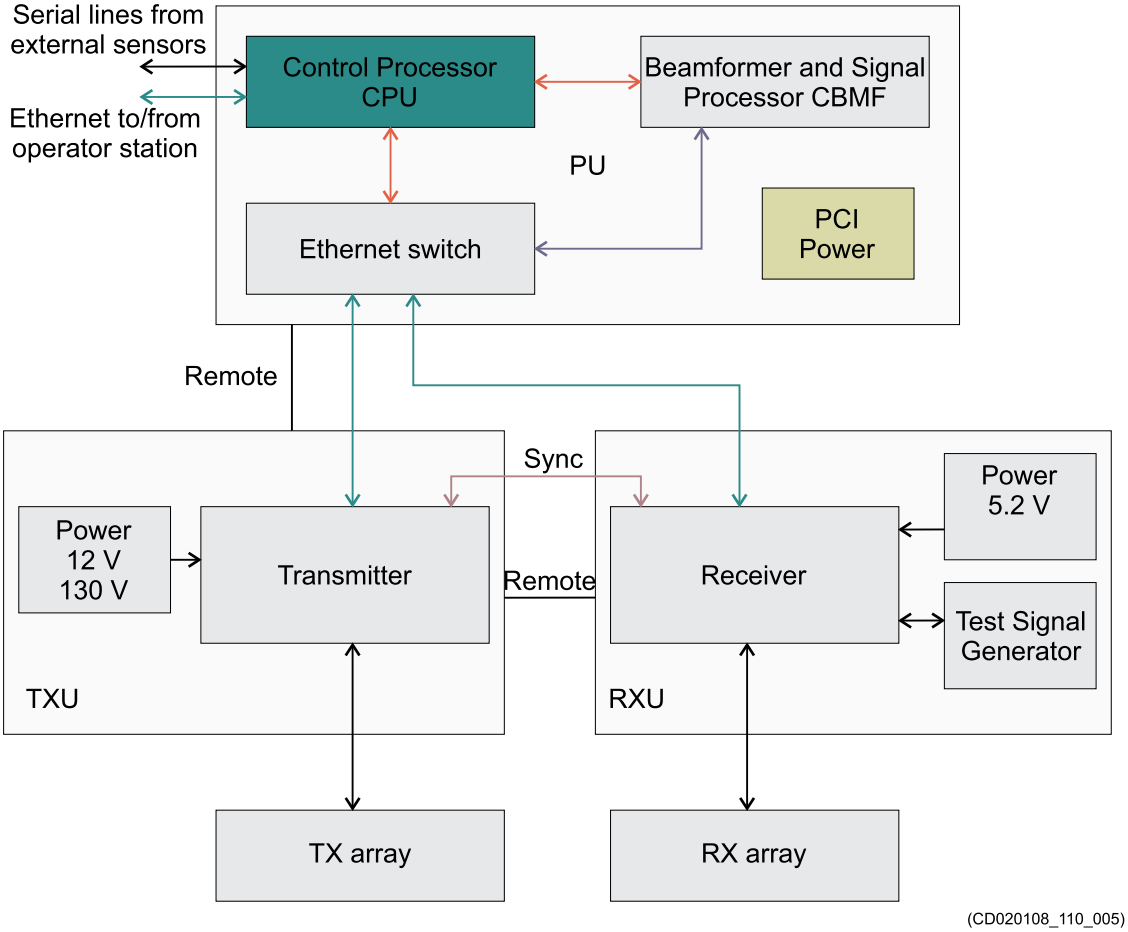
E *Receive transducer array*

CPU Test

Checks the CPU board in the in the EM 304 MKII Processing Unit.

This test presents the CPU type, the CPU clock frequency, the current and maximum temperatures for the CPU die and for the CPU board.

In addition some key voltages are reported, and finally the network addresses for the board's interfaces.

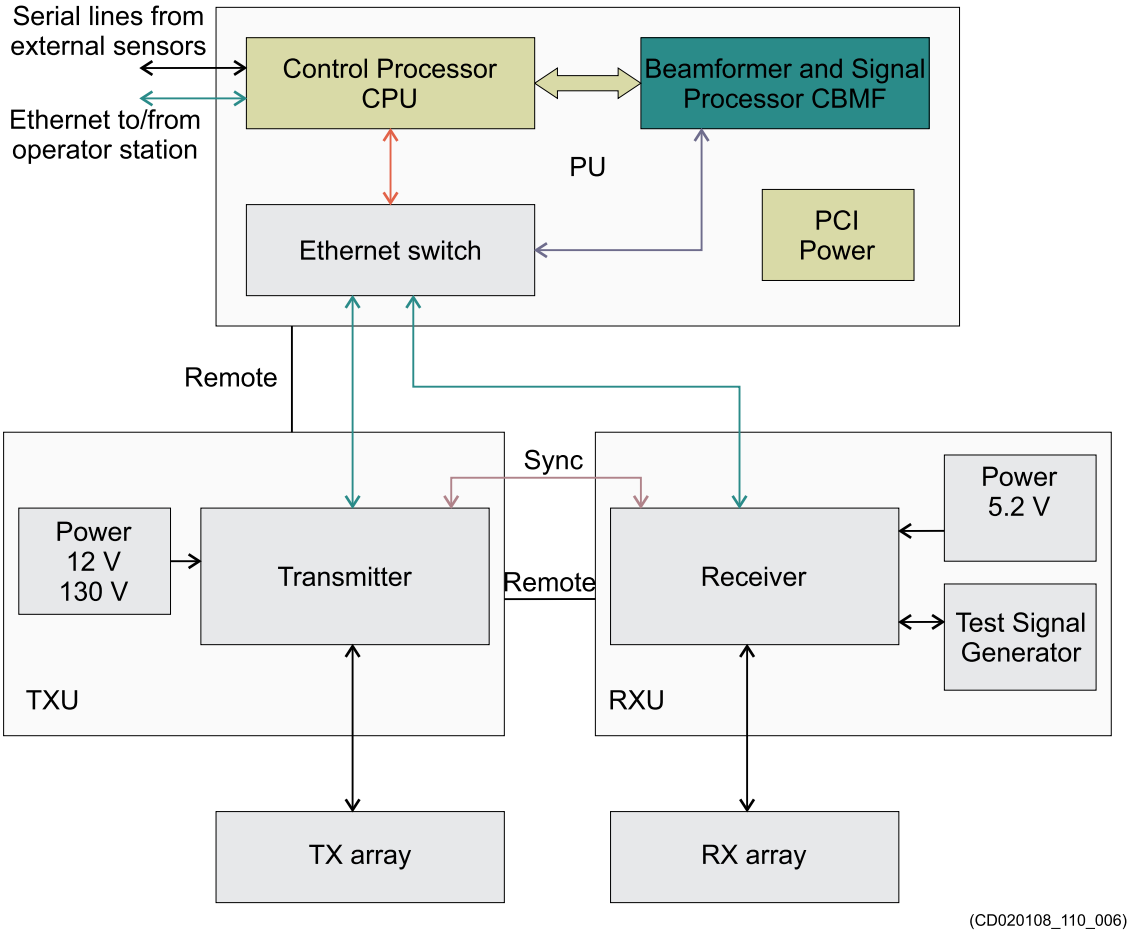


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

CBMF test

Checks all beamformer and signal processing boards (CBMF) in the EM 304 MKII Processing Unit.

This test presents the CBMF board temperature, the internal power supply voltages. In addition software and firmware versions are displayed.

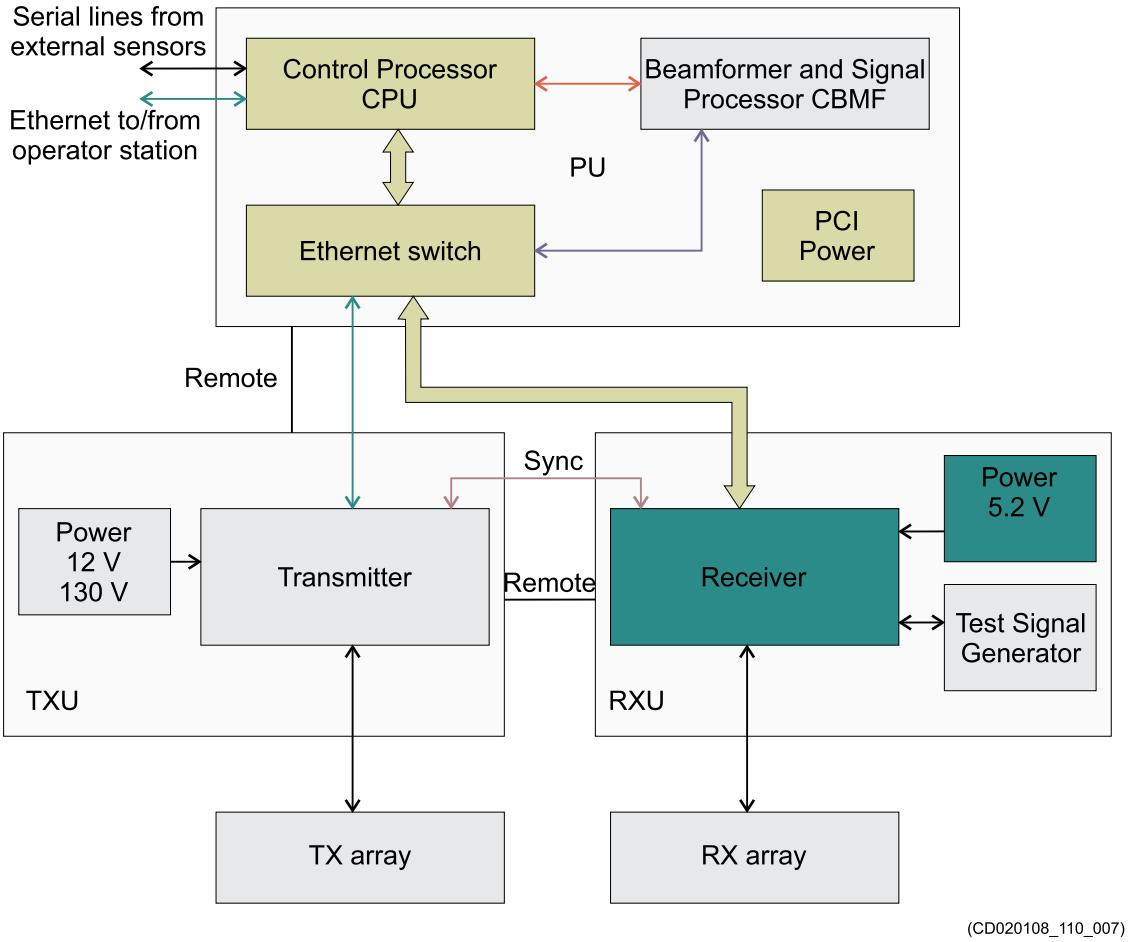


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

RX unit test

Checks the receiver electronics in the EM 304 MKII Receiver Unit.

This test presents the internal temperatures and voltages in the receiver electronics. In addition software and firmware versions are displayed.

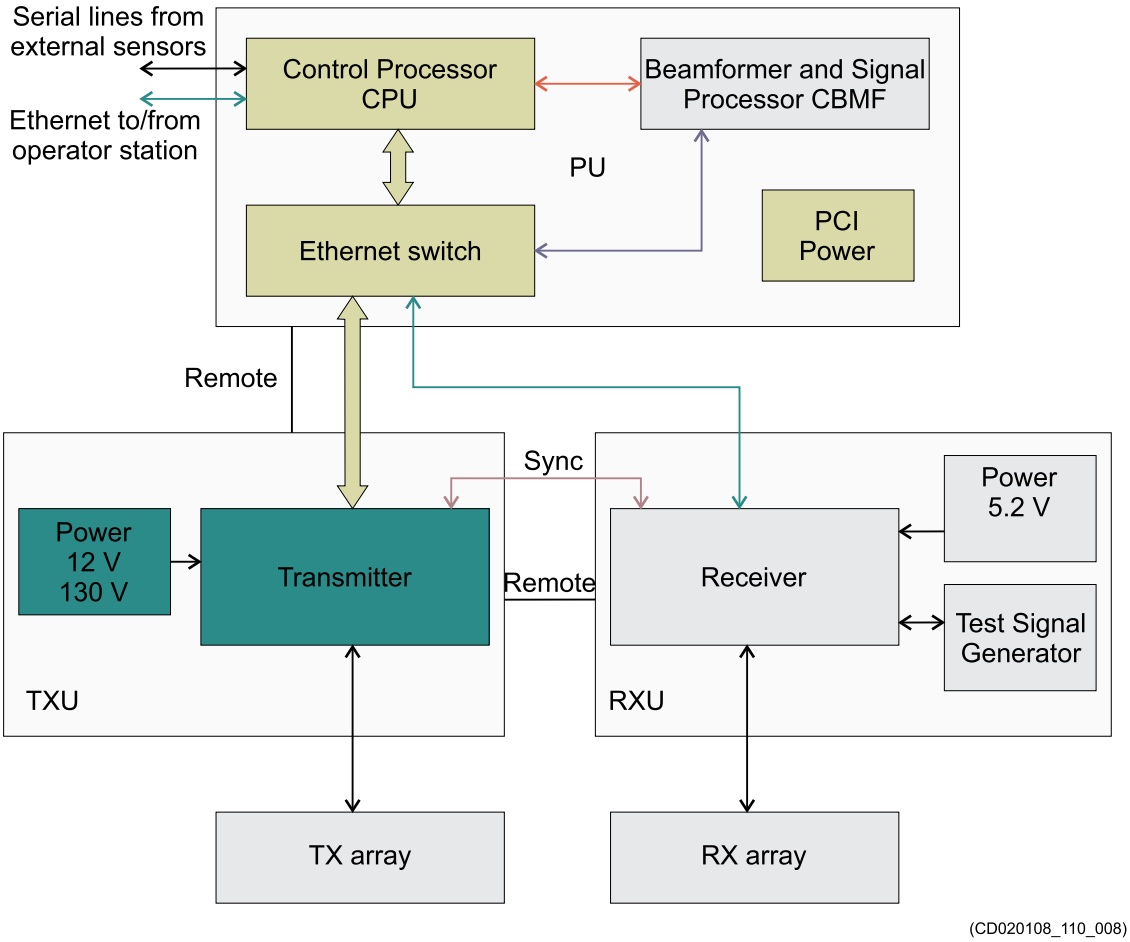


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

TX unit test

Checks the transmitter electronics in the EM 304 MKII Transmitter Unit.

This test presents the internal temperatures and voltages in the transmitter electronics. In addition software and firmware versions are displayed.

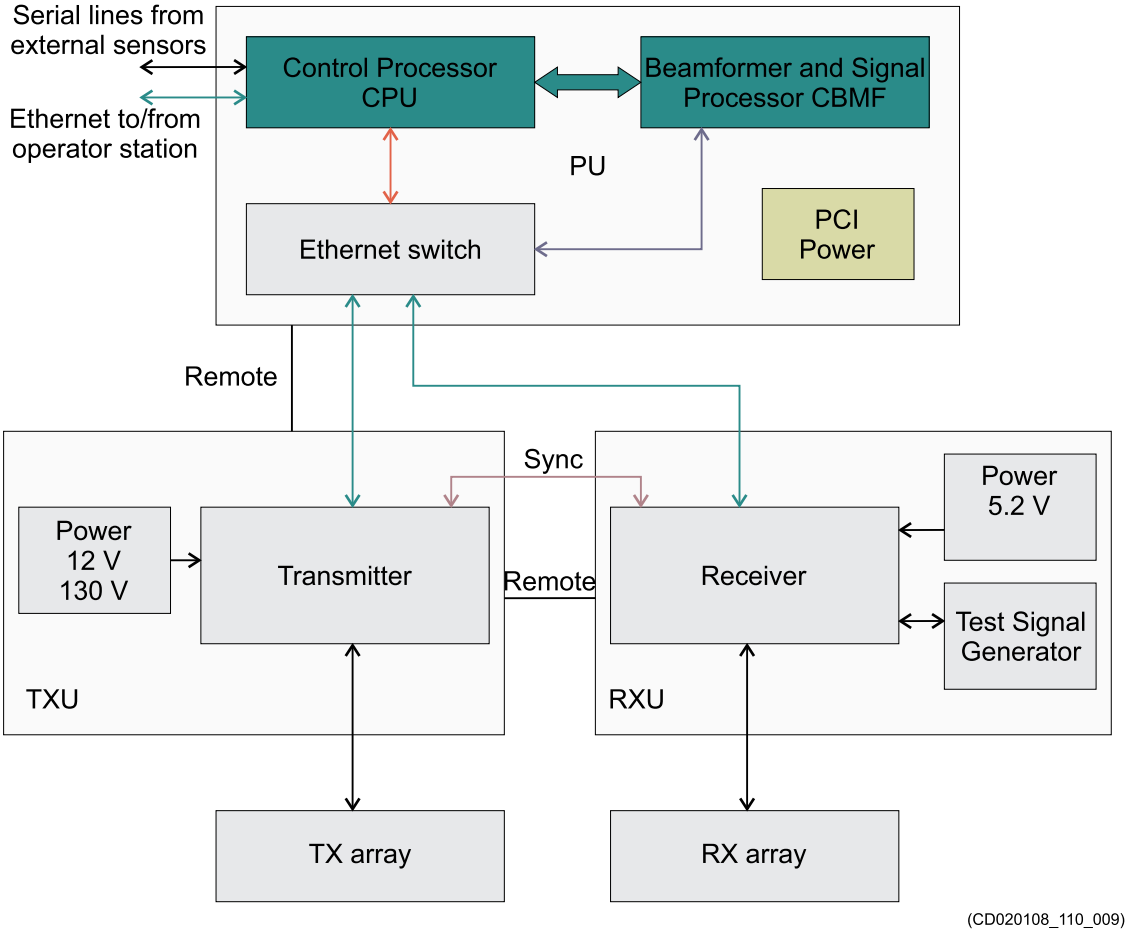


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

CBMF-CPU link

Checks the parallel bus interface between the CBMF board and the CPU board.

This test checks CBMF board(s), Ethernet connection and the parallel bus interface between the CBMF board(s) and the CPU circuit board. A large set of known data is transferred from the CPU unit on Ethernet via CBMF back to the CPU board. The data received is checked by the CPU board.

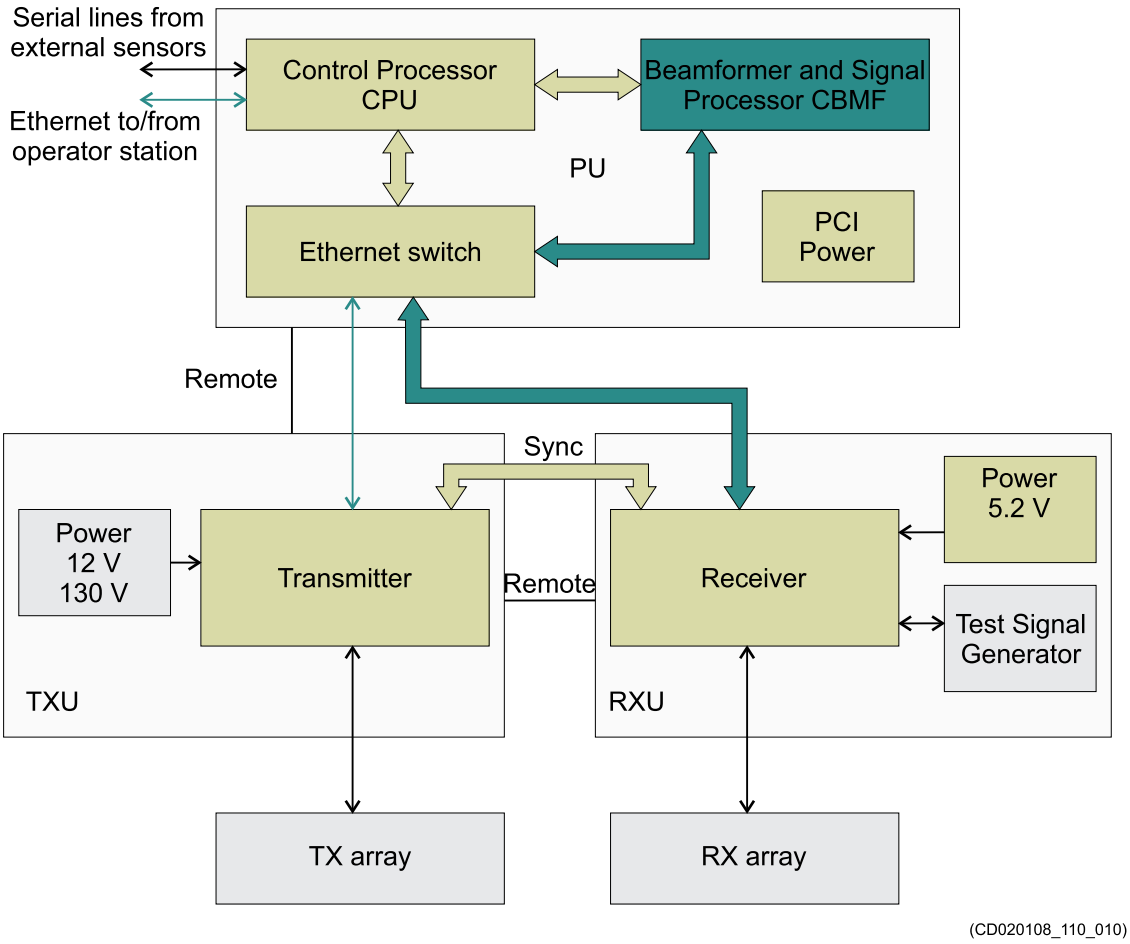


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

RX-CBMF link

This test checks the GBit interface between the RX unit and the CBMF boards.

A large set of known data is transferred from RX unit via CBMF to the CPU board on parallel bus. The data received is checked by the CPU board.

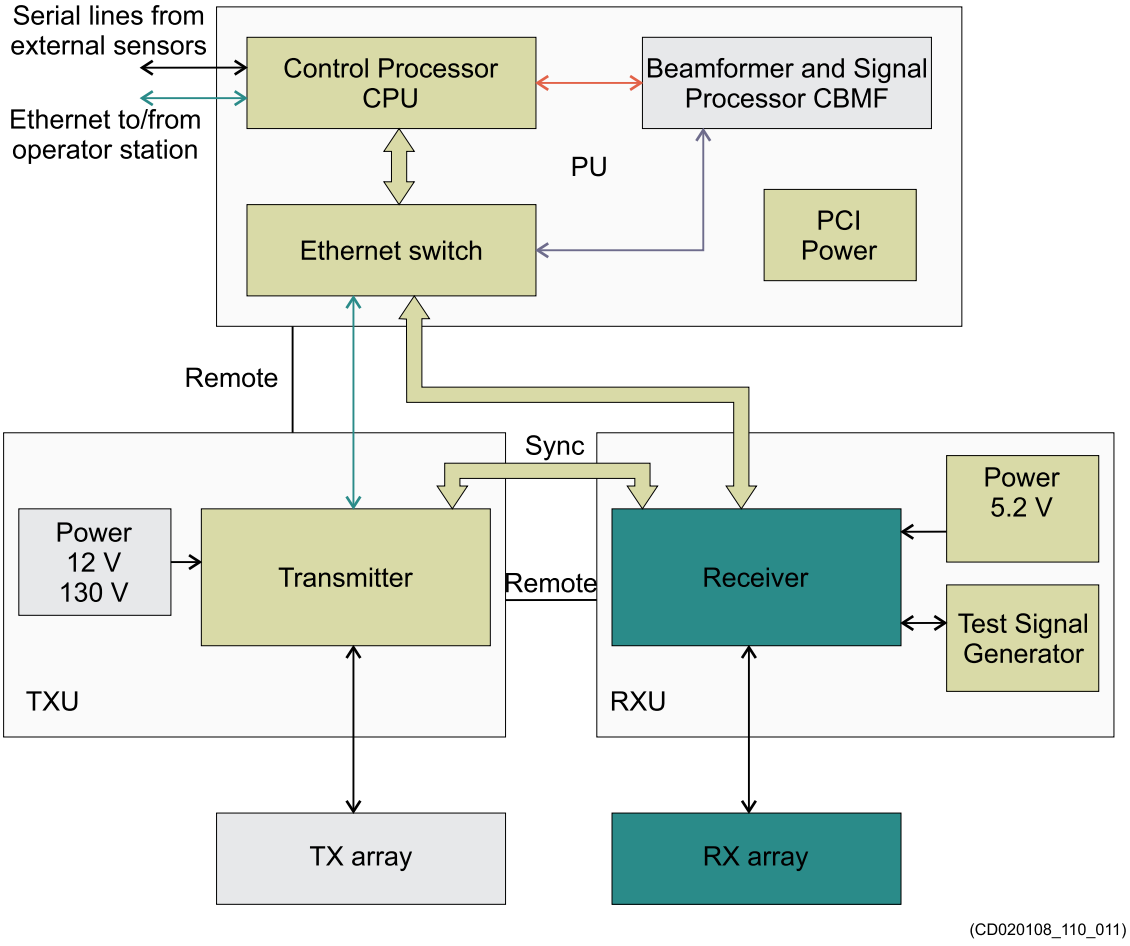


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

RX channels

Checks the RX channels including transducers by injecting a test signal at receiver input.

The Receiver Unit has a programmable signal generator board that is used to inject a test signal at the preamplifier inputs in the Receiver Unit. The BIST report displays the measured RX transducer impedance for all RX channels.

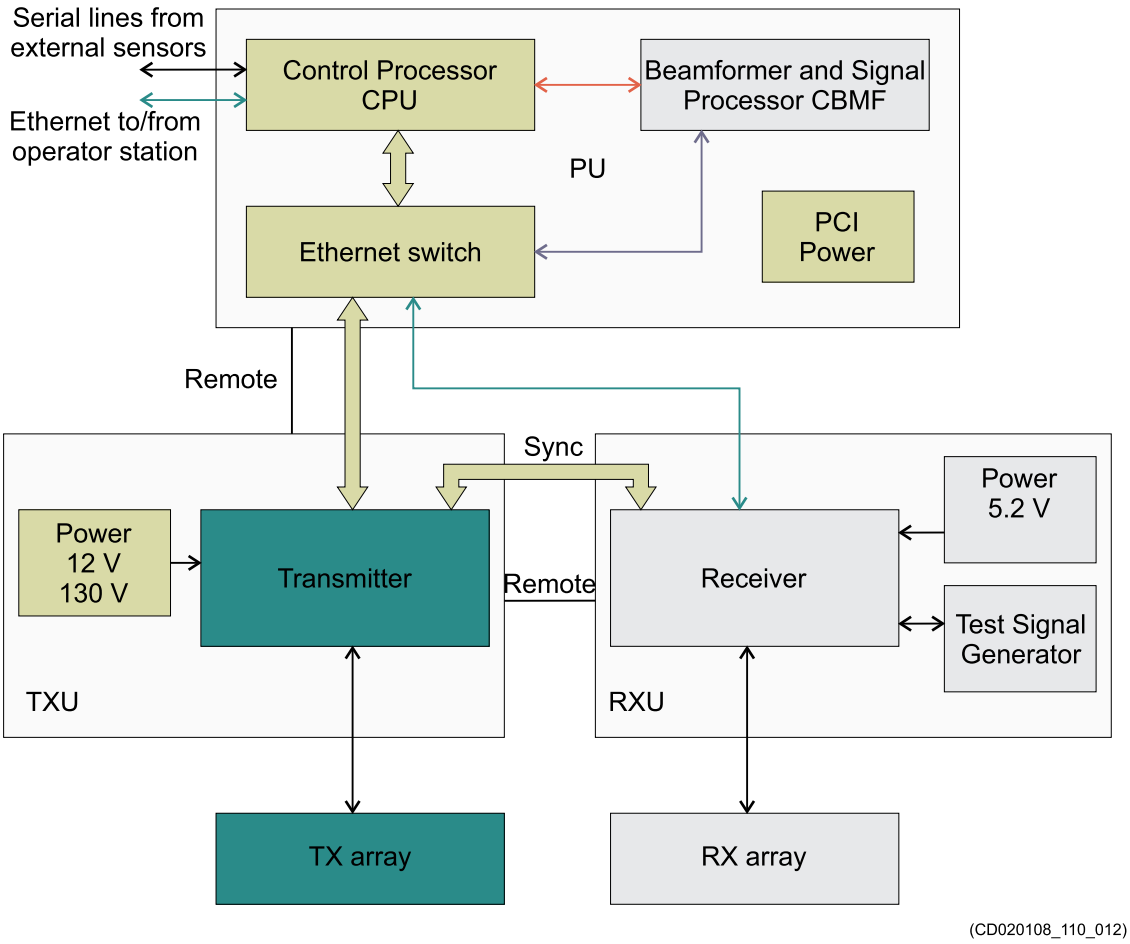


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

TX channels

Checks all TX channels including the transducers.

This test checks the impedance of all TX elements. This is done by measuring the voltage and current used by all individual transmitters.

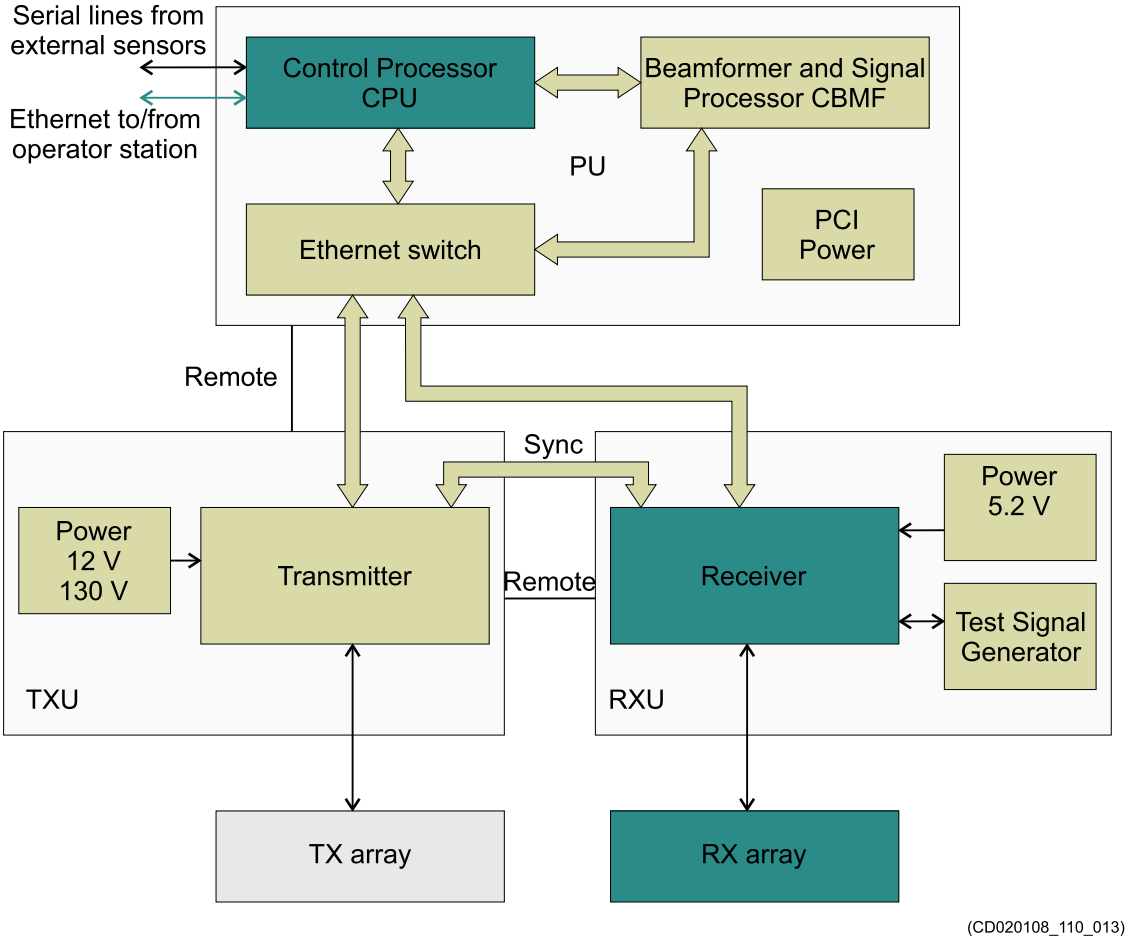


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

RX noise level

Checks the isotropic spectral noise level.

This test measures the average isotropic spectral noise level for each receiver channel (in dB rel 1 µPa/Hz) for different frequency bands. The receiver directivity index, the transducer sensitivity and the filter bandwidth is used to convert to isotropic spectral noise level.

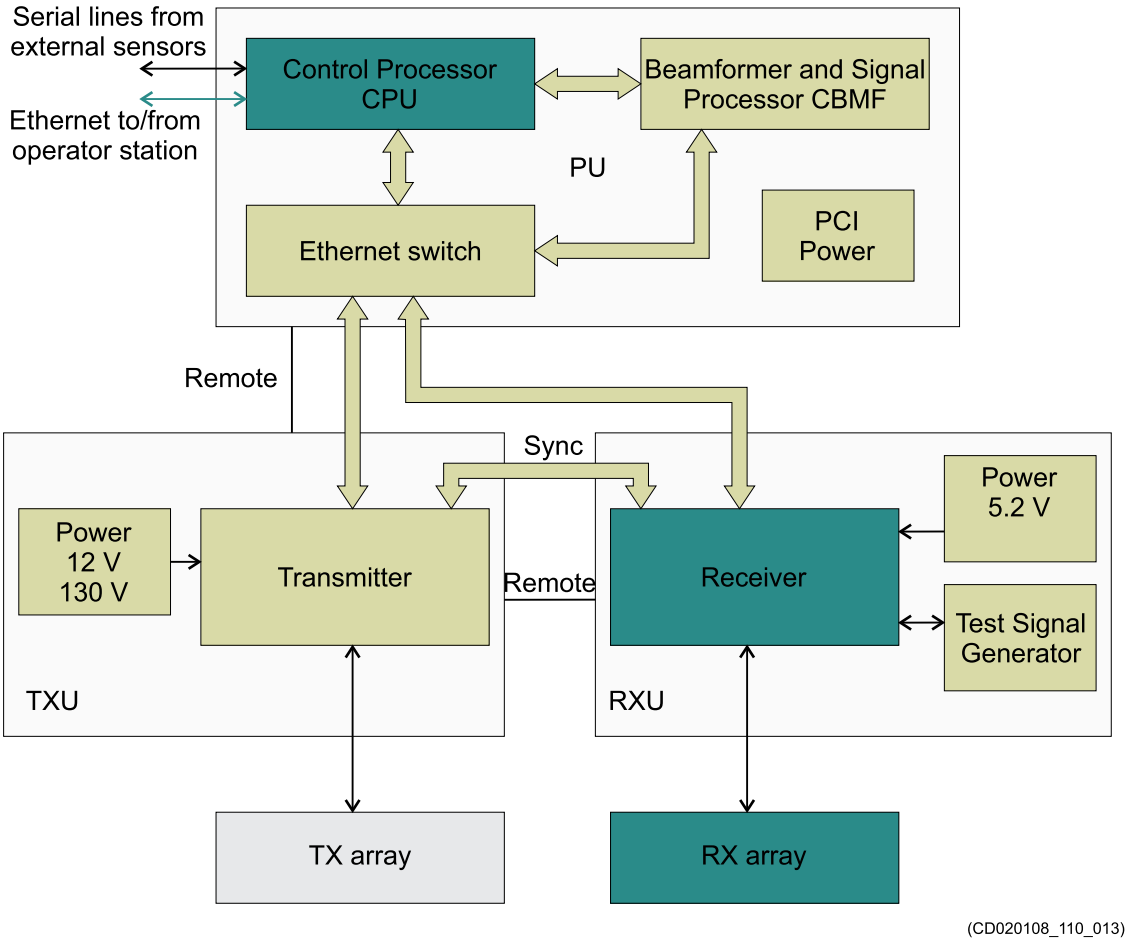


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

RX noise spectrum

Checks the isotropic spectral noise level.

This test measures the isotropic spectral noise level for each receiver channel as done in the RX noise level test. The noise spectrum level is displayed for small frequency bands for groups of 32 channels. In addition the average level for all channels are displayed. This spectrum test can be used to search for external noise sources.

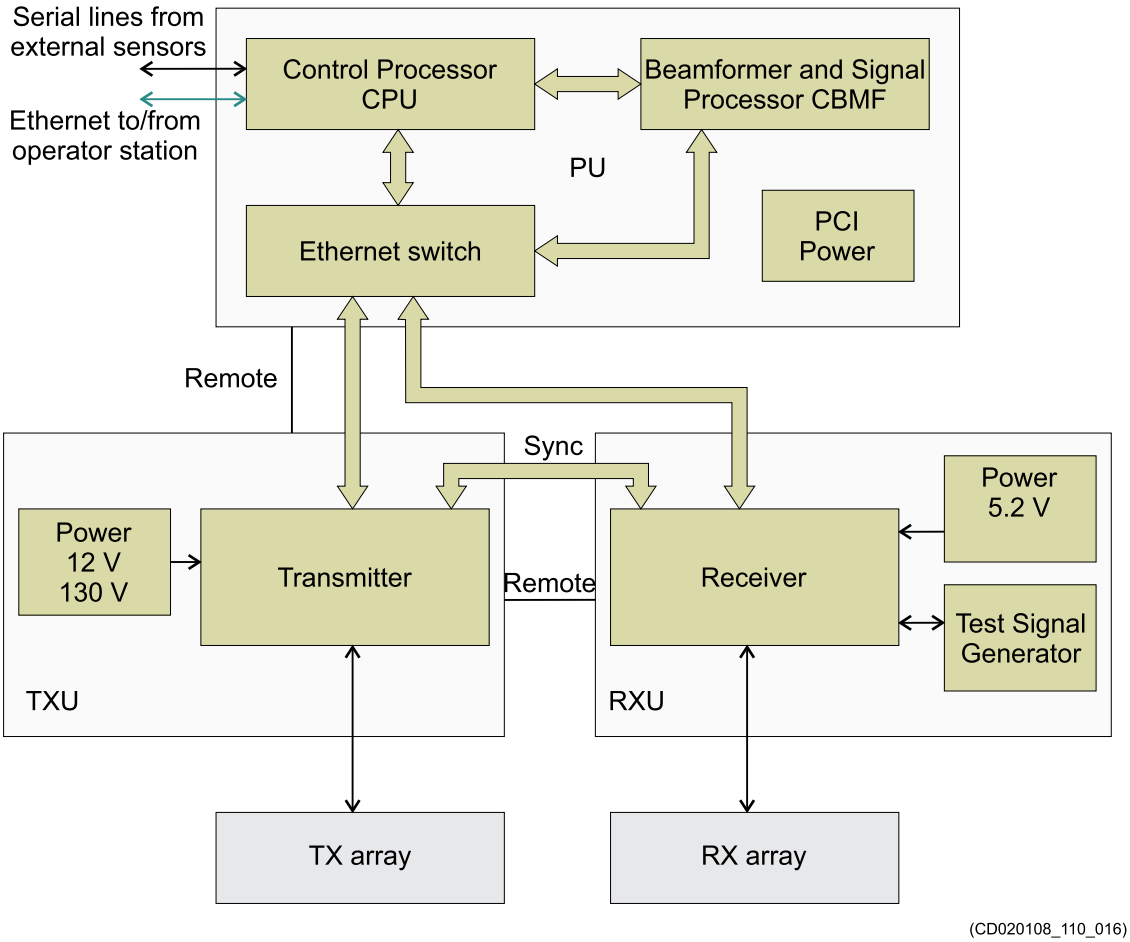


Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

Software date and versions

Checks the software date and versions.

This test presents the software date and versions for the system components.



Dark green modules are to be tested. Light green modules have to function to be able to perform current test.

System information

Generates a status report for the EM 304 MKII system.

This test acquires information needed (serial numbers, software versions, BIST results etc.) for a status report. This report can be sent to the factory to update the EM 304 MKII product database.

Preventive maintenance

Topics

Inspecting and cleaning the transducer face

Marine growth (biological fouling) on the transducer face reduces the EM 304 MKII performance. For this reason, it is important to keep the transducer face clean. Every time your vessel is in dry dock, you must remove the marine growth. At the same time, you must inspect the transducer closely for physical damage.

Prerequisites

The following tools and consumables are required.

- Personal protection
- Fresh water
- A mild synthetic detergent and a plastic brush
- A piece of wood or plastic without sharp corners
- Citric acid (<50%) (only if required)

Context

During normal use, the transducer is subjected to biological fouling. If this marine growth is excessive, it will reduce the performance of the EM 304 MKII system. Whenever opportunity arise, typically when the vessel is dry-docked, the transducer face must be cleaned for shells and other marine growth.

It is important to check the transducer for physical damage. Any cracks, fractures or holes in the red protective coating may result in a water leak, and a leak may cause irreparable damage to the transducer.

A transducer must always be handled as a delicate instrument. Incorrect actions may damage the transducer beyond repair. Observe these transducer handling rules:

- **Do not** activate the transducer when it is out of the water.
- **Do not** handle the transducer roughly. Avoid impacts.
- **Do not** expose the transducer to direct sunlight or excessive heat.
- **Do not** use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer face.
- **Do not** damage the outer protective skin of the transducer face.
- **Do not** lift the transducer by the cables.
- **Do not** step on the transducer cables.
- **Do not** damage the transducer cables. Avoid exposure to sharp objects.

Procedure

1 Allow for sufficient access to clean and inspect the entire surface of the transducer.

2 Remove biological fouling carefully using a plastic brush, a suitable synthetic detergent and fresh water.

Biological material which is strongly rooted in the substrate can be removed carefully with a piece of wood or plastic.

If required, you can also use citric acid. Apply, leave it working for several hours, and rinse thoroughly with fresh water.

Note

Do not *use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer face.*

Do not *damage the outer protective skin of the transducer face.*

3 Allow the transducer surface to dry.

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

If you find suspicious damage, take high resolution photos that show the damage. Contact your dealer or the Kongsberg Maritime support organization for advice.

5 Apply anti-fouling paint as described in the dedicated procedure.

Note

Because some paint types may be aggressive to the polyurethane in the transducer, consult our list of approved paints.

The list can also be found on Kongsberg Maritime (https://www.kongsberg.com/maritime/).

Related topics

Painting the transducer face, page 38
Approved anti-fouling paints, page 41

Painting the transducer face

Marine growth (biological fouling) on the transducer face reduces the EM 304 MKII performance. We recommend that you paint the transducer face immediately after installation, and then again as often as required to maintain the protection.

Prerequisites

The following tools and consumables are required.

- Personal protection
- Fresh water
- A mild synthetic detergent and a plastic brush
- Fine-grade sandpaper (240 inch grit size)
- Primer
- Anti-fouling paint
- Wet film gauge
- Airless spray

Because some paint types may be aggressive to the polyurethane in the transducer, consult our list of approved paints.

Context

The transducer has not been designed with any protection against biological fouling. Anti-fouling paint may therefore be applied to the transducer face. To minimize the negative acoustical effects the layer of anti-fouling paint must be as thin as possible.

Note

The anti-fouling paint will reduce the acoustical performance of the transducer. The surface roughness of the transducer substrate and the thickness of the paint may also influence the performance. Kongsberg Maritime cannot be held responsible for any negative consequences of the anti-fouling paint.

Observe the relevant instructions and safety information provided by the paint manufacturer.

Procedure

1 Clean the transducer thoroughly.

   Make sure that you remove all oil grease residues, as well as salt and other contamination.

2 Allow the transducer surface to dry.

3 Abrade the transducer surface using a sanding paper with 240 inch grit size.

   Do not exceed a surface roughness (R_{max}) of 35 microns as this can influence the EM 304 MKII performance.

4 Remove all dust.

5 Apply the primer, and let it dry.

6 Apply the paint.

   Observe the instructions provided by the paint manufacturer. Use airless spray. Apply the minimum specified film thickness per coat and for the complete layer. It is not possible to measure dry film thickness on transducer surface. You must therefore use a wet film gauge to frequently measure the paint thickness.

   Note

   We strongly recommend that you do not use a paintbrush and/or a roller.

7 Allow the paint to dry.

Further requirements

The contractor or shipyard must keep a daily paint log recording all relevant information from the surface treatment.

Related topics

Approved anti-fouling paints, page 41

Inspecting and replacing sacrificial anodes

Anodes are used on various units to prevent metals from corroding in salt water.

Context

Anodes are constructed of a metal alloy with an active voltage that is greater than the metal of the structure; thus, the anode corrodes before the material it is protecting. The three main alloys used are magnesium, aluminium, and zinc.

The sacrificial anodes must be inspected every time the vessel is in dry dock. Replace the anodes if they are damaged or severely corroded.

Procedure

1 Inspect all anodes for damage and corrosion.

2 Loosen the mounting screws and remove the anode.

3 Clean the new anode and mounting surface using Isopropyl alcohol on a soft cloth or paper wipe.

4 Grease the mounting screws and threads with Aqua Shield or Molykote P-40 paste.

5 Mount the new anode using the same screws. Make sure there is good electrical contact with the unit.

Approved anti-fouling paints

This is our list of approved antifouling paints for all transducer types. Always refer to the manufacturer's documentation and data sheets for a complete procedure and for relevant safety information.

Important

Do not paint the transducer with traditional hull plating paint. Use only the correct type of approved paint specified.

Do not use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer face.

Jotun

- **Manufacturer**: Jotun
- **Address:** P.O.Box 2021, N-3248 Sandefjord, Norway
- **Manufacturer's website**: http://www.jotun.com

Products :

- SeaQuantum Ultra S
  - **Primer**: Safeguard Universal ES

    Apply 80 µm wet film thickness (50 µm dry film thickness).
  - **Paint**: SeaQuantum Ultra S

    Apply 250 µm wet film thickness (125 µm dry film thickness).
- Seaforce 200 AV
  - **Primer**: Safeguard Universal ES AV

    Apply 70 µm wet film thickness (50 µm dry film thickness).
  - **Paint**: Seaforce 200 AV

    Apply 140 µm wet film thickness (90 µm dry film thickness).

Data sheets and application guides can be downloaded from:

http://www.jotun.com/ww/en/b2b/technical-info/tds/index.aspx

International Marine Coatings

- **Manufacturer**: International Marine Coatings
- **Address:** Stoneygate Lane, Felling, Gateshead, Tyne & Wear, NE10 0JY United Kingdom
- **Manufacturer's website**: www.international-marine.com

Products:

- Intersleek 1100SR
  - **Primer**: Intersleek 737

    Apply 50 µm dry film thickness.
  - **Paint**: Intersleek 1100SR

    Apply 150 µm dry film thickness.
- Intersmooth 7465Si SPC
  - **Primer**: Intergard 269

    Apply 40 µm dry film thickness.
  - **Paint**: Intersmooth 7465Si SPC

    Apply 100 µm dry film thickness.

The list can also be found on
Kongsberg Maritime (https://www.kongsberg.com/maritime/).

- **Painting instructions - Kongsberg echo sounder transducers**: 420527

Related topics

Inspecting and cleaning the transducer face, page 36
Painting the transducer face, page 38

Parts replacement

Topics

Tools and equipment required for parts replacement

In order to safely remove and replace printed circuit boards modules, generic and specific tools are required.

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.

- Screwdrivers (various types and sizes)
- Allen keys (various sizes)
- Cable cutter, knife and/or scissors
- Wire stripper
- Pliers (various types and sizes)
- Spanner (various sizes) (Wrench)
- Tweezers

Note

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

Note

Circuit boards and electronic modules are delicate items. They may work year after year in an advanced product, but then fail due to a small spark of static electricity. For this reason, it is very important that they are properly handled and protected during handling. You must be familiar with the applicable handling precautions. Take all necessary steps to avoid Electrostatic Discharge (ESD).

As a minimum, the following precautions must be taken:

1 For correct and safe handling of printed circuit boards and electronic modules, you need a suitable working area. The working area must be covered by an approved conductive service mat that has a resistance of between 50 kΩ and 2 MΩ, and is connected directly to a reliable earth point via its earthing cord.

2 You - and all other service personnel involved - must wear a wristband in direct contact with the skin. The wristband must be electrically connected to the service mat.

3 Printed circuit boards and electronic modules must be placed on the conductive service mat during installation and maintenance operations.

4 If, for any reason, it is necessary to move the circuit board from the conductive service mat, it must be placed in an approved antistatic transportation container (for example a static shielding bag) before transportation.

5 During installation and servicing, all electrical equipment (for example soldering irons and test equipment) must be earthed.

Important

Check that all the equipment is earthed before power is connected or switched on.

Processing Unit - Parts replacement

Topics

Processing Unit replacement

The complete Processing Unit can be supplied as a spare part. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

The Processing Unit is the central controlling device in the EM multibeam system. It is provided to process the signals to and from the transducer(s).

Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

Removing the Processing Unit, page 48

Installing the Processing Unit, page 49

Removing the Processing Unit

One or two Processing Units can be used in the EM® system. The complete Processing Unit can be supplied as a spare part.

Prerequisites

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for mechanical tasks. This includes different screwdriver types, pliers, adjustable spanners, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

Refer to the detailed information in the *Cable layout and interconnections* chapter.

Procedure

1 Locate the unit you wish to remove.

The Processing Unit is normally mounted in a cabinet, in a rack or placed on a table.

2 Turn off the EM 304 MKII.

3 Disconnect the power cable on the rear side of the unit.

4 Disconnect the cables.

5 Loosen the unit by removing the mounting bolts on both sides.

6 Grab a firm hold of the unit, and pull it straight out.

7 Place the unit on a conductive service mat on your work table.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the Processing Unit

The Processing Unit is designed to be installed in a 19" 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.

Context

Refer to the detailed information in the *Cable layout and interconnections* chapter.

Procedure

1 Grab a firm hold of the unit, and push it straight in.

2 Fasten the unit by securing the mounting bolts on both sides.

3 Connect the power cable on the rear side of the unit.

4 Connect the cables.

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.

Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

CPU board replacement

If a CPU board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

This is a generic photo. The CPU board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

There is one CPU board in the Processing Unit.

Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

Removing the CPU board, page 51

Installing the CPU board, page 52

Removing the CPU board

If a CPU board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Prerequisites

This is a generic photo. The CPU board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

Removal is done by pulling the board straight out of the Processing Unit.

Procedure

1 Turn off the Processing Unit.

2 Disconnect the power cable on the rear side of the unit.

3 Identify the circuit board you wish to remove.

4 Disconnect all relevant cables.

5 Loosen the screws. **(A)**

6 Loosen the circuit board by pushing the two red locking devices on the handles. **(B)**

7 Push the handles outward. **(C)**

8 Grab the handles and pull the circuit board straight out.

9 Place the circuit board on a conductive service mat on your workbench.

Further requirements

To return the circuit board for repair or replacement, follow the relevant handling instructions.

Installing the CPU board

If a CPU board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Prerequisites

This is a generic photo. The CPU board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

A new circuit board must be available.

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. 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.

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handles and push the circuit board straight in.

3 Push the handles inward. **(C)**

4 Tighten the screws. **(A)**

5 Connect the cables.

6 Connect AC mains power.

Further requirements

Once the circuit board has been installed, follow the normal procedure to turn on the EM 304 MKII.

Ethernet switch replacement - Processing Unit

If a VadaTech CP219 Ethernet switch fails to operate, it must be replaced with a new switch. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

The VadaTech CP219 board is used as an Ethernet switch in the EM 304 MKII Processing Unit.

Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

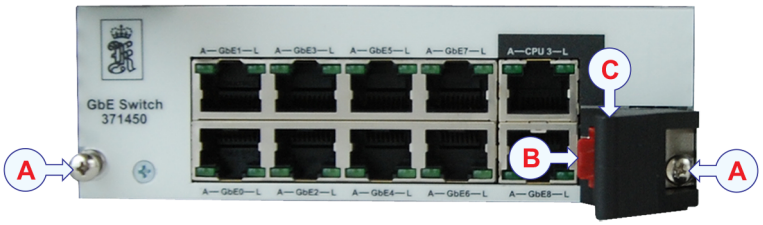
Removing the Ethernet switch - Processing Unit, page 54

Installing the Ethernet switch - Processing Unit, page 55

Removing the Ethernet switch - Processing Unit

If a VadaTech CP219 Ethernet switch fails to operate, it must be replaced with a new switch. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

Removal is done by pulling the board straight out of the Processing Unit.

Procedure

1 Turn off the Processing Unit.

2 Disconnect the power cable on the rear side of the unit.

3 Identify the circuit board you wish to remove.

4 Disconnect all relevant cables.

5 Loosen the screws. **(A)**

6 Loosen the circuit board by pushing the red locking device on the handle. **(B)**

7 Push the handle to the right. **(C)**

8 Grab the handle and pull the circuit board straight out.

9 Place the circuit board on a conductive service mat on your workbench.

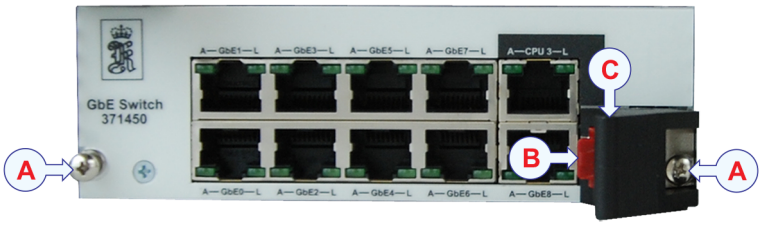
Further requirements

To return the circuit board for repair or replacement, follow the relevant handling instructions.

Installing the Ethernet switch - Processing Unit

If a VadaTech CP219 Ethernet switch fails to operate, it must be replaced with a new switch. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Prerequisites



A new circuit board must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handle and push the circuit board straight in.

3 Push the handle to the left. **(C)**

4 Tighten the screws. **(A)**

5 Connect the cables.

6 Connect AC mains power.

Further requirements

Once the circuit board has been installed, follow the normal procedure to turn on the EM 304 MKII.

CBMF board replacement

If a CBMF board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

The Compact Beamformer (CBMF) board is used by the Processing Unit for beamforming and signal processing purposes.

Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

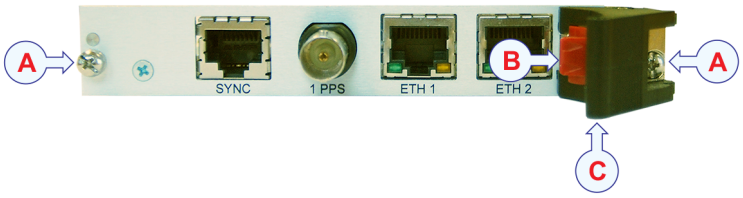
Removing the CBMF board, page 57

Installing the CBMF board, page 58

Removing the CBMF board

If a CBMF board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Prerequisites



This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

There are one or two Compact Beamformer (CBMF) boards in the Processing Unit. The number of CBMF boards depends on the system. Removal is done by pulling the board straight out of the Processing Unit.

Procedure

1 Turn off the Processing Unit.

2 Disconnect the power cable on the rear side of the unit.

3 Identify the circuit board you wish to remove.

4 Disconnect all relevant cables.

5 Loosen the screws. **(A)**

6 Loosen the circuit board by pushing the red locking device on the handle. **(B)**

7 Push the handle to the right. **(C)**

8 Grab the handle and pull the circuit board straight out.

9 Place the circuit board on a conductive service mat on your workbench.

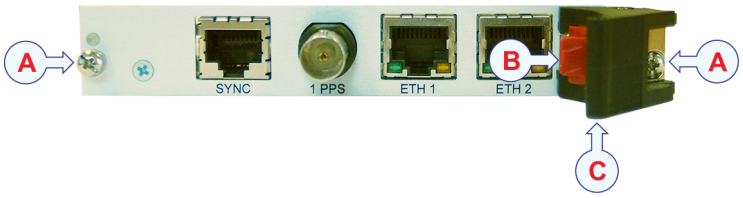
Further requirements

To return the circuit board for repair or replacement, follow the relevant handling instructions.

Installing the CBMF board

If a CBMF board fails to operate, it must be replaced with a new circuit board. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Prerequisites



This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

There are one or two Compact Beamformer (CBMF) boards in the Processing Unit. The number of CBMF boards depends on the system.

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Check the DIP switch settings and correct them if they are wrong.

The switch setting on the CBMF board has to be correct. All the switches on all the CBMF boards in the Processing Unit should be set to OFF. OFF is when they are pushed towards the edge of the circuit board.

3 Grab the handle and push the circuit board straight in.

4 Push the handle to the left. **(C)**

5 Tighten the screws. **(A)**

6 Connect the cables.

7 Connect AC mains power.

Further requirements

Once the circuit board has been installed, follow the normal procedure to turn on the EM 304 MKII.

Related topics

CBMF board configuration, page 134

Fan unit replacement - Processing Unit

If a fan unit fails to operate, it must be replaced with a new module. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

The Processing Unit has two fan units for cooling purposes.

Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

Removing the fan unit, page 62

Installing the fan unit, page 63

Removing the fan unit

If a fan unit fails to operate, it must be replaced with a new module. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

The Processing Unit has two fan units for cooling purposes.

Procedure

1 Turn off the Processing Unit.

2 Disconnect the power cable on the rear side of the unit.

3 Locate the unit you wish to remove.

4 Loosen the screw. **(A)**

5 Grab the handle and pull the unit straight out. **(B)**

6 Place the unit on a conductive service mat on your workbench.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the fan unit

If a fan unit fails to operate, it must be replaced with a new module. All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

The Processing Unit has two fan units for cooling purposes.

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handle and push the unit straight in. **(B)**

3 Tighten the screw. **(A)**

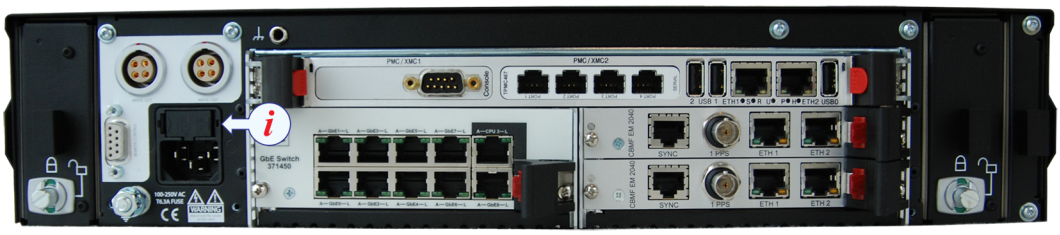
4 Connect AC mains power.

Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

Fuse replacement - PU

The Processing Unit is protected with two ceramic body cartridge fuses on the power inlet. The fuses are replaced if blown.



Note

These procedures will instruct you to handle electronic circuit boards and/or modules. Before doing so, make sure that you are familiar with the applicable handling precautions. Follow the relevant handling procedures for circuit boards and electronic modules.

Topics

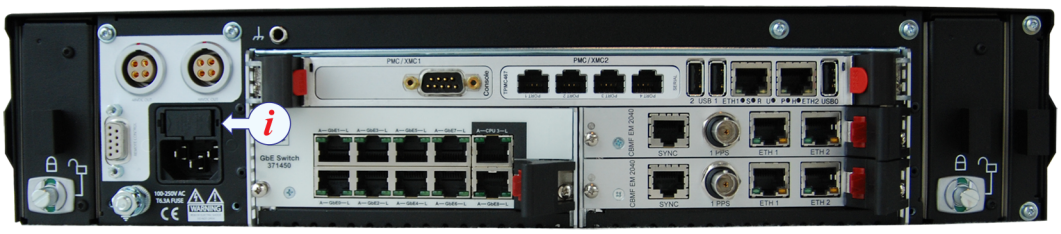
Removing the fuse in the Processing Unit, page 65

Installing the fuse in the Processing Unit, page 66

Removing the fuse in the Processing Unit

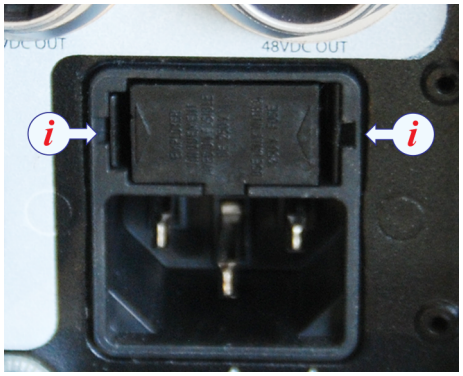
The Processing Unit is protected with two ceramic body cartridge fuses on the power inlet. The fuses are replaced if blown. Follow this procedure to remove the fuses.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Procedure



1 Turn off the Processing Unit.

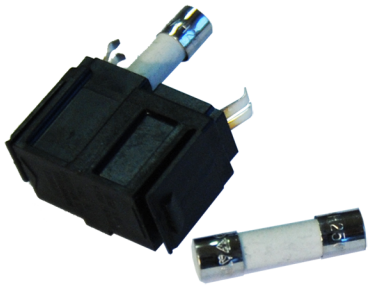
2 Disconnect the power cable on the rear side of the unit.

3 Locate the fuse holder.

4 Insert a small-blade screwdriver into the side of the fuse holder to release the lid catch.

5 Gently pull the fuse holder out.

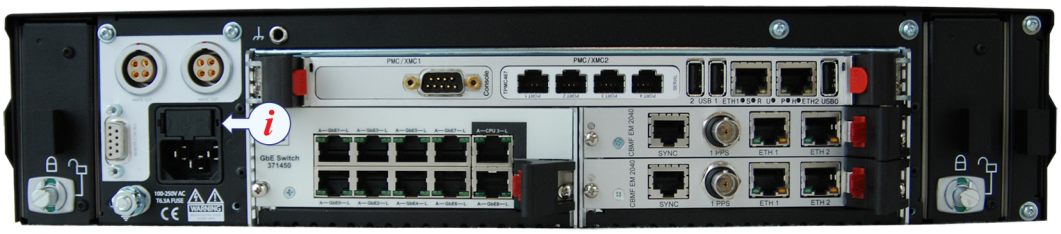
6 Remove the blown fuse from the fuse holder.



Installing the fuse in the Processing Unit

The Processing Unit is protected with two ceramic body cartridge fuses on the power inlet. The fuses are replaced if blown. Follow theis procedure to install the fuses.

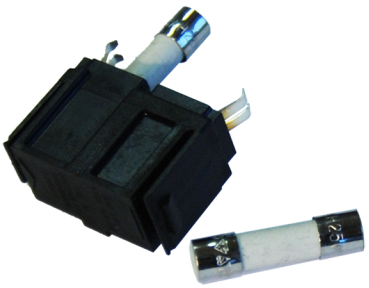
Prerequisites



A new fuse must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Procedure



1 Make sure that all AC mains power has been disconnected.

2 Insert a new fuse into the fuse holder.

3 Push the fuse holder in.

4 Connect the power cable on the rear side of the unit.

5 Turn on the Processing Unit.

Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

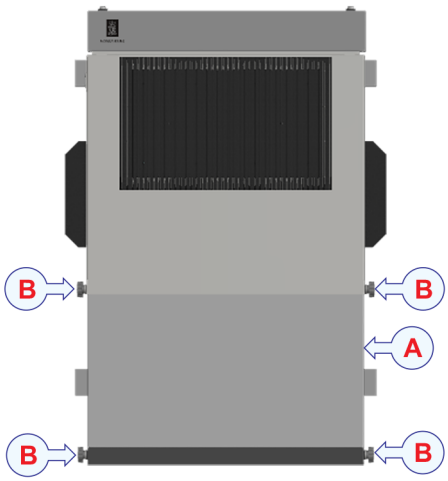
Transmitter Unit - Parts replacement

Topics

TX RIO board replacement

There are up to 12 TX RIO boards in each Transmitter Unit. If a TX RIO board fails, it must be replaced with a new circuit board.

The TX RIO boards are located behind the protection lid at the bottom of the Transmitter Unit.



A *Protection cover*

B *Screws*

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the TX RIO board, page 69

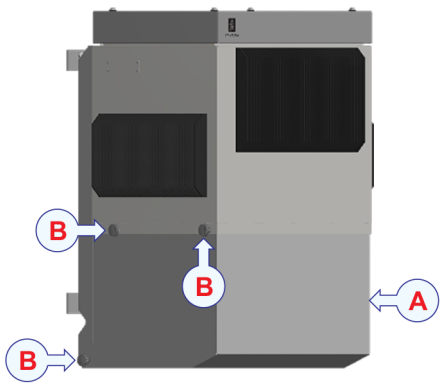
Installing the TX RIO board, page 71

Removing the TX RIO board

If a TX RIO board fails, it must be replaced with a new circuit board. Follow this procedure to remove the TX RIO board.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There are up to 12 TX RIO boards in each Transmitter Unit. The TX RIO boards are located behind the protection lid at the bottom of the Transmitter Unit.

A *Protection cover*

B *Screws*

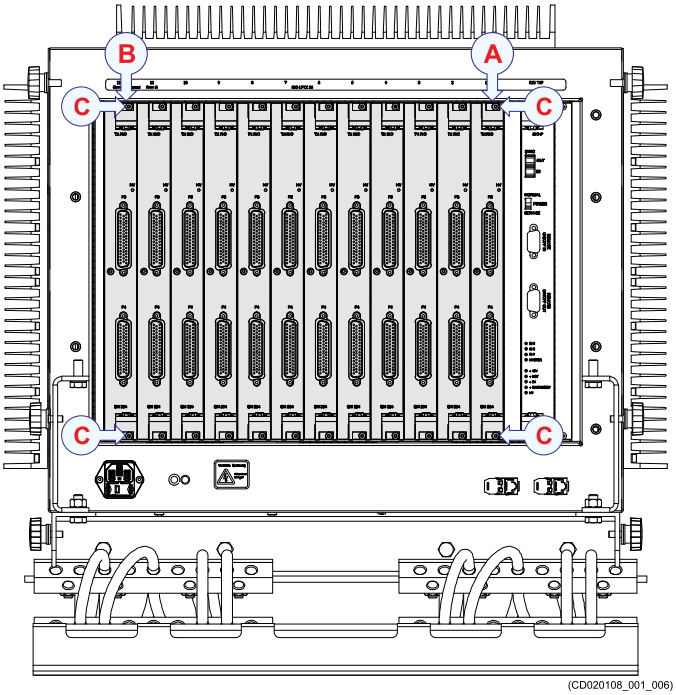
Procedure

1 Turn off the EM 304 MKII system.

2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the protection cover from the Transmitter Unit.

4 Identify the circuit board you wish to remove. There are up to 12 TX RIO boards in each Transmitter Unit.**(A - B)**



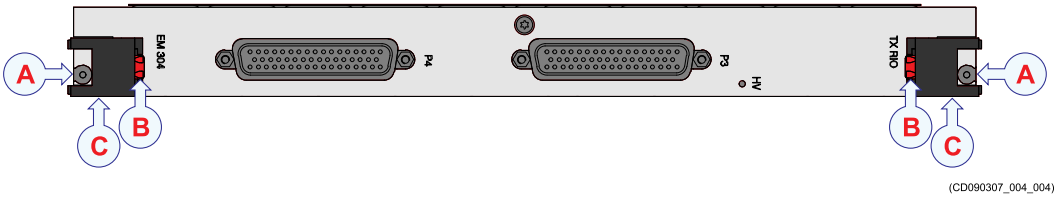
A *TX RIO board 1*

B *TX RIO board 12*

C *Screws*

5 Disconnect all relevant cables.

6 Loosen the screws. **(A)**



7 Loosen the circuit board by pushing the two red locking devices on the handles. **(B)**

8 Push the handles outward. **(C)**

9 Grab the handles and pull the circuit board straight out.

10 Place the unit on a clean and stable workbench.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the TX RIO board

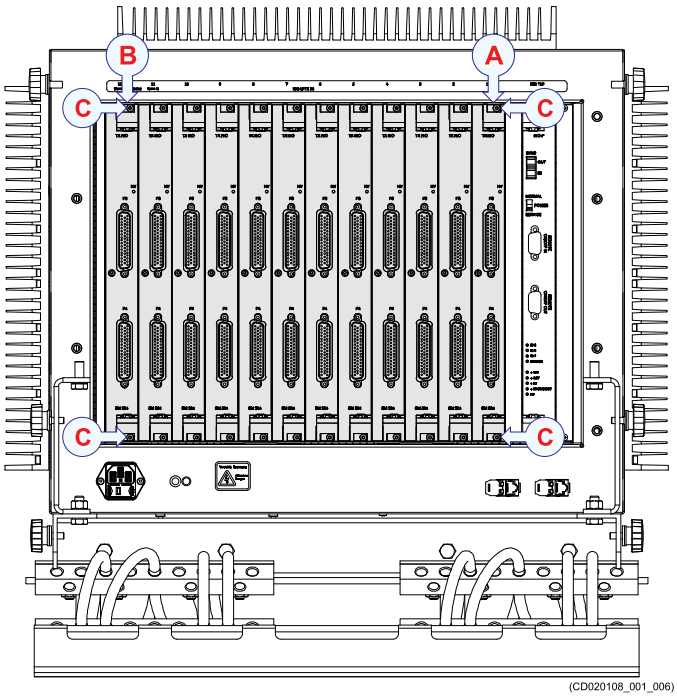
If a TX RIO board fails, it must be replaced with a new circuit board. Follow this procedure to install the TX RIO board.

Prerequisites

The failed circuit board must have been removed.

A new circuit board must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There are up to 12 TX RIO boards in each Transmitter Unit. The TX RIO boards are located behind the protection lid at the bottom of the Transmitter Unit.

A *TX RIO board 1*

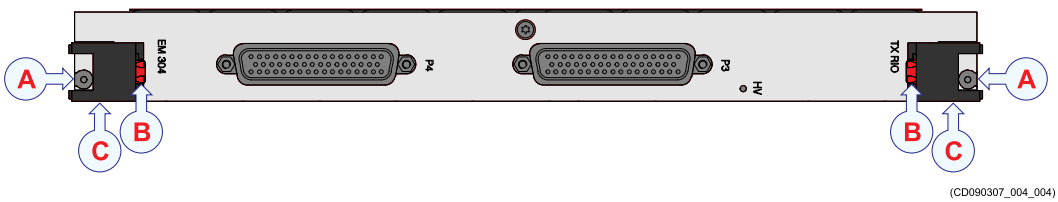
B *TX RIO board 12*

C *Screws*

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handles and push the circuit board straight in.**(C)**

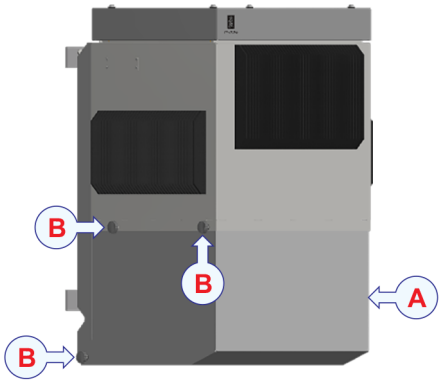


3 Push the handles inward. **(C)**

4 Tighten the screws. **(A)**

5 Connect the cables.

6 Mount protection cover on the Transmitter Unit and tighten the screws.



A *Protection cover*

B *Screws*

7 Connect AC mains power.

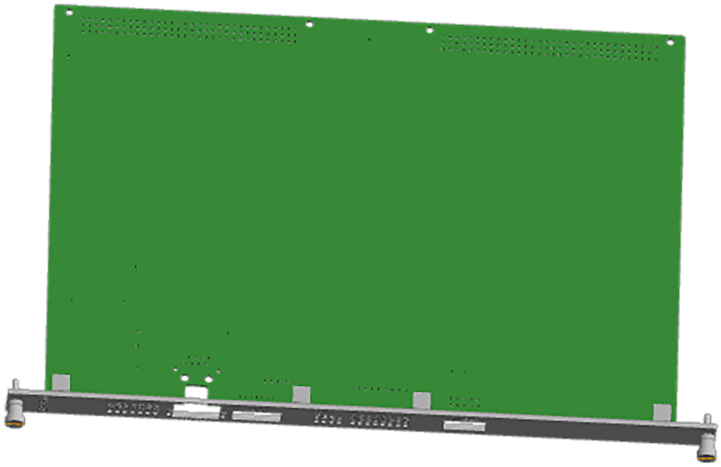
Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

LPTX36 board replacement

There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit. If an LPTX36 board fails, it must be replaced with a new circuit board.

The LPTX36 Transmitter boards are located behind the lid on top of the Transmitter Unit.



All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the LPTX36 board, page 74

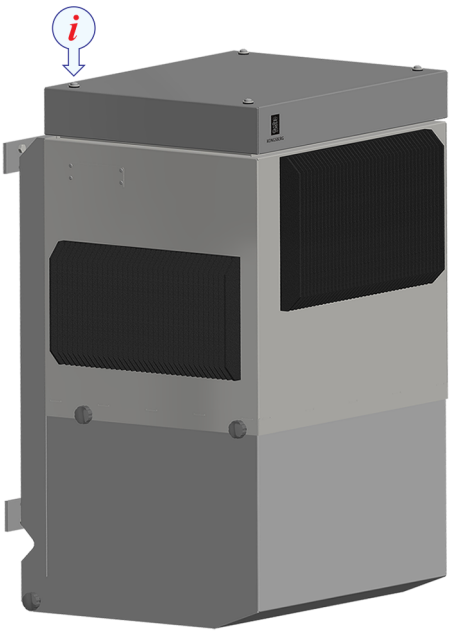
Installing the LPTX36 board, page 77

Removing the LPTX36 board

If an LPTX36 board fails, it must be replaced with a new circuit board. Follow this procedure to remove the LPTX36 board.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit. The LPTX36 Transmitter boards are located behind the lid on top of the Transmitter Unit.

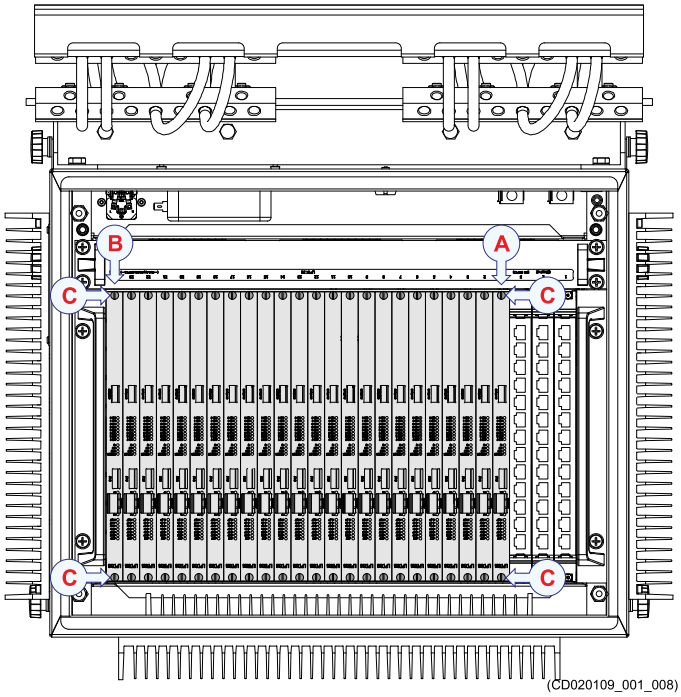
Procedure

1 Turn off the EM 304 MKII system.

2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the lid from the Transmitter Unit.

4 Identify the circuit board you wish to remove. There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit.**(A - B)**



A *LPTX36 board 1*

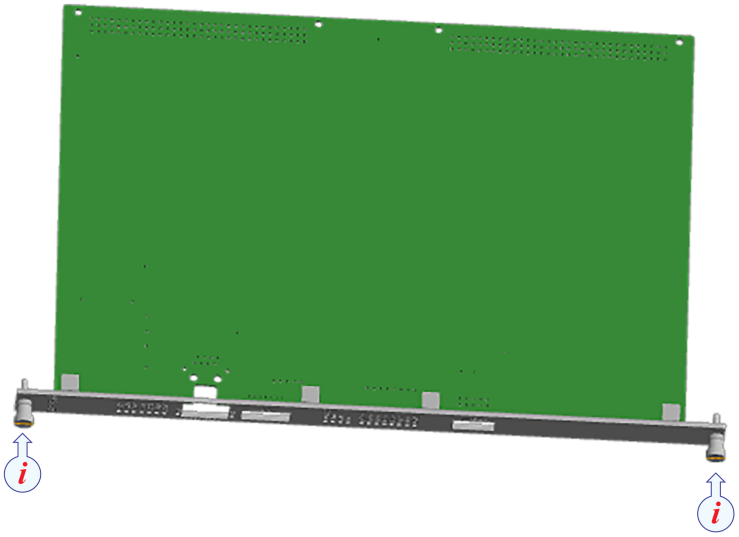
B *LPTX36 board 24*

C *Screws*

5 Disconnect all relevant cables.

6 Loosen the screws. **(C)**

7 Grab the screws and pull the circuit board straight out.



8 Place the unit on a clean and stable workbench.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the LPTX36 board

If an LPTX36 board fails, it must be replaced with a new circuit board. Follow this procedure to install the LPTX36 board.

Prerequisites

A LPTX36 board 1

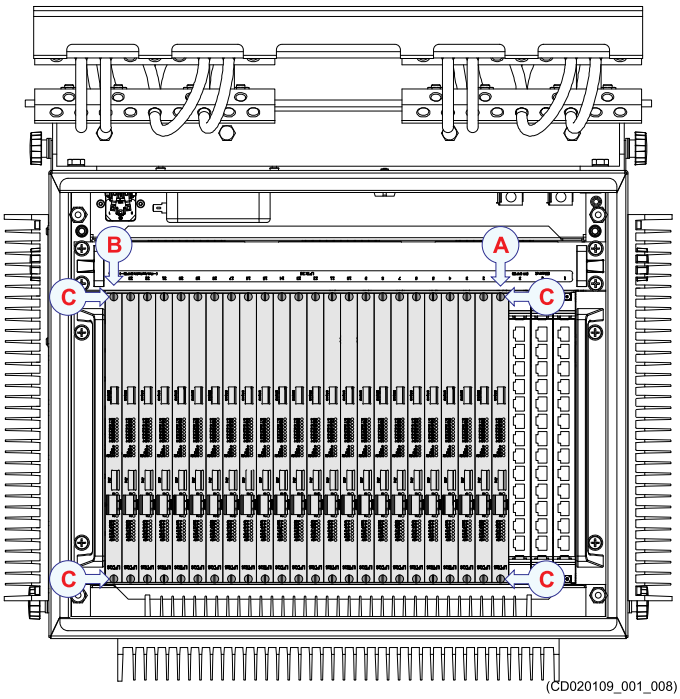
B LPTX36 board 24

C Screws

The failed circuit board must have been removed.

A new circuit board must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

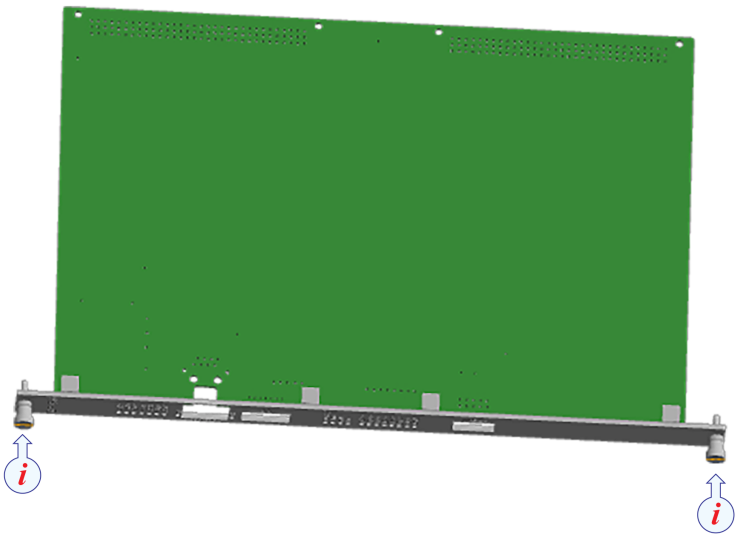


There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit. The LPTX36 Transmitter boards are located behind the lid on top of the Transmitter Unit.

Procedure

1 Make sure that all AC mains power has been disconnected.

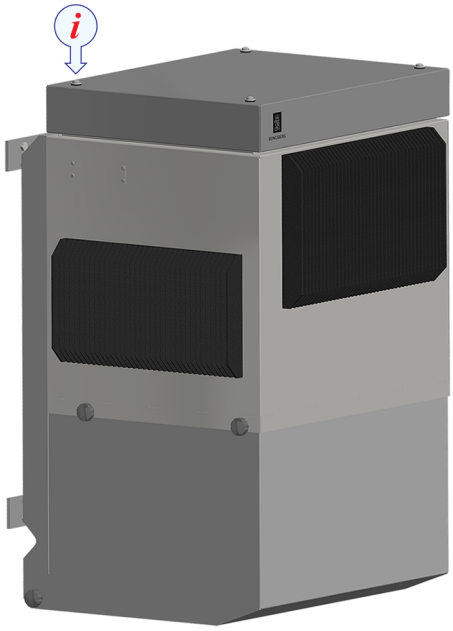
2 Grab the screws and push the circuit board straight in.



3 Tighten the screws. **(C)**

4 Connect the cables.

5 Put the lid on the Transmitter Unit and tighten the screws.



6 Connect AC mains power.

Further requirements

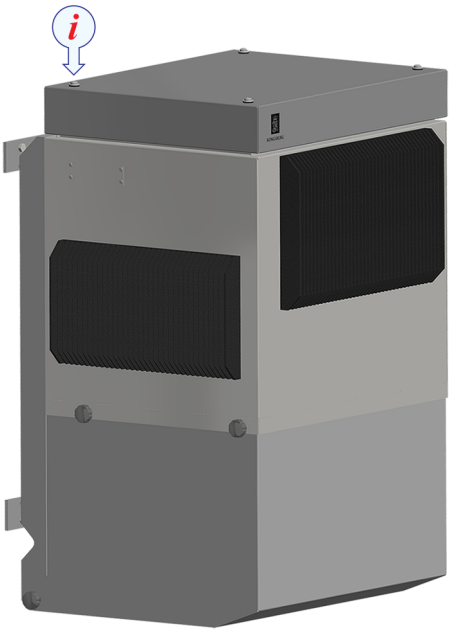
Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

Ethernet switch replacement - Transmitter Unit

There are up to three Ethernet switches in each Transmitter Unit. If an Ethernet switch fails, it must be replaced with a new module.

The Ethernet switches are located behind the lid on top of the Transmitter Unit.

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.



Topics

Removing the Ethernet switch, page 80

Installing the Ethernet switch, page 82

Removing the Ethernet switch

If an Ethernet switch fails, it must be replaced with a new module. Follow this procedure to remove the Ethernet switch.

Prerequisites

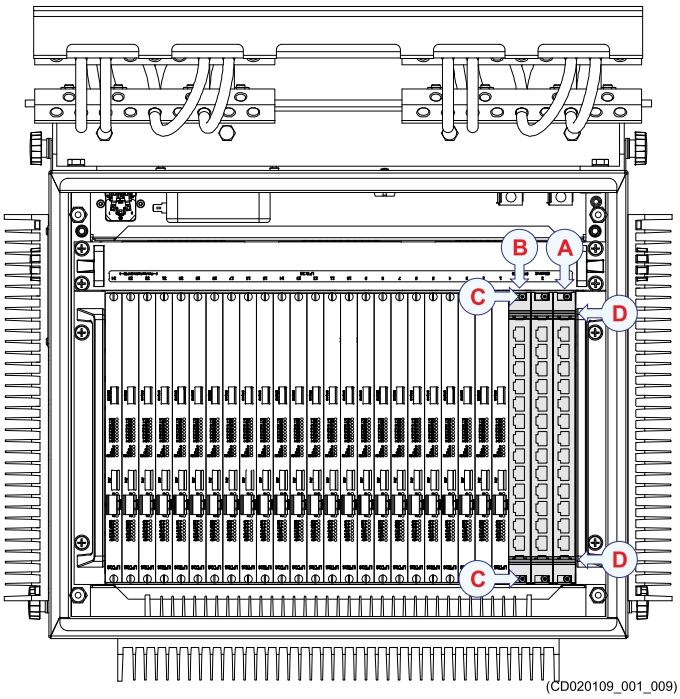
A *Ethernet switch 1*

B *Ethernet switch 3*

C *Screws*

D *Handles*

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There are up to three Ethernet switches in each Transmitter Unit. The Ethernet switches are located behind the lid on top of the Transmitter Unit.

Procedure

1 Turn off the EM 304 MKII system.

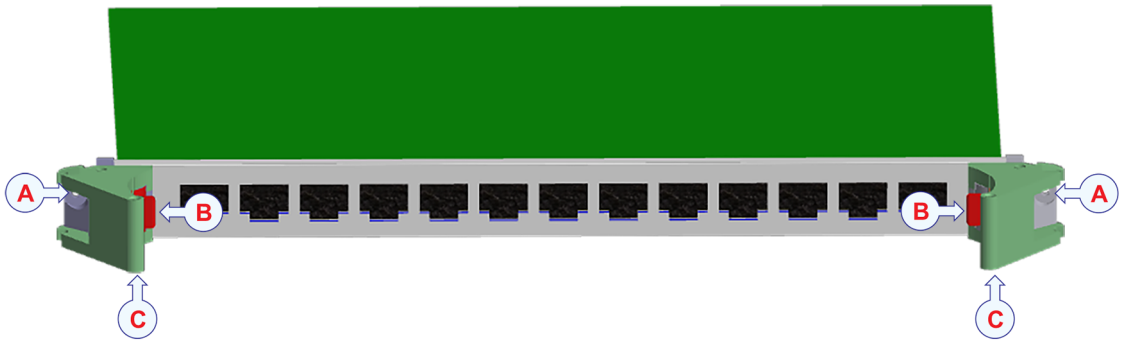
2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the lid from the Transmitter Unit.

4 Identify the circuit board you wish to remove. There are up to three Ethernet switches in each Transmitter Unit.

5 Disconnect all relevant cables.

6 Loosen the screws. **(A)**



7 Loosen the circuit board by pushing the two red locking devices on the handles. **(B)**

8 Push the handles outward. **(C)**

9 Grab the handles and pull the circuit board straight out.

10 Place the unit on a clean and stable workbench.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the Ethernet switch

If an Ethernet switch fails, it must be replaced with a new module. Follow this procedure to install the Ethernet switch.

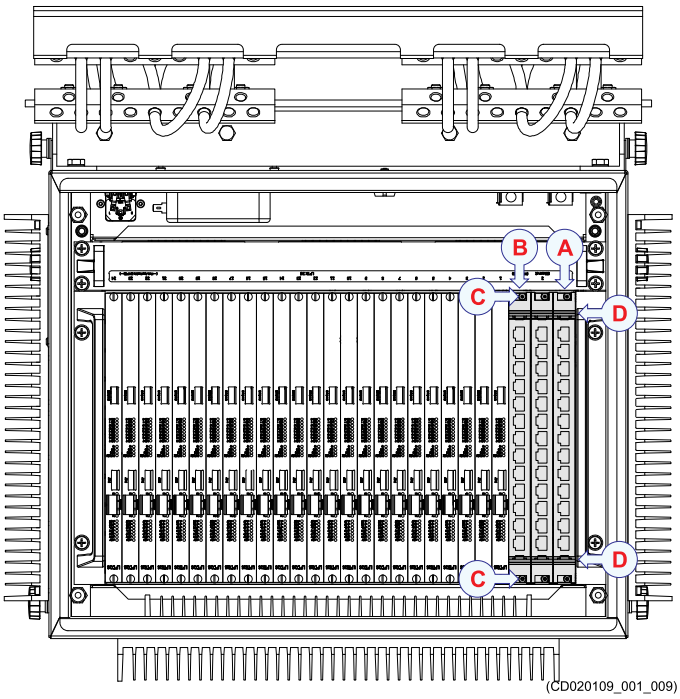
Prerequisites

A *Ethernet switch 1*

B *Ethernet switch 3*

C *Screws*

D *Handles*



The failed circuit board must have been removed.

A new circuit board must be available.

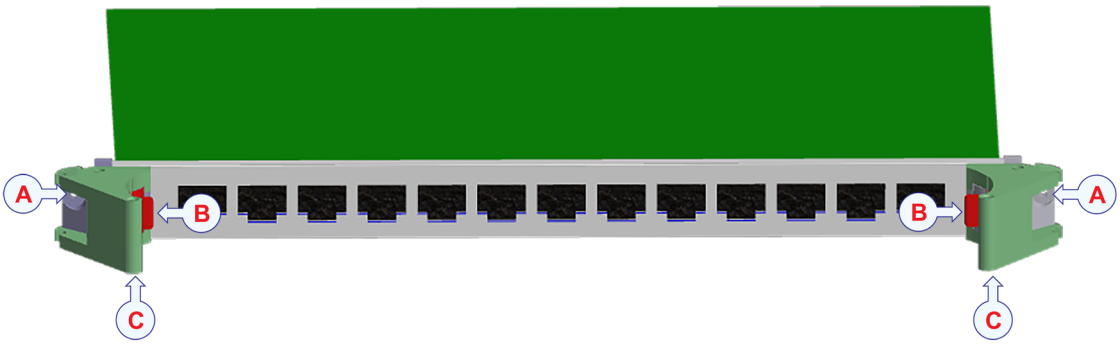
You must be equipped with a standard set of tools. This tool set must comprise the normal tools for electromechanical tasks. This includes different screwdriver types, pliers, adjustable spanners, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

There are up to three Ethernet switches in each Transmitter Unit. The Ethernet switches are located behind the lid on top of the Transmitter Unit.

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handles and push the circuit board straight in. **(C)**

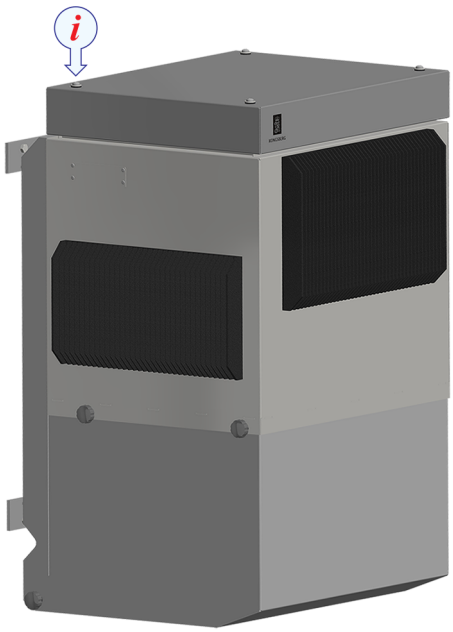


3 Push the handles inward. **(C)**

4 Tighten the screws. **(A)**

5 Connect the cables.

6 Put the lid on the Transmitter Unit and tighten the screws.



7 Connect AC mains power.

Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

Fan unit replacement - Transmitter Unit

Each Transmitter Unit has one fan unit for cooling purposes. If the fan unit fails, it must be replaced with a new unit.

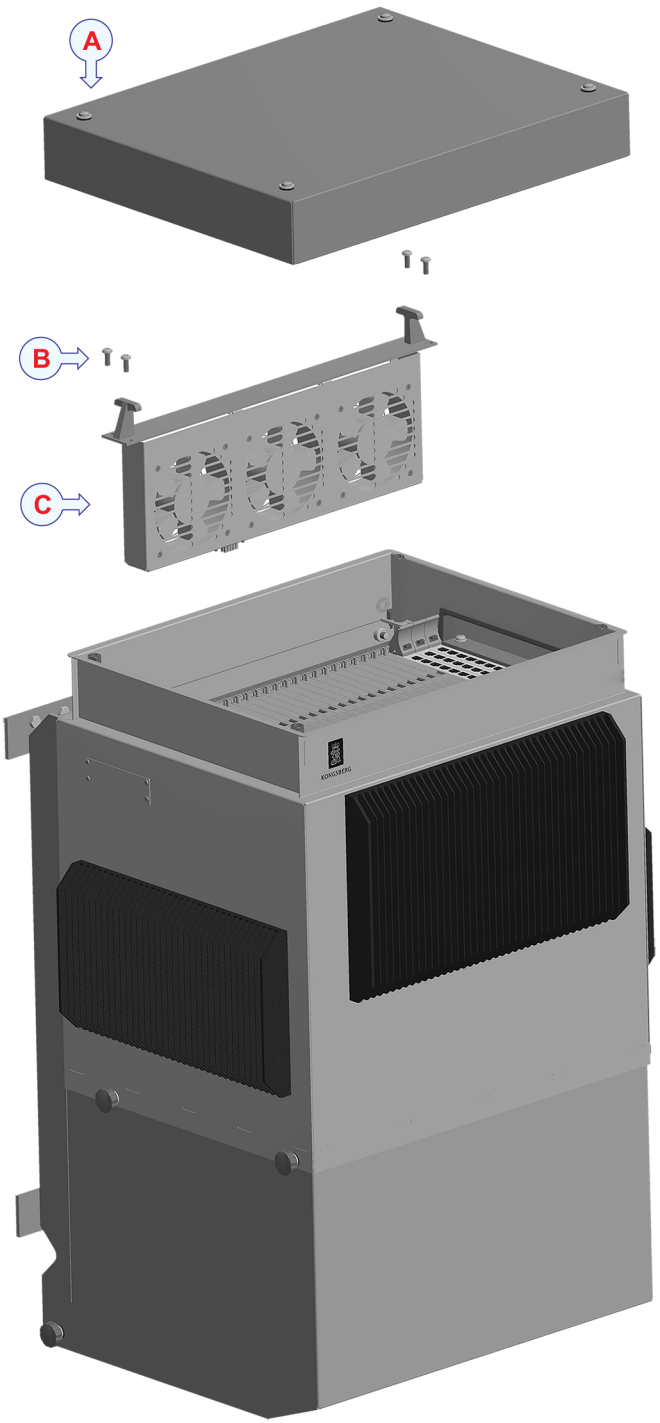
A *Lid with mounting screws*

B *Mounting screws*

C *Fan unit*

The fan is located behind the lid on top of the Transmitter Unit.

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.



Topics

Removing the fan unit, page 85

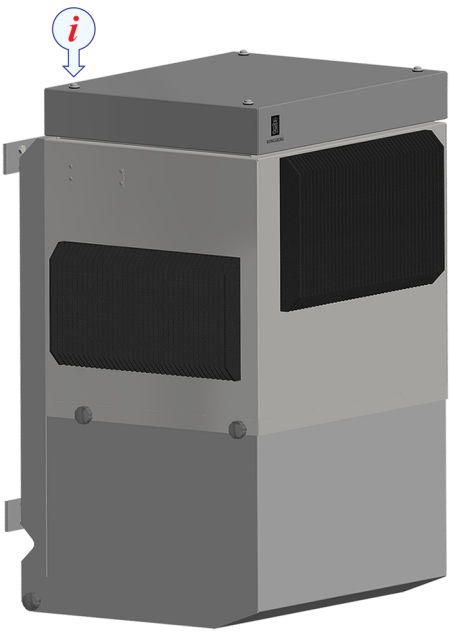
Installing the fan unit, page 87

Removing the fan unit

If the fan unit fails, it must be replaced with a new unit. Follow this procedure to remove the fan unit.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

Each Transmitter Unit has one fan unit for cooling purposes. The fan is located behind the lid on top of the Transmitter Unit.

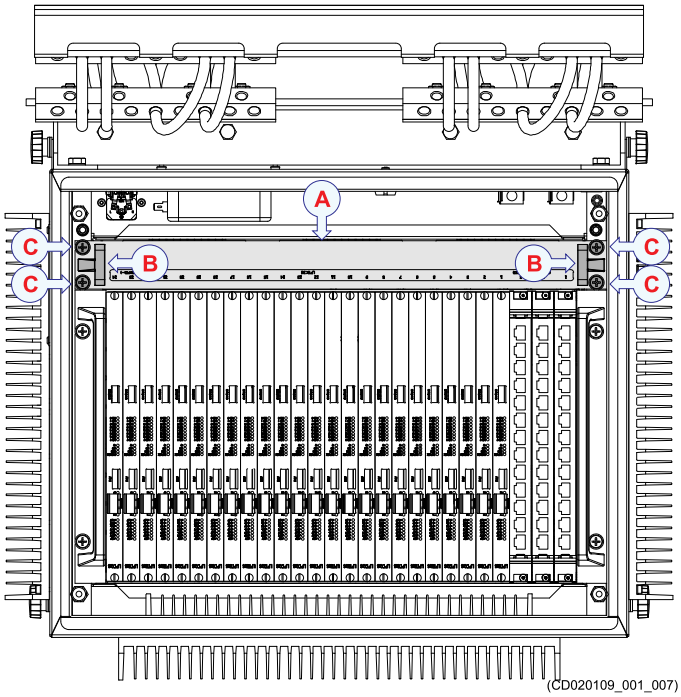
Procedure

1 Turn off the EM 304 MKII system.

2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the lid from the Transmitter Unit.

4 Locate the fan unit. **(A)**



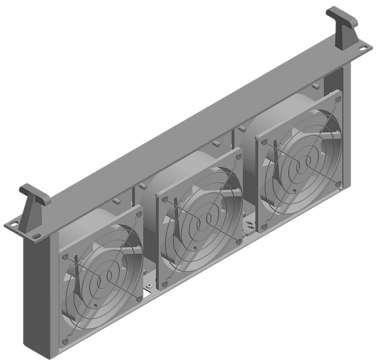
5 Loosen the screws holding the fan unit. **(C)**

6 Grab the handles and pull the fan unit straight out. **(B)**

7 Place the unit on a clean and stable workbench.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.



Installing the fan unit

If the fan unit fails, it must be replaced with a new unit. Follow this procedure to install the fan unit.

Prerequisites

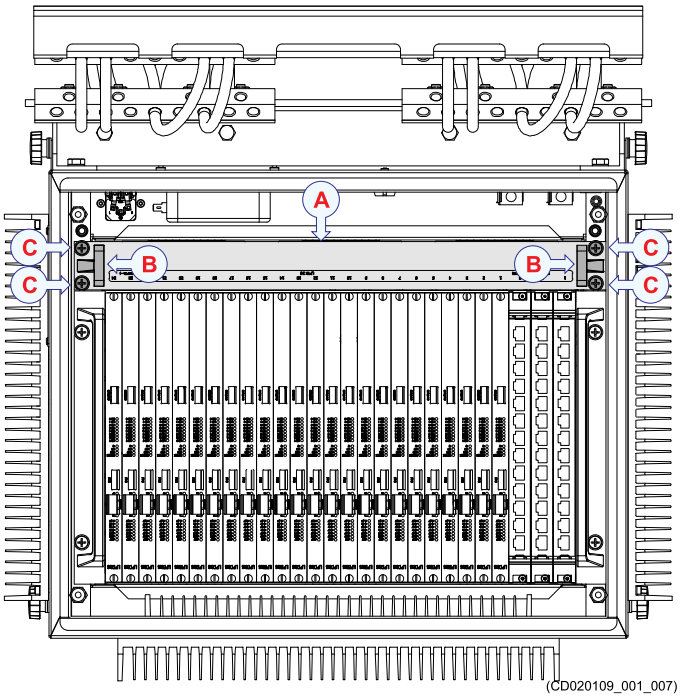
The failed fan unit must have been removed.

A new fan unit must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Context

Each Transmitter Unit has one fan unit for cooling purposes. The fan is located behind the lid on top of the Transmitter Unit.



A *Fan unit*

B *Handles*

C *Mounting screws*

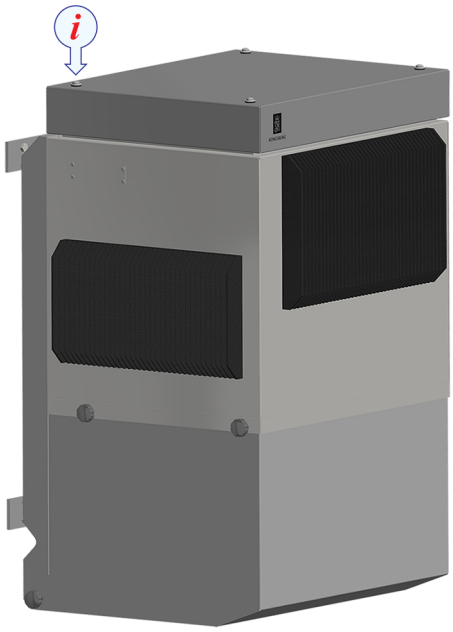
Procedure

1 Make sure that all AC mains power has been disconnected.

2 Grab the handles and push the fan unit straight in. **(B)**

3 Tighten the screws holding the fan unit. **(C)**

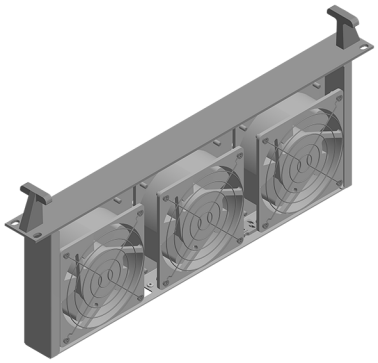
4 Put the lid on the Transmitter Unit and tighten the screws.



5 Connect AC mains power.

Further requirements

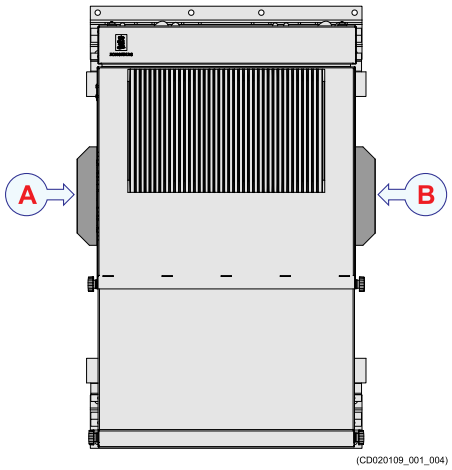
Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.



12V Power supply replacement - Transmitter Unit

There is one 12V power supply in each Transmitter Unit. If the power supply module fails, it must be replaced with a new module.

The power supplies are mounted behind the heat sinks on the sides of the Transmitter Unit.



A *HV Power supply module*

B *12V Power supply module*

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the 12V power supply, page 90

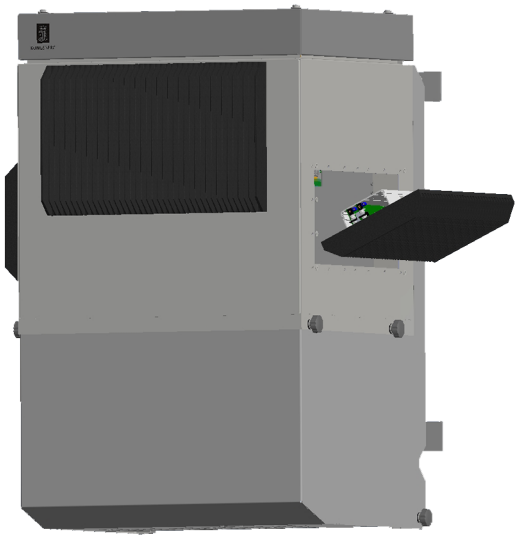
Installing the 12V power supply, page 92

Removing the 12V power supply

If the power supply module fails, it must be replaced with a new module. Follow this procedure to remove the power supply module.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There is one 12V and one HV power supply in each Transmitter Unit. The power supplies are mounted behind the heat sinks on the sides of the Transmitter Unit.

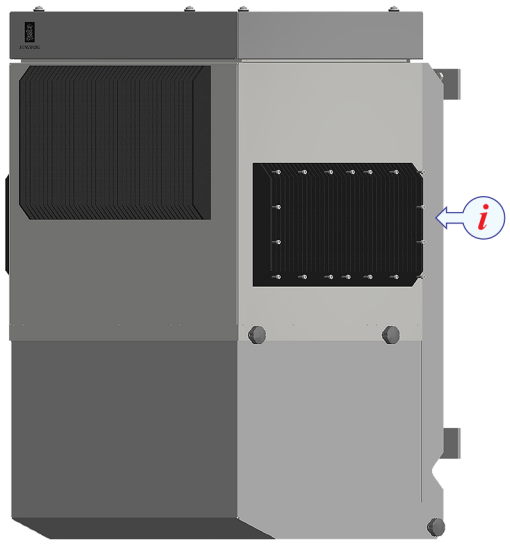
The 12V power is mounted on the right side when the Transmitter Unit is seen from the front.

Procedure

1 Turn off the EM 304 MKII system.

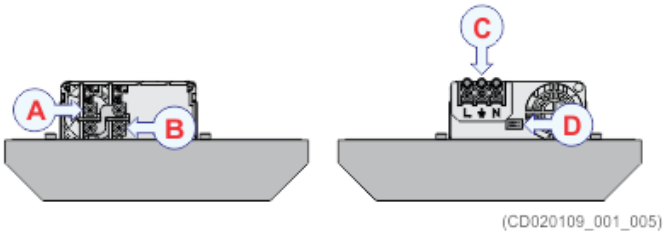
2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the heat sink from the unit.



4 Carefully turn the heat sink around.

5 Disconnect the **AC power** (C) and the **Control and monitoring** (D) cables from the power supply.



A *VDC Out - Red*

B *DC Out Ground - Black*

C *AC power connector*

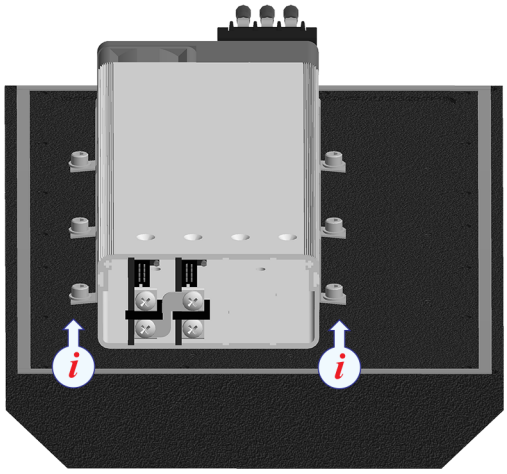
D *Control and monitoring signals*

The cables are connected with plugs or connectors.

6 Disconnect the **VDC Out** (A/B) cable from the Transmitter Unit backplane.

7 Place the heat sink with power supply on a clean and stable workbench.

8 Loosen the screws and remove the power supply unit from the heat sink.



Further requirements

To return the power supply for repair or replacement, follow the relevant handling instructions.

Installing the 12V power supply

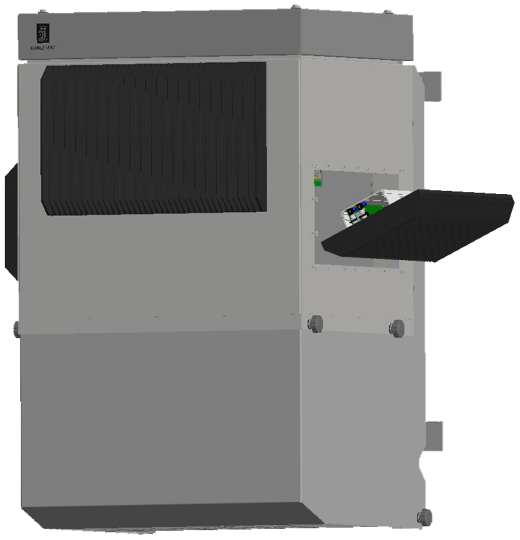
If the power supply module fails, it must be replaced with a new module. Follow this procedure to install the new power supply module.

Prerequisites

The failed power supply module must have been removed.

A new power supply module must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Procedure

1 Make sure that all AC mains power has been disconnected.

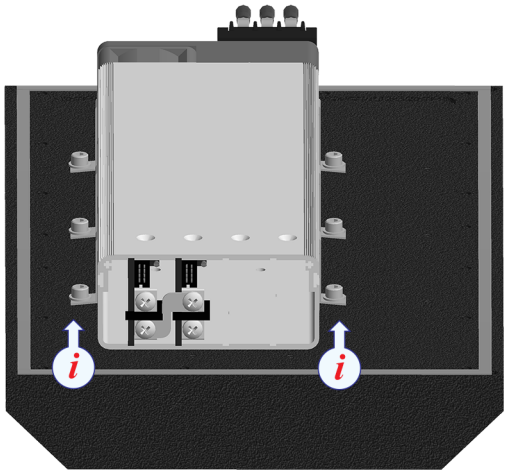
2 Mount the power supply unit on the heat sink.

Note

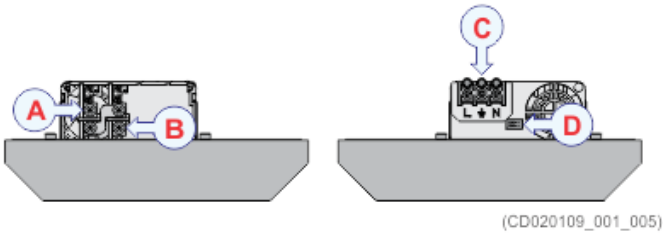
A thin layer of heat sink compound is required between the power supply and the heat sink.

Usually a sufficient amount of heat sink compound is left from the old power supply assembly.

The power supply module is fastened to the heat sink with screws and clips. Use Loctite 243 or similar to secure the screws.



3 Connect the **VDC Out** (A/B) cable from the power supply to the Transmitter Unit backplane.



A *VDC Out - Red*

B *DC Out Ground - Black*

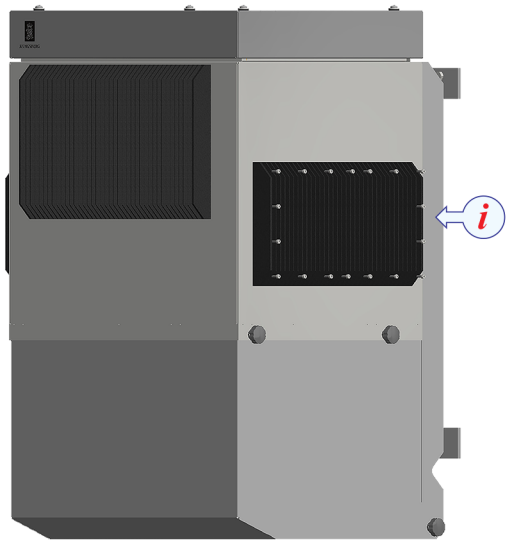
C *AC power connector*

D *Control and monitoring signals*

4 Connect the **AC power** (C) and the **Control and monitoring** (D) cables to the power supply.

5 Mount the heat sink on the unit and tighten the screws.

Use Loctite 243 or similar to secure the screws.



6 Connect AC mains power.

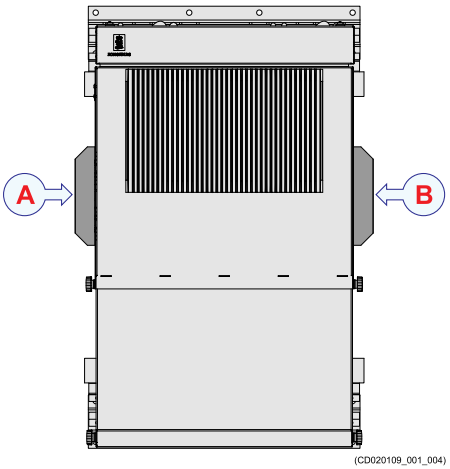
Further requirements

Once the power supply has been installed, follow the normal procedure to turn on the EM 304 MKII.

HV Power supply replacement - Transmitter Unit

There is one HV power supply in each Transmitter Unit. If the power supply module fails, it must be replaced with a new module.

The power supplies are mounted behind the heat sinks on the sides of the Transmitter Unit.



A *HV Power supply module*

B *12V Power supply module*

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the HV power supply, page 96

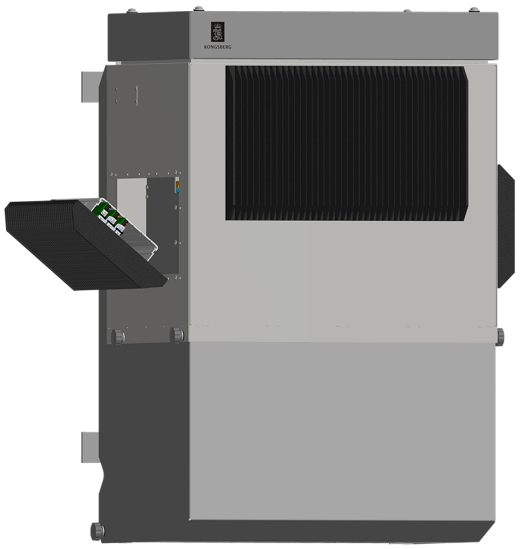
Installing the HV power supply, page 98

Removing the HV power supply

If the power supply module fails, it must be replaced with a new module. Follow this procedure to remove the power supply module.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Context

There is one 12V and one HV power supply in each Transmitter Unit. The power supplies are mounted behind the heat sinks on the sides of the Transmitter Unit.

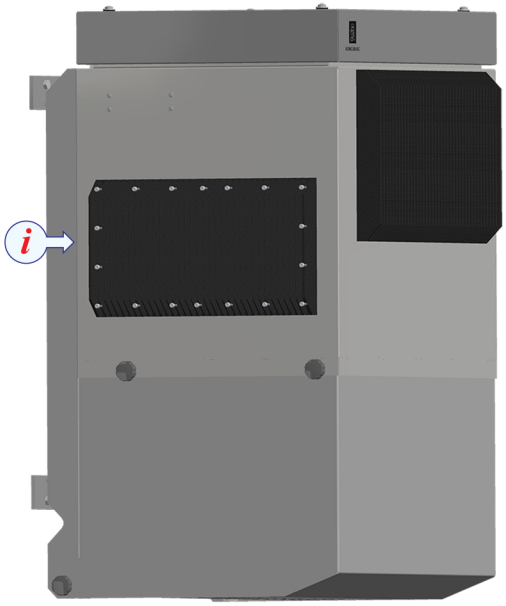
The HV power is mounted on the left side when the Transmitter Unit is seen from the front.

Procedure

1 Turn off the EM 304 MKII system.

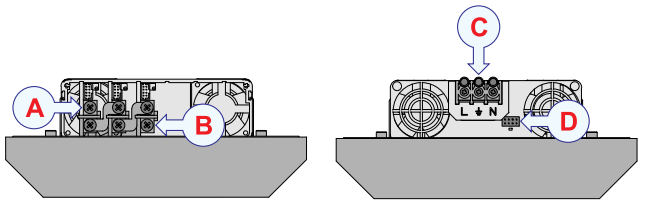
2 Disconnect the power cable from the Transmitter Unit

3 Loosen the mounting screws and remove the heat sink from the unit.



4 Carefully turn the heat sink around.

5 Disconnect the **AC power** (C) and the **Control and monitoring** (D) cables from the power supply.



(CD020109_001_006)

A *VDC Out - Orange*

B *DC Out Ground - Blue*

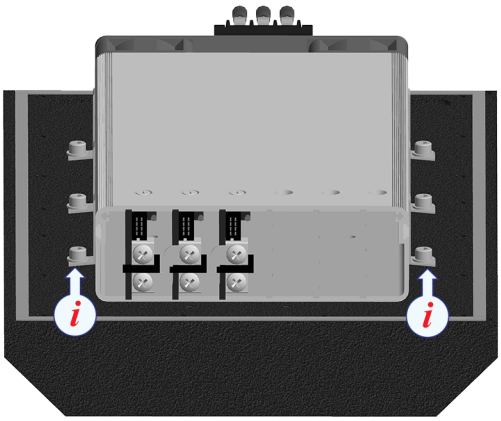
C *AC power connector*

D *Control and monitoring signals*

6 Disconnect the **VDC Out** (A/B) cable from the Transmitter Unit backplane.

7 Place the heat sink with power supply on a clean and stable workbench.

8 Loosen the screws and remove the power supply unit from the heat sink.



Further requirements

To return the power supply for repair or replacement, follow the relevant handling instructions.

Installing the HV power supply

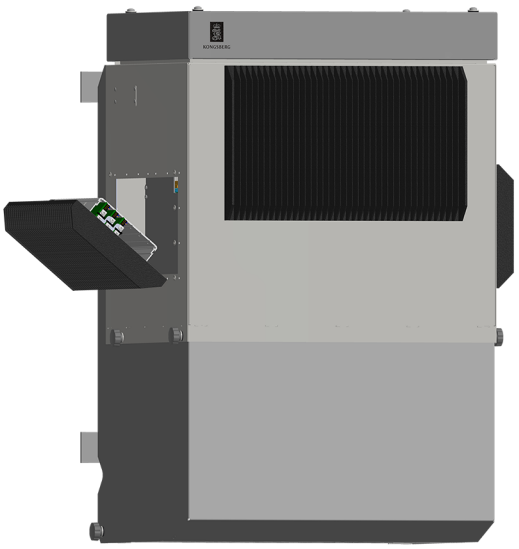
If the power supply module fails, it must be replaced with a new module. Follow this procedure to install the new power supply module.

Prerequisites

The failed power supply module must have been removed.

A new power supply module must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



Procedure

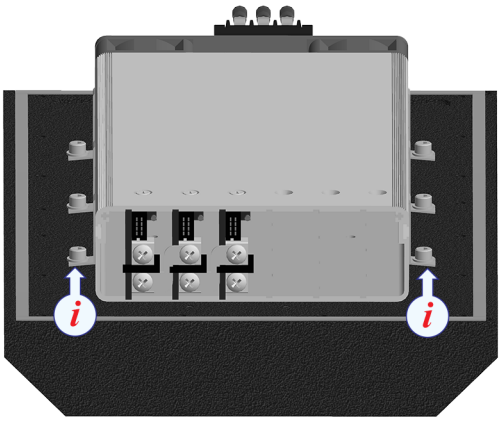
1 Make sure that all AC mains power has been disconnected.

2 Mount the power supply unit on the heat sink.

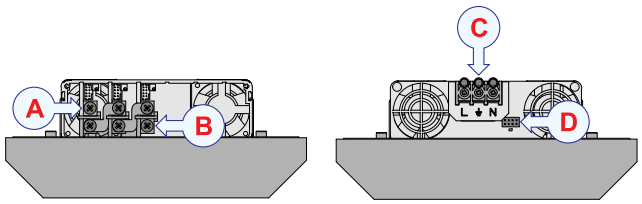
Note

A thin layer of heat sink compound is required between the power supply and the heat sink.

The power supply module is fastened to the heat sink with screws and clips.



3 Connect the **VDC Out** (A/B) cable from the power supply to the Transmitter Unit backplane.



(CD020109_001_006)

A *VDC Out - Orange*

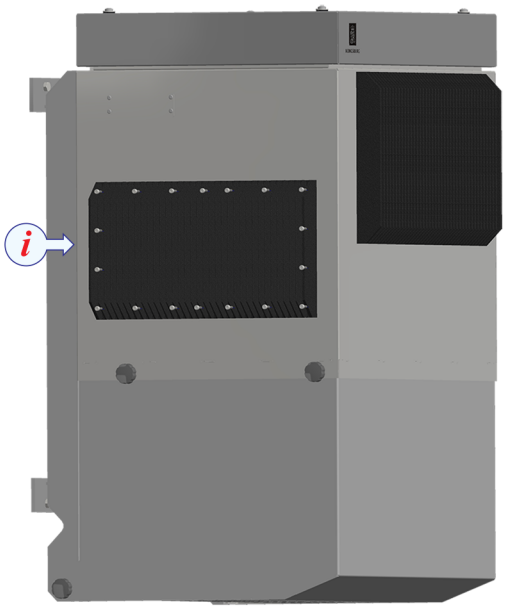
B *DC Out Ground - Blue*

C *AC power connector*

D *Control and monitoring signals*

4 Connect the **AC power** (C) and the **Control and monitoring** (D) cables to the power supply.

5 Mount the heat sink on the unit and tighten the screws.



6 Connect AC mains power.

Further requirements

Once the power supply has been installed, follow the normal procedure to turn on the EM 304 MKII.

Receiver Unit - Parts replacement

Topics

Receiver Unit replacement

The complete receiver Unit can be supplied as a spare part.

All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the Receiver Unit, page 102

Installing the Receiver Unit, page 104

Removing the Receiver Unit

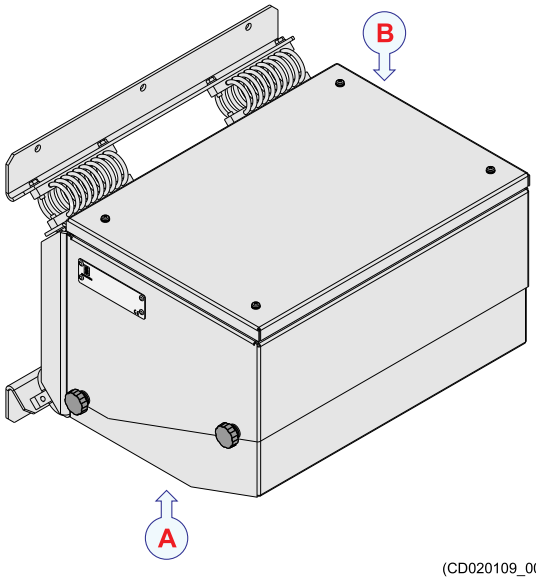
Follow this procedure to remove the Receiver Unit.

Prerequisites

A Cable connection, behind protection lid

B Lid for access to circuit boards and power supply

You must be equipped with a standard set of tools. This tool set must comprise the normal tools for mechanical tasks. This includes different screwdriver types, pliers, adjustable spanners, etc. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



(CD020109_003_002)

Context

If a Receiver Unit fails to operate, it must be replaced with a new unit. One or two Processing Units can be used in the EM® system. The complete receiver Unit can be supplied as a spare part.

The Receiver Unit is a small wall-mounted steel cabinet with integrated shock and vibration absorbers, designed for bulkhead mounting. The connectors of the Receiver Unit are accessed from the bottom.

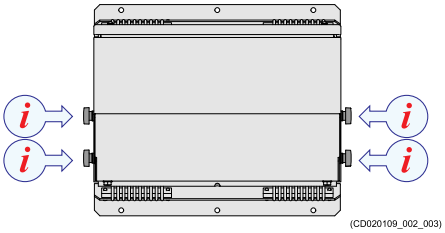
Refer to the detailed information in the *Cable layout and interconnections* chapter.

Procedure

1 Turn off the EM 304 MKII.

2 Remove all AC mains power.

3 Remove the protection lid.

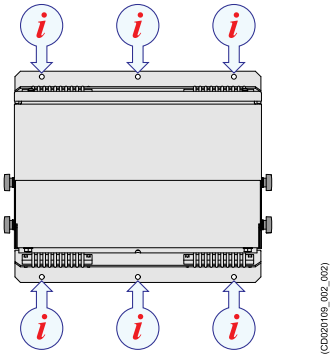


(CD020109_002_003)

4 Open the cable support bracket.

5 Disconnect the cables.

6 Loosen the unit by removing the mounting bolts.



7 Place the unit on a clean and stable workbench.

8 Remove the cable support bracket.

The cable support bracket has to be moved to the spare unit. The Receiver Unit delivered as spare part does not include the cable support bracket.

Further requirements

To return the unit for repair or replacement, follow the relevant handling instructions.

Installing the Receiver Unit

Follow this procedure to install the new Receiver Unit.

Prerequisites

The failed unit must have been removed.

A new unit must be available.

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.

Context

The Receiver Unit is delivered as a complete cabinet with shock absorbers. The Receiver Unit delivered as spare part does not include the cable support bracket.

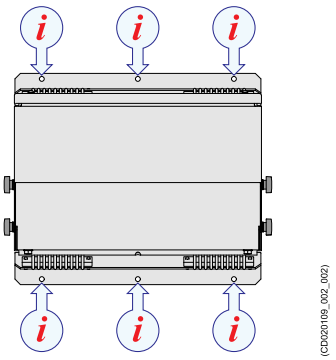
Refer to the relevant cable plans, cable lists and/or interconnection drawings for the EM 304 MKII.

Procedure

1 Mount the cable support bracket on the Receiver Unit.

The Receiver Unit delivered as spare part does not include the cable support bracket. Use the cable support bracket that has been removed from the unit being replaced.

2 Mount the cabinet to the bulkhead with six (6) M8 bolts.



3 Connect the cables.

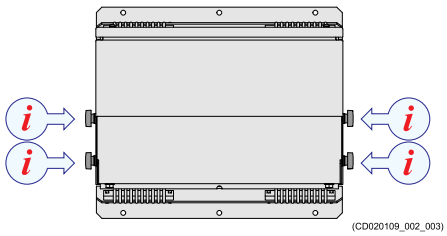
Refer to the detailed information in the *Cable layout and interconnections* chapter.

4 Close the cable support bracket.

Note

Make sure the cables are all properly secured, and able to withstand the vibration and movements of the vessel.

5 Install the protection lid.



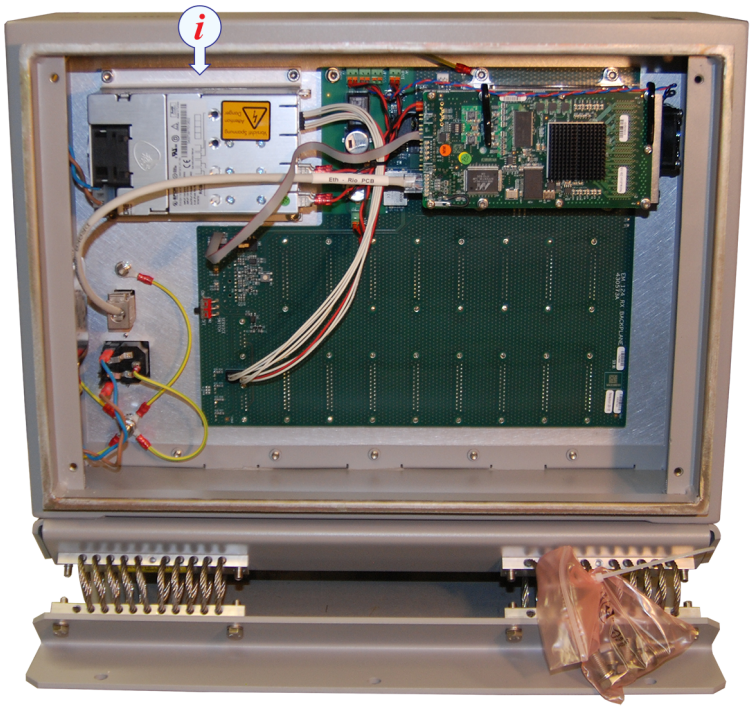
6 Connect AC mains power.

Further requirements

Once the unit has been installed, follow the normal procedure to turn on the EM 304 MKII.

Power supply replacement - Receiver Unit

There is one power supply unit in each Receiver Unit. If the power supply module fails, it must be replaced with a new module.



All replacement tasks must be done according to the specified procedures, and you must follow the relevant safety instructions.

Topics

Removing the power supply, page 107

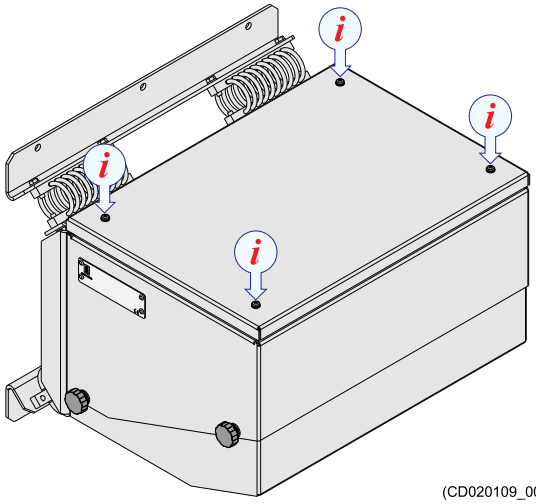
Installing the power supply, page 109

Removing the power supply

If the power supply module fails, it must be replaced with a new module. Follow this procedure to remove the power supply module.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



(CD020109_003_003)

Context

You have to open the lid on top of the Receiver Unit to access the power supply module. The power supply module is mounted on a bracket.

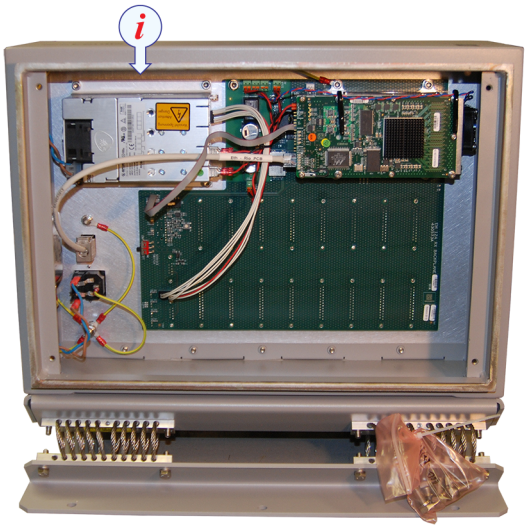
Procedure

1 Turn off the EM 304 MKII system.

2 Disconnect the power cable from the Receiver Unit

3 Loosen the mounting screws and remove the lid from the unit.

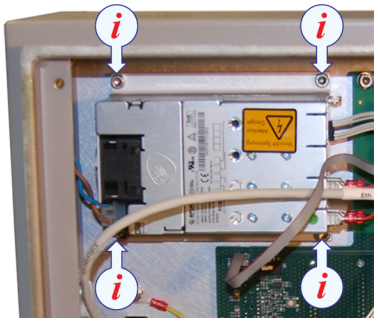
4 Identify the power supply module.



5 Disconnect the cables from the power supply unit.

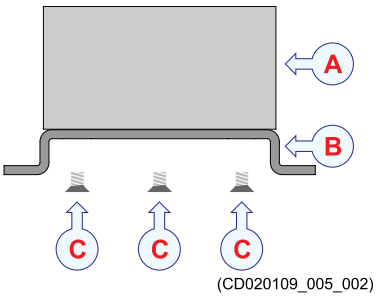
All cables are connected to the unit with plugs or connectors.

6 Loosen the mounting screws and remove the bracket with the power supply unit.



The power supply module is mounted on a bracket.

7 Loosen the screws and remove the power supply unit from the mounting bracket.



A *Power supply module*

B *Mounting bracket*

C *Screws*

Further requirements

To return the power supply for repair or replacement, follow the relevant handling instructions.

Installing the power supply

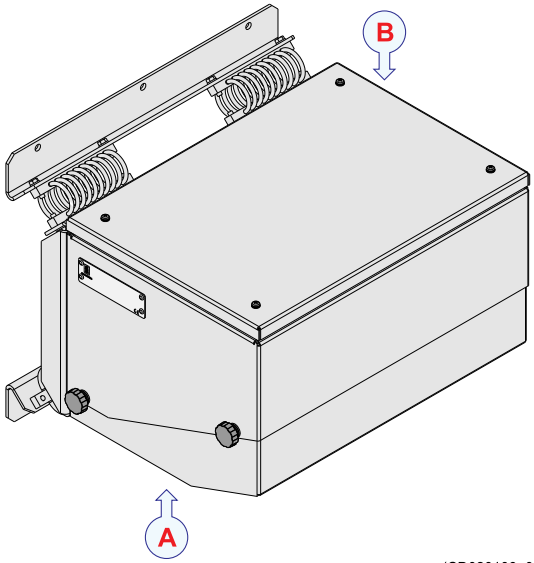
If the power supply module fails, it must be replaced with a new module. Follow this procedure to install the new power supply module.

Prerequisites

The failed power supply module must have been removed.

A new power supply module must be available.

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. Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.



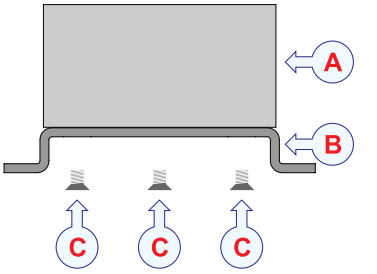
(CD020109_003_002)

Procedure

1 Make sure that all AC mains power has been disconnected.

2 Mount the power supply unit on the bracket.

The power supply module is fastened to the bracket with screws.



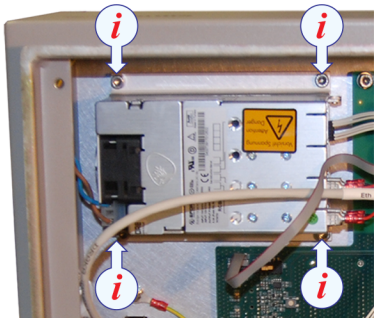
(CD020109_005_002)

A *Power supply module*

B *Mounting bracket*

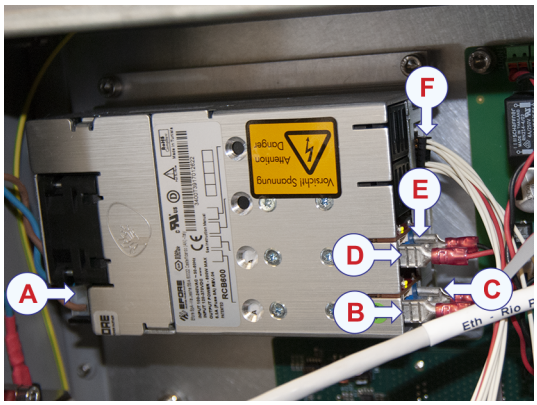
C *Screws*

3 Mount the bracket with the power supply unit.



4 Connect the cables.

All cables are connected to the unit with plugs or connectors.



A *AC power connector*

B *DC output module 1 + Red*

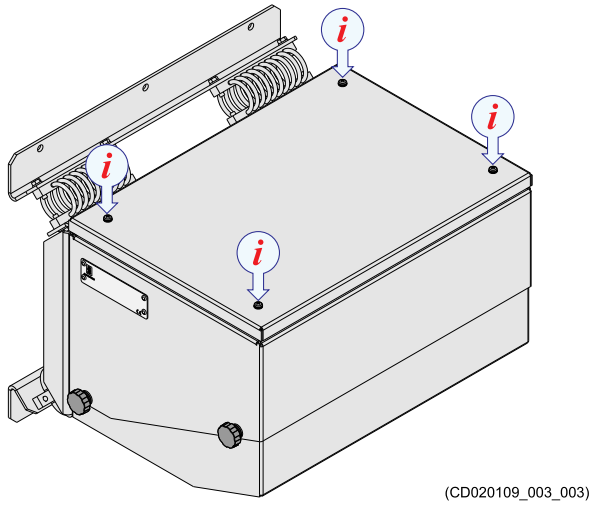
C *DC output module 1 - Black*

D *DC output module 2 + White*

E *DC output module 2 - Black*

F *Control and monitoring signals*

5 Put the lid on the unit and tighten the screws.



6 Connect AC mains power.

Further requirements

Once the power supply has been installed, follow the normal procedure to turn on the EM 304 MKII.

Spare parts and consumables

Topics

Ordering spare parts

To make the order process as short and efficient as possible, you must provide accurate information about the product, the part you need, and yourself.

The following information must be provided with your order:

- Part name and/or description
- Our part number
- Number of items required
- Your shipment address
- Preferred shipment method
- Required date of delivery from us

For certain spare parts (typically complete units, printed circuit boards and software) the vessel name is also useful, as this allows us to update our vessel database.

Processing Unit - List of spare parts

Topics

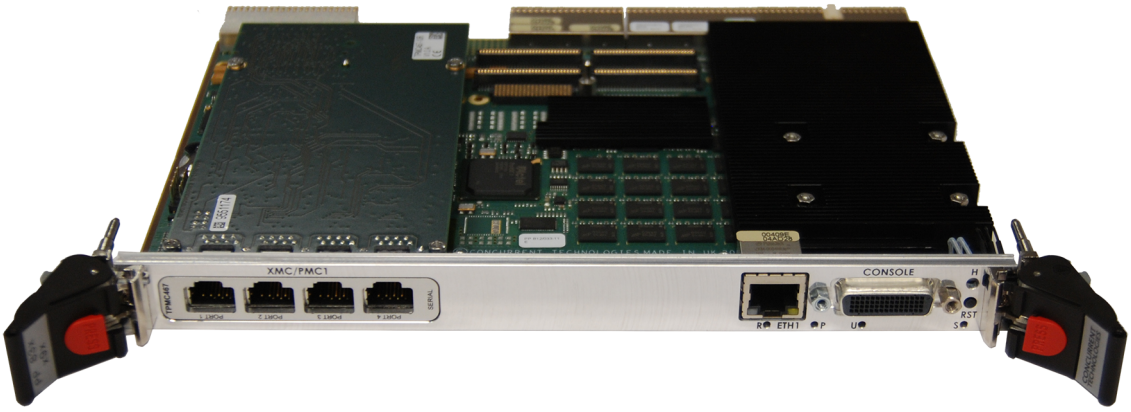
Processing Unit - spare part 470574

The complete Processing Unit can be supplied as a spare part.

- **Part name:** Processing Unit
- **Part number:** 470574
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

Concurrent PP B12 CPU board - spare part 470580

There is one CPU board in the Processing Unit.



- **Part name:** Concurrent PP B12/033 CPU board
- **Part number:** 470580
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Concurrent Technologies Plc.

  Concurrent Technologies (http://www.gocct.com)

PU Ethernet switch - spare part 384691

There is one VadaTech CP219 Ethernet switch in the Processing Unit.

This is a generic photo. The Vadatech CP219 board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

- **Part name:** VadaTech CP219 Ethernet switch board
- **Part number:** 384691
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** VadaTech Incorporated

  VadaTech (http://www.vadatech.com)

Related topics

Ethernet switch replacement - Processing Unit, page 53

CBMF board - spare part 430675

There are two Compact Beamformer (CBMF) boards in the Processing Unit.

This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

- **Part name:** CBMF board
- **Part number:** 430675
- **Number in use:** 2
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

Related topics

CBMF board replacement, page 56

PU Power supply - spare part 373897

One power supply unit is used in the EM 304 MKII Processing Unit for supply of 5, 24 and 48 VDC.

- **Part name:** Power supply, Excesys XLB
- **Part number:** 373897
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Excelsys

  Excelsys Technologies (http://www.excelsys.com)

PU Fan unit - spare part 385387

Two fan units are used in the EM 304 MKII Processing Unit for side to side cooling.

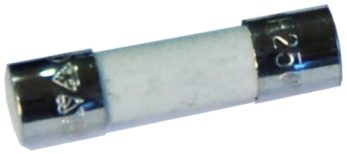
- **Part name:** Fan unit
- **Part number:** 385387
- **Number in use:** 2
- **Recommended number in spare:** 1
- **True manufacturer:** Recab/Schroff

Related topics

Fan unit replacement - Processing Unit, page 61

Selection of fuses - spare part 308255

- **Part name:** Ceramic body cartridge fuses
- **Part number:** 308255
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Several



Related topics

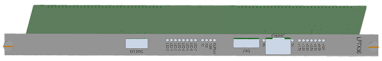
Fuse replacement - PU, page 64

Transmitter Unit - List of spare parts

Topics

LPTX36 Transmitter board - spare part 446679

There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit.



- **Part name:** LPTX36 Transmitter board
- **Part number:** 446679
- **Number in use:** 24
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

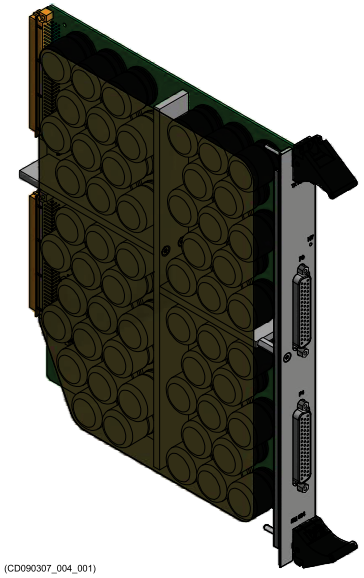
Related topics

LPTX36 board replacement, page 73

TX RIO board - spare part 426310

There are up to 12 TX RIO boards in each Transmitter Unit.

- **Part name:** TX RIO board
- **Part number:** 426310
- **Number in use:** 12
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)



Related topics

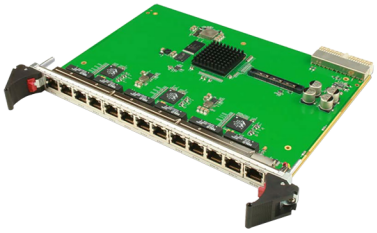
TX RIO board replacement, page 68

TXU Ethernet switch - spare part 338124

There are up to three VadaTech CP218 Ethernet switches in each Transmitter Unit.

- **Part name:** VadaTech CP218 Ethernet switch board
- **Part number:** 338124
- **Number in use:** 3
- **Recommended number in spare:** 1
- **True manufacturer:** VadaTech Incorporated

  VadaTech (http://www.vadatech.com)



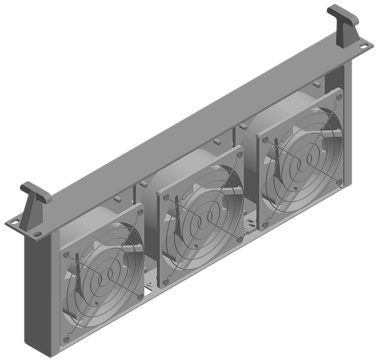
Related topics

Ethernet switch replacement - Transmitter Unit, page 79

TXUFan unit - spare part 430443

There is one fan unit in each Transmitter Unit.

- **Part name:** TXU Fan unit
- **Part number:** 430443
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Elma (https://www.elma.com)



Related topics

Fan unit replacement - Transmitter Unit, page 84

TXU 12V Power supply - spare part 437247

There is one 12V power supply in each Transmitter Unit.

- **Part name:** Power supply Excesys UX422
- **Part number:** 437247
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Excelsys Technologies (http://www.excelsys.com)

Related topics

12V Power supply replacement - Transmitter Unit, page 89

TXU HV Power supply spare part 437680

There is one HV power supply in each Transmitter Unit.

- **Part name:** Power supply Excesys UX6QQQ
- **Part number:** 437680
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Excelsys Technologies (http://www.excelsys.com)

Receiver Unit - List of spare parts

Topics

Receiver Unit 1 degree - spare part 426631

The complete receiver Unit can be supplied as a spare part. The number of Receiver Units used will depend on the system configuration.

The number of circuit boards in the Receiver Unit will depend on the chosen transducer configuration.

- **Part name:** Receiver Unit 1 degree
- **Part number:** 426631
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

Related topics

Receiver Unit replacement, page 101

Receiver Unit 2 degrees - spare part 426632

The complete receiver Unit can be supplied as a spare part. The number of Receiver Units used will depend on the system configuration.

The number of circuit boards in the Receiver Unit will depend on the chosen transducer configuration.

- **Part name:** Receiver Unit 2 degrees
- **Part number:** 426632
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

Related topics
Receiver Unit replacement, page 101

Receiver Unit 4 degrees - spare part 426633

The complete receiver Unit can be supplied as a spare part. The number of Receiver Units used will depend on the system configuration.

The number of circuit boards in the Receiver Unit will depend on the chosen transducer configuration.

- **Part name:** Receiver Unit 4 degrees
- **Part number:** 426633
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Kongsberg Maritime (https://www.kongsberg.com/maritime/)

Related topics
Receiver Unit replacement, page 101

RXU Power supply - spare part 428206

There is one power supply unit in each Receiver Unit.

- **Part name:** Power supply Roal RCB600-AA00
- **Part number:** 428206
- **Number in use:** 1
- **Recommended number in spare:** 1
- **True manufacturer:** Roal/Efore (https://www.efore.com)

Related topics
Power supply replacement - Receiver Unit, page 106

Processing Unit

Topics

Processing Unit description

The EM 304 MKII Processing Unit is provided to process the signals to and from the Transmitter and Receiver Units.

The EM 304 MKII Processing Unit is an industrial computer using both COTS (commercial off-the-shelf) components and custom made components. The unit is designed and tested for rugged use.

The Processing Unit performs the receiver beamforming, bottom detection, and motion and sound speed corrections. It contains all interfaces for time-critical external sensors such as vessel attitude (roll, pitch, heading and heave), vessel position and external clock. More than one sensor of each type may be connected simultaneously, with one in use and all of them logged.

The Processing Unit controls the Transmitter and Receiver units via Ethernet communication, and is also interfaced to the Operator station via Ethernet.

The 48 V output from the Processing Unit can be used for remote on/off control of the Transmitter and Receiver Units.

The Processing Unit is normally located in a "sonar room" close to the transducer arrays. The unit can also be placed in the "survey room" or on the bridge.

Related topics

Processing Unit, page 123

Processing Unit familiarization

The Processing Unit consists of an instrument case with integrated rack mounting in a 19 inch rack.

It uses both COTS (commercial off-the-shelf) components and custom made components. Ventilation is provided through slits located on the sides. The front panel of the Processing Unit holds a mains power switch and an information display.

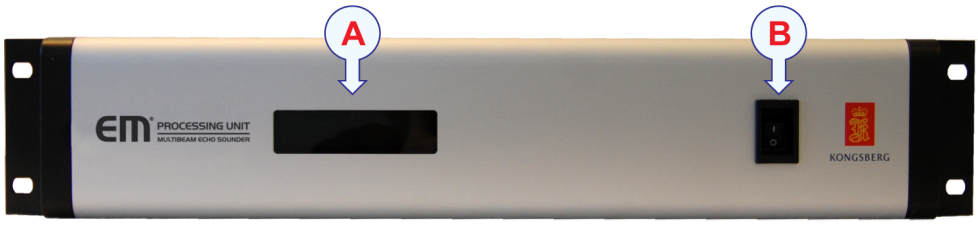
The Processing Unit can be switched on/off with a remote switch.

The receive data from the Gbit link is filtered and beamformed by an FPGA unit on the CBMF board(s). The result is transferred to the CPU board via the cPCI backplane.

The Transmitter Unit(s) and Receiver Unit(s) are connected to the Ethernet switch in the Processing Unit.

Processing Unit front panel description

The front panel of the Processing Unit holds a mains power switch and an information display.

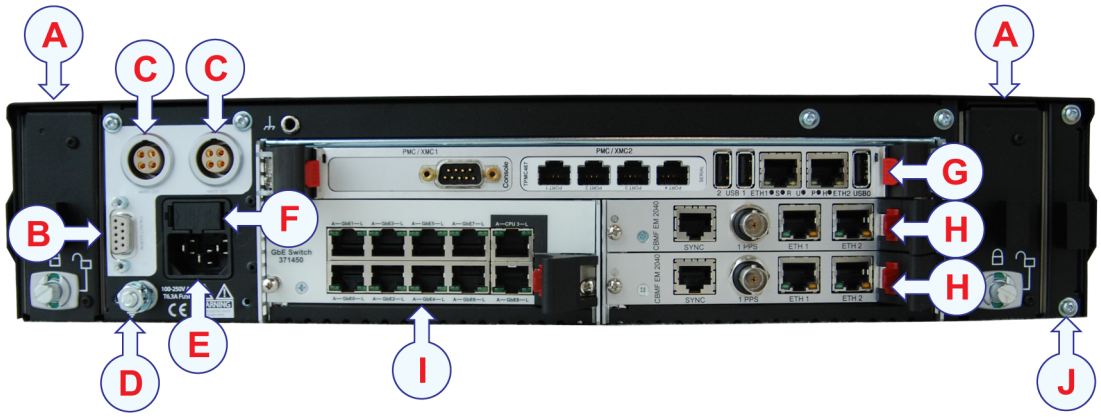


A *Information display*

B *Power On/Off*

Processing Unit rear panel description

The rear panel of the Processing Unit holds all the connectors used to communicate with external devices and the power input socket. It also holds a fuse for the power input.



A *Fan unit*

The Processing Unit has two fan units for cooling purposes.

B *Remote Control connector*

C *48 Vdc output connector*

D *Ground connector*

E *AC mains power socket*

F *Fuse for the AC mains supply*

G *CPU board*

H *CBMF board*

There are one or two Compact Beamformer (CBMF) boards in the Processing Unit. The number of CBMF boards depends on the system.

I *CP219 Ethernet switch*

J *Air filter unit*

Processing Unit circuit boards and modules

In order to do the necessary tasks and meet the operational requirements, the Processing Unit is equipped with several circuit boards and modules. All the circuit boards and modules are line replaceable units (LRU).

The following circuit boards and modules are used in the EM 304 MKII Processing Unit.

A ***CPU board***

Different CPU boards can be used in the EM 304 MKII Processing Unit.

B ***CBMF board***

The Compact Beamformer (CBMF) board is used by the Processing Unit for beamforming and signal processing purposes.

There are one or two Compact Beamformer (CBMF) boards in the Processing Unit. The number of CBMF boards depends on the system.

C ***VadaTech CP219 board***

The VadaTech CP219 board is used as an Ethernet switch in the EM 304 MKII Processing Unit.

D ***Fan unit***

The Processing Unit has two fan units for cooling purposes.

- ***Power supply***

  One power supply unit is used in the EM 304 MKII Processing Unit for supply of 5, 24 and 48 VDC.

  The Excelsys XLB power supply is located inside the Processing Unit, and is not visible from the outside.

CPU board

Topics

Introduction

There is one CPU board in each EM 304 MKII Processing Unit.

The CPU board is based on a commercial design. Due to the constant development of new computer parts, older parts are no longer manufactured.

This means that the CPU board used with the EM 304 MKII changes from time to time.

Concurrent PP B12 CPU board overview

Concurrent PP B12 is one version of CPU board used in the EM 304 MKII Processing Unit.

The Concurrent PP B12 is a PC-compatible high functionality Compact PCI (cPCI) board used by the EM 304 MKII Processing Unit as the Central Processing Unit (CPU).

The circuit board is manufactured by Concurrent Technologies and configured by Kongsberg Maritime AS. Different CPU boards can be used in the EM 304 MKII Processing Unit.

Concurrent PP B12 CPU board connectors

The Concurrent PP B12 CPU board holds two large connectors for the backplane, as well as several front mounted connectors.

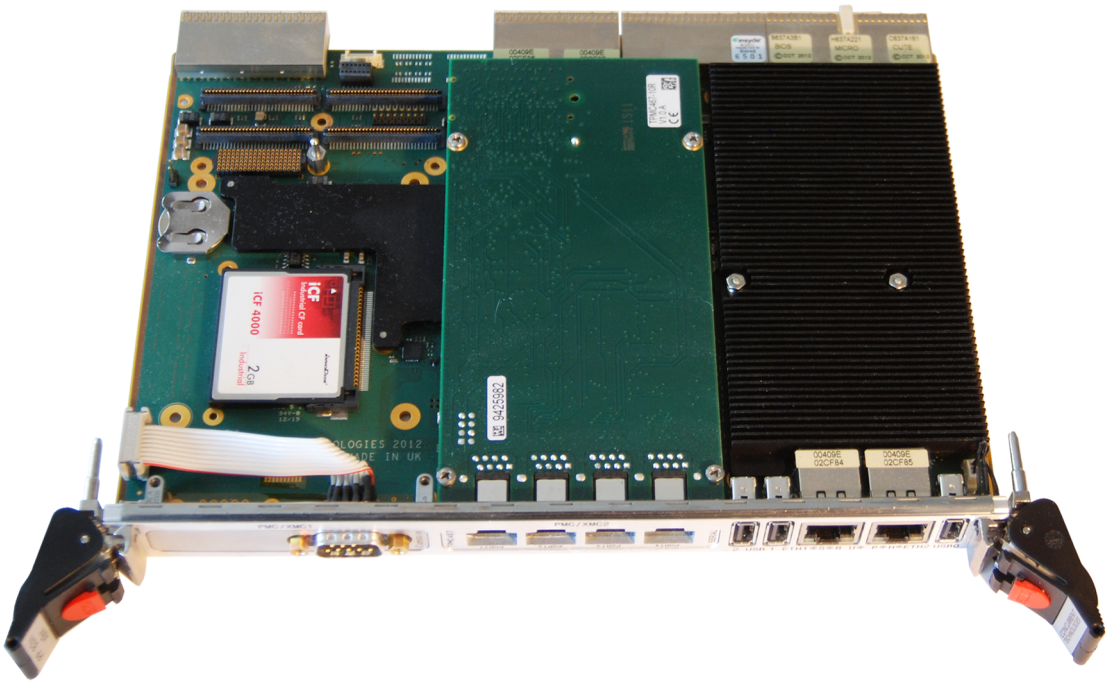
A *Console - for Kongsberg Maritime use only*

B *COM1 to COM4 - Four serial ports with RJ45 connectors. The ports can be configured to be RS-232 or RS-422*

C *Ethernet 1 - used for communication to the Operator Station (Hydrographic Work Station)*

CPU board Concurrent PP833 overview

Concurrent PP833 is one version of CPU board used in the EM 304 MKII Processing Unit.

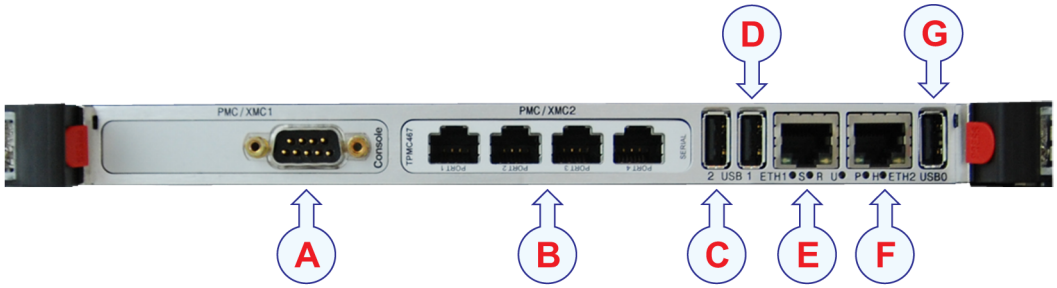


The Concurrent PP833 is a PC-compatible high functionality Compact PCI (cPCI) board used by the EM 304 MKII Processing Unit as the Central Processing Unit (CPU).

The circuit board is manufactured by Concurrent Technologies and configured by Kongsberg Maritime AS. Different CPU boards can be used in the EM 304 MKII Processing Unit.

CPU board Concurrent PP833 connectors

The Concurrent PP833 CPU board holds two large connectors for the backplane, as well as several front mounted connectors. Not all of these connectors are used in the EM 304 MKII.



A *PMC/XMC1 Console - for Kongsberg Maritime use only*

B *COM1 to COM4 - Four serial ports with RJ45 connectors. The ports can be configured to be RS-232 or RS-422*

C *USB 2 - not used*

D *USB 1 - not used*

E *Ethernet 1 - used for communication to the Operator Station (Hydrographic Work Station)*

F *Ethernet 2 - not used*

G *USB 0 - not used*

CP219 Ethernet switch

Topics

Ethernet switch overview

The VadaTech CP219 board is used as an Ethernet switch in the EM 304 MKII Processing Unit.

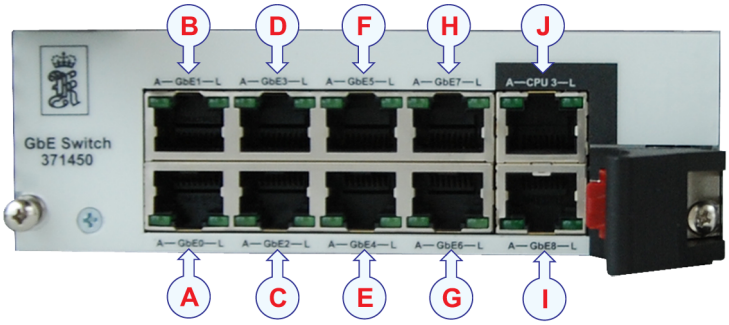
This is a generic photo. The Vadatech CP219 board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

The VadaTech CP219 is a compact PCI module that provides 10 Gigabit Ethernet ports on the front panel.

Ethernet switch connectors

The VadaTech CP219 Ethernet switch holds 10 front mounted connectors, as well as one large connector for the backplane.

This is a generic photo. The Vadatech CP219 board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.



The Vadatech CP219 board is fitted with the following connectors.

A *Port 1, GbE0*
Regular Gigabit Ethernet port

B *Port 2, GbE1*
Regular Gigabit Ethernet port

C *Port 3, GbE2*
Regular Gigabit Ethernet port

D *Port 4, GbE3*
Regular Gigabit Ethernet port

E *Port 5, GbE4*
Regular Gigabit Ethernet port

F *Port 6, GbE5*
Regular Gigabit Ethernet port

G *Port 7, GbE6*
Regular Gigabit Ethernet port

H *Port 8, GbE7*
Regular Gigabit Ethernet port

I *Port 9, GbE8*
Regular Gigabit Ethernet port

J *Port 10, CPU3*
Gigabit Ethernet port reserved for external sensor input over UDP

CBMF board

Topics

CBMF board overview

The Compact Beamformer (CBMF) board is used by the Processing Unit for beamforming and signal processing purposes.

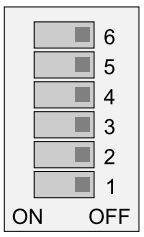
This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

CBMF board configuration

The CBMF board is a generic circuit board designed for multiple applications and operational frequencies. By means of the on-board software, the links and the switches it can be configured for specific use. When a board is provided as a spare part, it is readily configured.

This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

Switches and links



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The CBMF board holds several switches and links. These are implemented to allow the circuit board to be used in several different configurations.

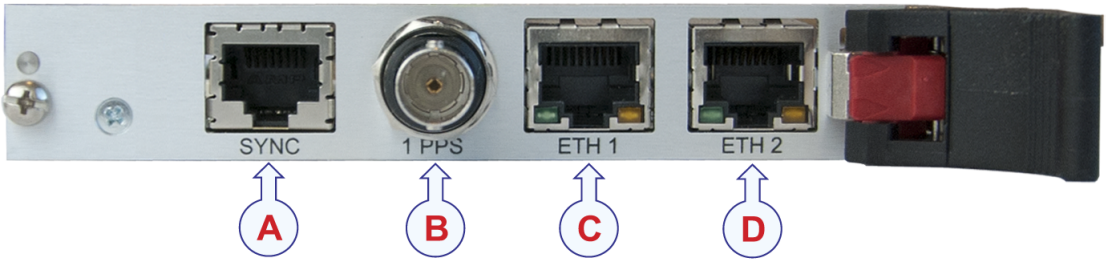
The switch setting on the CBMF board has to be correct. All the switches on all the CBMF boards in the Processing Unit should be set to OFF. OFF is when they are pushed towards the edge of the circuit board.

Do not touch other switches or link settings.

The CBMF board is configured by Kongsberg Maritime for use in the EM 304 MKII. If you receive a spare CBMF board, this is also set up correctly before it is shipped.

CBMF board connectors

The CBMF board holds a large connector for the backplane, as well as several front mounted connectors.



This is a generic photo. The CBMF board used by the EM 304 MKII may look slightly different due to minor design changes on the protective lid and/or the front panel.

The CBMF board is fitted with the following connectors.

A *SYNC - signal used for synchronisation when multiple echo sounders are employed on a vessel*

B *1PPS - one pulse per second input signal used to synchronise the internal clock in the Processing Unit*

C *ETH1 - Ethernet connection to internal switch in the Processing Unit*

D *ETH2 - not used for EM 304 MKII*

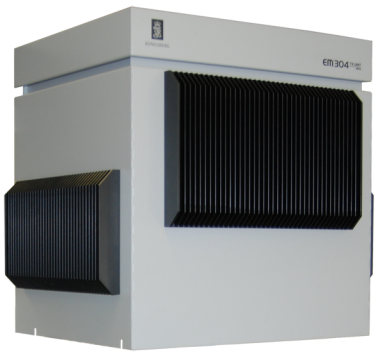
Transmitter Unit

Topics

Transmitter Unit familiarization

The Transmitter Unit holds several circuit boards and two power supplies. All the circuit boards are accessed either from the top or the bottom of the unit.

The Transmitter Unit is a wall-mounted steel cabinet with integrated shock and vibration absorbers, designed for bulkhead mounting. One 19 inch sub-rack is contained in the cabinet. The number of circuit boards in the sub-rack will depend on the chosen transducer configuration.



Twisted pair Ethernet is used for data communication with the Processing Unit.

The Transmitter Unit is normally located in a "sonar room" close to the transducer arrays.

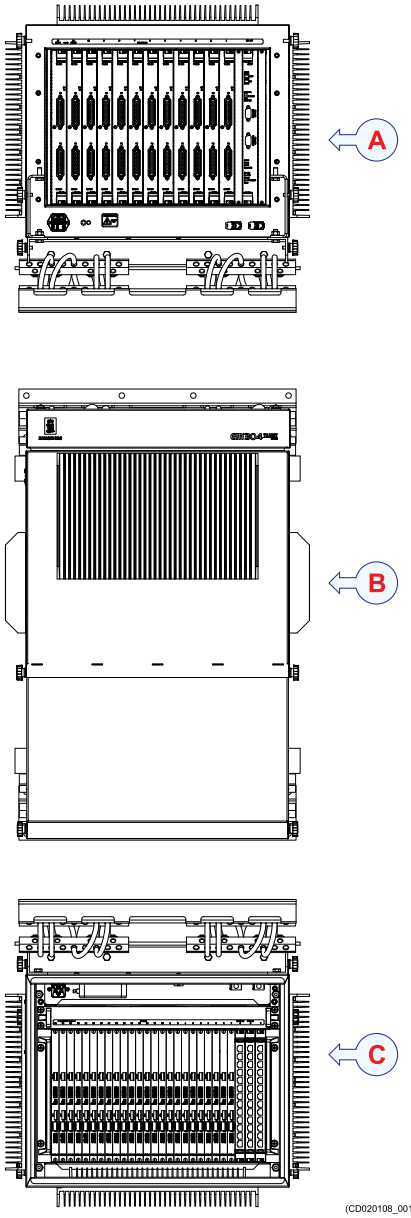
A *Front view*

B *Bottom view*

Protection cover and cable clamp not shown

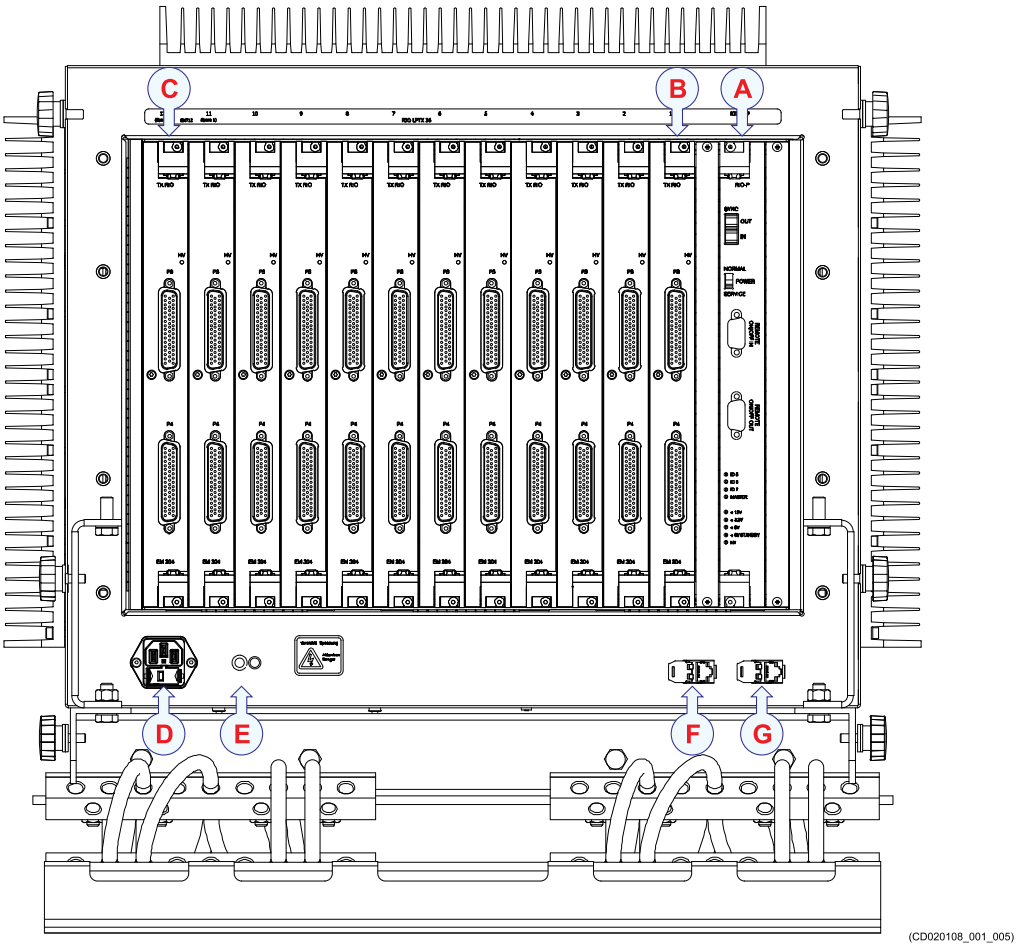
C *Top view*

Lid not shown



Transmitter Unit bottom panel description

All external cables are connected at the bottom of the Transmitter Unit.



A *RIO-P board*

B *TX RIO board 1*

C *TX RIO board 12*

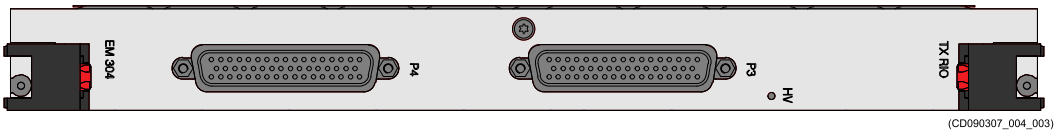
D *AC power connector*

E *Ground connector*

F *Ethernet connector*

G *Ethernet connector*

TX RIO board



There are up to 12 TX RIO boards in each Transmitter Unit. The transducer cables connect to the TX RIO boards.

The number of TX RIO boards depends on the configuration of the EM 304 MKII system.

- 0.3 degrees TX array: 24 (12 + 12) - 2 Transmitter Units
- 0.5 degrees TX array: 16 (8 + 8) - 2 Transmitter Units
- 0.6 degrees TX array: 12 - 1 Transmitter Unit
- 1 degree TX array: 8 - 1 Transmitter Unit
- 2 degrees TX array: 4 - 1 Transmitter Unit
- 4 degrees TX array: 2 - 1 Transmitter Unit

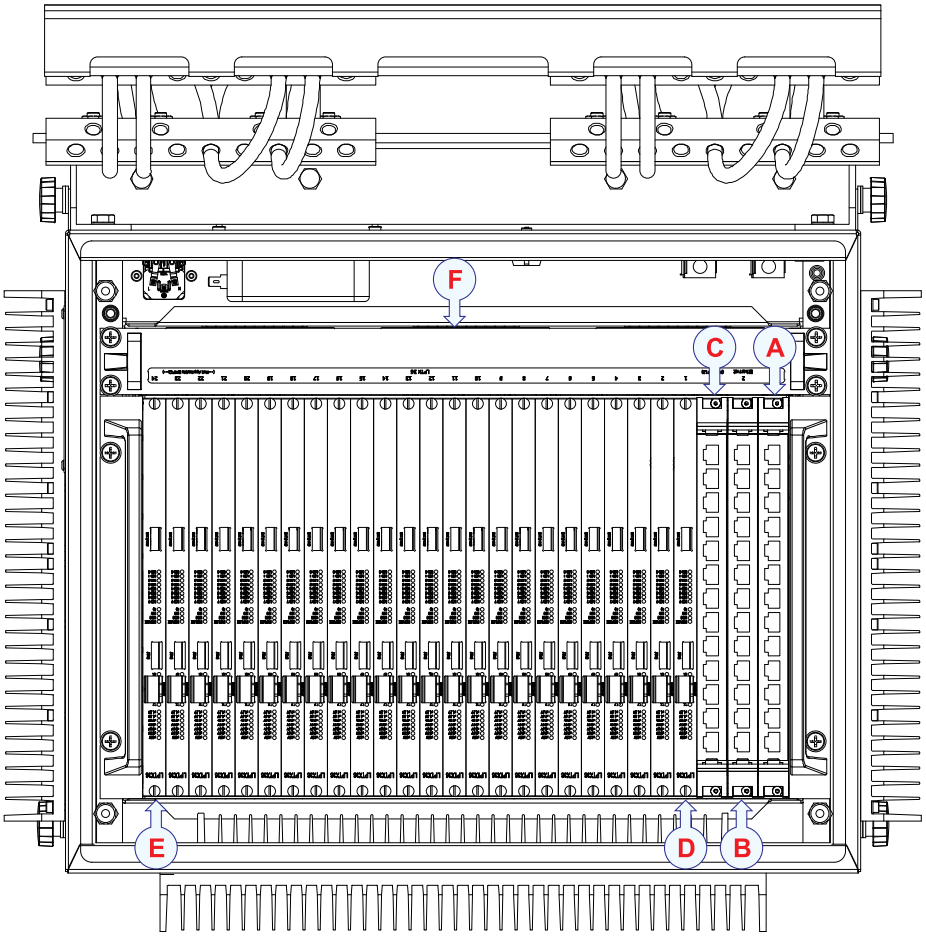
RIO-P board

There is one RIO-P board in each Transmitter Unit. The signals for remote on/off control and synchronization is connected to the RIO-P board.

In addition there are two Ethernet connectors and connection for power at the bottom of the Transmitter Unit.

Transmitter Unit top panel description

There are only internal connections at the top of the Transmitter Unit.



A *Ethernet switch 1*

B *Ethernet switch 2*

C *Ethernet switch 3*

D *LPTX36 board 1*

E *LPTX36 board 24*

F *Fan unit*

LPTX36 Transmitter board

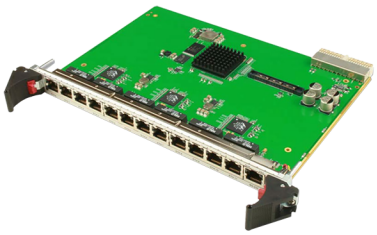
There are up to 24 LPTX36 Transmitter boards in each Transmitter Unit. Each LPTX36 board is connected to the Ethernet switch in the Transmitter Unit.

The number of LPTX36 boards depends on the configuration of the EM 304 MKII system.

- 0.3 degrees TX array: 48 (24 + 24) - 2 Transmitter Units
- 0.5 degrees TX array: 32 (16 + 16) - 2 Transmitter Units
- 0.6 degrees TX array: 24 - 1 Transmitter Unit
- 1 degree TX array: 16 - 1 Transmitter Unit
- 2 degrees TX array: 8 - 1 Transmitter Unit
- 4 degrees TX array: 4 - 1 Transmitter Unit

VadaTech CP218 Ethernet switch

There are up to three VadaTech CP218 Ethernet switches in each Transmitter Unit. Each LPTX36 board is connected to the Ethernet switch in the Transmitter Unit.



Transmitter Unit power supplies

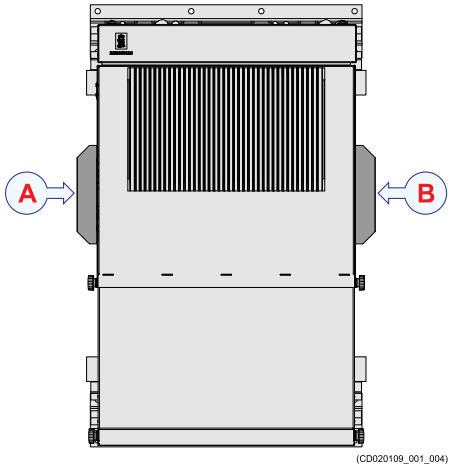
There is one 12V and one HV power supply in each Transmitter Unit. The power supplies are mounted behind the heat sinks on the sides of the Transmitter Unit.

A *HV Power supply module*

The HV power is mounted on the left side when the Transmitter Unit is seen from the front. The HV power supply provides 130 VDC.

B *12V Power supply module*

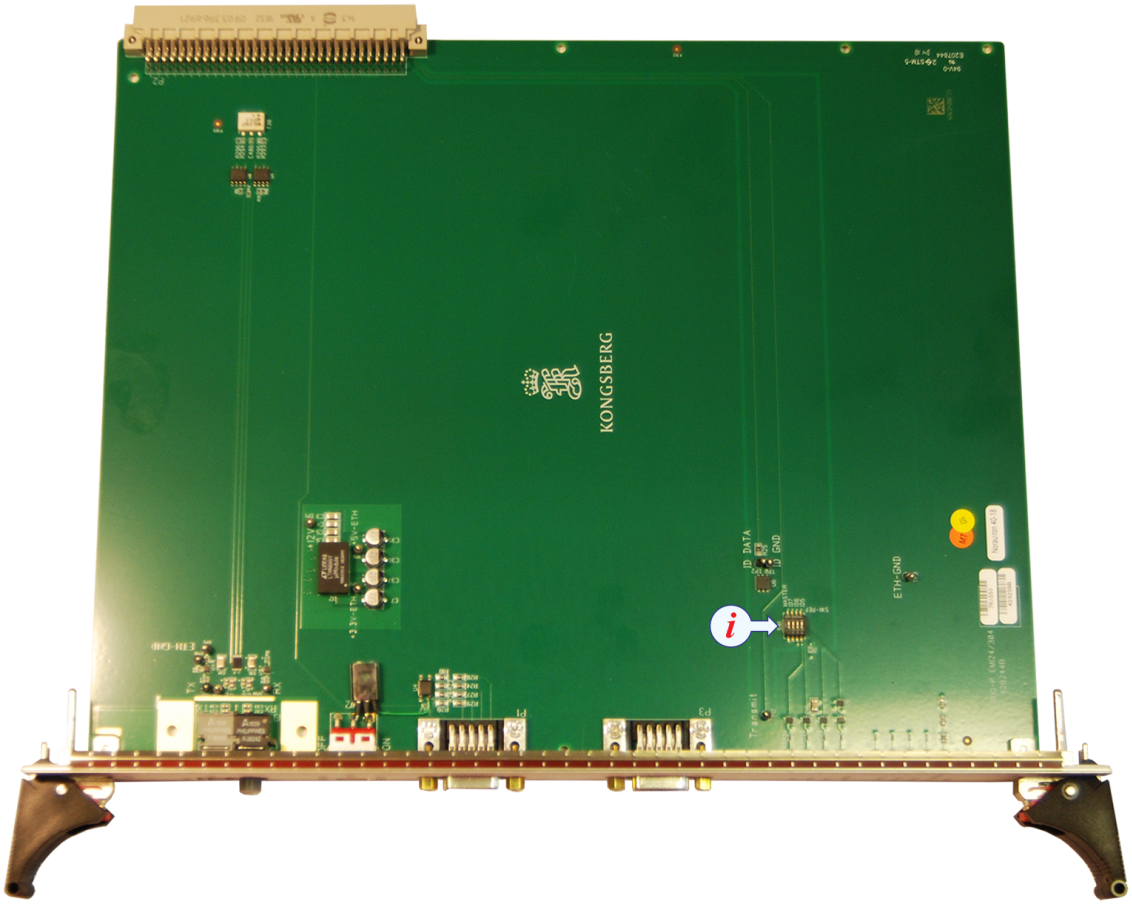
The 12V power is mounted on the right side when the Transmitter Unit is seen from the front.



The power supply modules provide the operating voltages to the circuit boards in the EM 304 MKII Transmitter Unit. These include the low voltages for the electronic circuitry, and the high voltage required to create the transmit pulses.

RIO-P board - dip switch setting

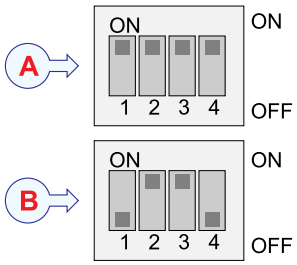
The dip switch setting on the RIO–P board has to be correct.



A Transmitter Unit 1 (MASTER): All switches must be set to ON.

The position of the dip switches are shown with the LED lights on the front of the RIO-P board when the board is installed and the Transmitter Unit is powered up.

- MASTER should be lit.
- ID5, ID6 and ID7 should not be lit.



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B Transmitter Unit 2 (SLAVE): Switch 1 and 4 must be set to OFF, switch 2 and 3 must be set to ON.

Note

If there is only one Transmitter Unit in the system, it has to be set to Transmitter Unit 1 (MASTER).

Receiver Unit

Topics

Receiver Unit familiarization

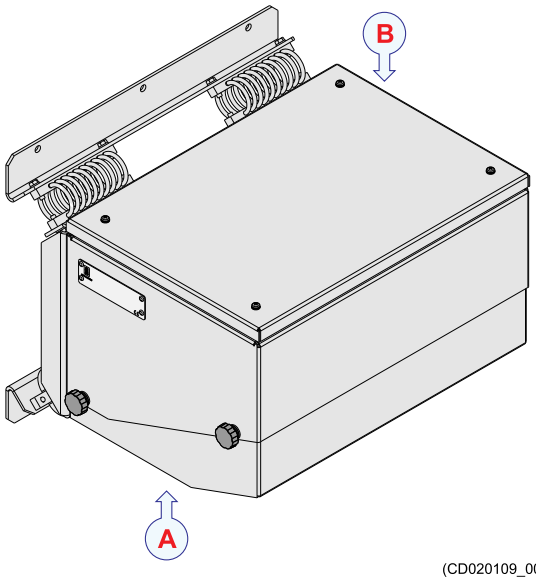
The EM 304 MKII Receiver Unit has all receive electronics, like control processor, amplifiers, Analog-to-Digital Converters, power supply and Ethernet interface.

A Cable connection, behind protection lid

B Lid for access to circuit boards and power supply

The Receiver Unit is a small wall-mounted steel cabinet with integrated shock and vibration absorbers, designed for bulkhead mounting.

The connectors of the Receiver Unit are accessed from the bottom. The circuit boards and power supply are accessed from the top.



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Receiver Unit bottom panel description

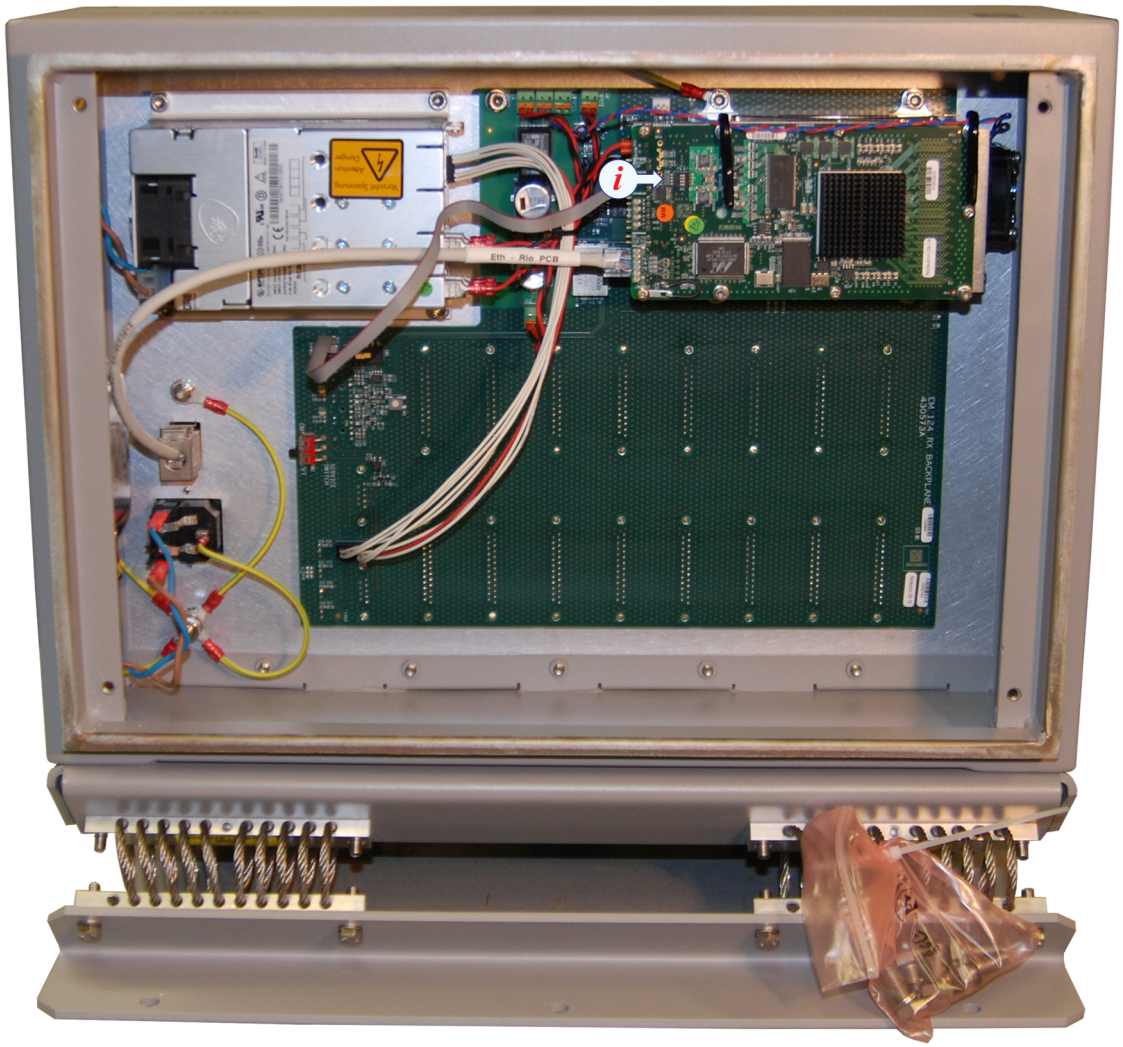
The connectors of the Receiver Unit are accessed from the bottom.

The transducer cables connect at the bottom of the Receiver Unit. The number of cables depends on the chosen system configuration.

Receiver Unit - dip switch setting

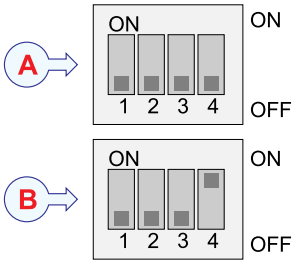
The dip switch setting in the Receiver Unit has to be correct.

The software in the Processing Unit must know the identification of the Receiver Unit(s). A switch on the processing board inside the Receiver Unit is used for this.



A Receiver Unit 1 (MASTER): all switches must be set to OFF.

B Receiver Unit 2 (SLAVE): switch 1, 2 and 3 must be set to OFF, switch 4 must be set to ON.



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Note

If there is only one Receiver Unit in the system, it has to be set to Receiver Unit 1 (MASTER).

Hydrographic Work Station

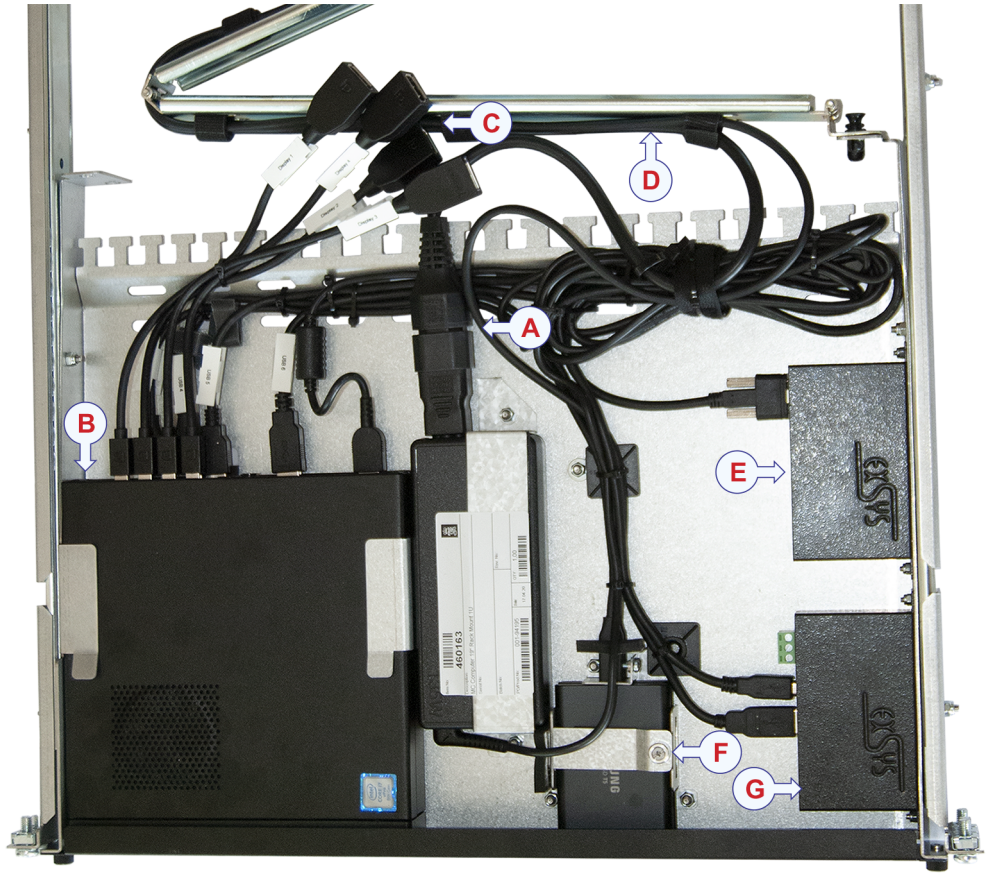
Topics

Hydrographic Work Station

The Hydrographic Work Station is the operator station of the EM 304 MKII system. A dedicated maritime computer is provided. It is set up with all necessary software. The Hydrographic Work Station is normally mounted near the operator work space.

Hydrographic Work Station, type MC330

Hydrographic Work Station, type MC330



A AC power cable connection

B Network cable to the Multibeam Echo Sounder

C Display port connectors

D Moving arm to guide the cables

E Switch for network cables. Not for cable connected to **B**

F Remove this screw to change removable SSD-drive.

G USB-HUB for mouse and keyboard connectors

Drawing file

The *Drawing file* are found in the EM 304 MKII Installation Manual

Technical specifications

The *Technical specifications* are found in the EM 304 MKII Installation Manual

Cable layout and interconnections

The *Cable layout and interconnections* are found in the EM 304 MKII Installation Manual

Equipment handling

Observe these basic rules for transportation, storage and handling of units. In this context, a *unit* may be any large or small part of the system. It can be supplied as part of the initial delivery, or as a spare part. The phrase *box* is used to describe all kinds of cases, wooden or cardboard boxes etc used to hold the *unit*.

Topics

Transporting Kongsberg Maritime equipment

Unless otherwise stated in the accompanying documentation, electronic, electromechanical and mechanical units supplied by Kongsberg Maritime can be only transported using methods approved for delicate and fragile equipment.

Prerequisites

Transportation methods approved for delicate equipment includes transportation by road, rail, air or sea.

Context

The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, wooden boxes, or carton boxes as appropriate.

Observe the packing instructions.

Note

Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. These units must be checked properly, and the regulations must be investigated by the packer/shipper before the unit is dispatched.

Procedure

1 Ensure that all local transportation is done according to the same specifications as for the initial delivery.

2 Make sure that the box containing the unit is kept dry at all times, and sheltered from the weather.

It must not be subjected to shocks, excessive vibration or other rough handling. The box will normally be marked with text or symbols indicating which way it is to be placed. Follow the instructions provided, and make sure that the box is always placed with its “top” facing upwards.

3 Make sure that the box is not used for any purpose for which it was not intended (step, table, etc.).

In the absence of other information, no other boxes must be stacked on top of it.

4 Handle all boxes and units with care.

Note

Due to the nature of Kongsberg Maritime’s products, and the extensive use of delicate electronic parts, all units and boxes must be regarded and handled as fragile equipment.

Lifting units and transportation boxes

Some of the boxes used to hold equipment units may be heavy. Use caution when lifting.

Prerequisites

Units and boxes may be heavy. Make sure that you have the necessary equipment required for lifting heavy items. Persons using the lifting equipment must be skilled and have the relevant certificate(s).

Context

A heavy box will normally be marked with its weight. The weights of other boxes in the shipment will normally be entered on the packing list(s).

Heavy units may be equipped with dedicated lifting lugs for transportation by crane within the workshop or installation area.

Note

Observe the local rules and regulations related to the use of lifting equipment.

Procedure

1 Check the weight of the box or unit before you attempt to lift it.

2 Make sure that you have the relevant lifting apparatus required, and that this equipment is approved and certified for the load.

3 If you need to use a crane:

   a Check the applicable weight certificate for the crane.

   b Check the security of the lifting lugs.

   c If the unit to be lifted is provided with dedicated lifting lugs, make sure that all available lugs are used.

   d Make sure that the unit remains under full control during the lifting operation.

   This is important to avoid damage to the unit, equipment or personnel.

4 If you need to use a forklift truck:

   a Check the applicable weight certificate for the truck.

   b Check the limitations for lifting height and angles.

   c Pay special attention to the position of the unit's centre of gravity.

   d Make sure that the unit is properly secured to the truck during the lifting and transportation operations.

5 Handle all units and boxes with care.

Note

Due to the nature of Kongsberg Maritime's products, and the extensive use of delicate electronic parts, all units and boxes must be regarded and handled as fragile equipment.

Inspection of units and transportation boxes after arrival

A visual inspection must be done immediately after the box(es) have arrived at their destination.

Prerequisites

If you suspect that the equipment has been damaged during the transport, request that a representative of the carrier is present during the inspection.

Procedure

1 Check all boxes (wooden or cardboard boxes, plastic bags and/or pallets) for physical damage.

Look for signs of dropping, immersion in water or other mishandling.

2 If external damage is detected, open the box to check its contents.

Request that a representative of the carrier to be present while the box is opened, so any transportation damage can be identified and documented.

3 If a unit has been damaged, prepare an inspection report stating the condition of the unit and actions taken.

Describe the damage, and collect photographic evidence if possible. Return the inspection report to Kongsberg Maritime as soon as possible.

4 If units are not damaged, check the humidity absorbing material.

If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

Specifications for storage prior to installation or use

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long time storage prior to installation and use.

General specifications

During this storage period, certain specifications must be met. The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

1 The equipment must be stored in its original transportation box.

2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.

3 The box must not be used for any purpose for which it was not intended (work platform, steps, table etc.).

4 Boxes must not be placed on top of each other, unless specific markings permit this.

5 Boxes must not be placed directly on a dirt floor.

6 Do not open a box for inspection unless special circumstances permit so.

"Special circumstances" may be suspected damage to the box and its content, or inspections by civil authorities.

a If a unit is damaged, prepare an inspection report stating the condition of the unit and the actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.

b If the unit is not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit according to the packing instructions.

7 If a box has been opened, make sure that is it closed and sealed after the inspection. Use the original packing material as far as possible.

8 The storage room/area must be dry with a non-condensing atmosphere. It must be free from corrosive agents.

9 The storage room/area's mean temperature must not be lower than -10° C, and not warmer than +50° C. If other limitations apply, the crates will be marked accordingly.

10 Boxes must not be exposed to moisture from fluid leakages.

11 Boxes must not be exposed to direct sunlight or excessive warmth from heaters.

12 Boxes must not be subjected to excessive shock and vibration.

13 If the unit contained in a box holds normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them, or dispose of them by incineration.

Refer to the applicable product data sheets or battery handling procedures for further details.

Temperature protection

Any units that requires protection against extreme temperatures are identified as such in the applicable documentation. The box used to transport and store such units are clearly marked, for example:

Must not be transported or stored in temperatures below -5 °C.

Other temperature limits may be used if applicable.

If a unit needs temperature protection, the box to be used for storage and transportation must be lined on all walls, base and lid, using minimum 5 cm thick polyurethane or polystyrene foam.

Most system units can normally be stored in temperatures between -30° C and +70° C. Refer to the relevant technical specifications for details.

Note

Unless otherwise specified, transducers and hydrophones must not be stored in temperatures below −10°C and above +50°C.

Unpacking instructions

Prior to installation or use, electronic, electromechanical and mechanical units must be unpacked from their transport boxes. It is important that this unpacking is done according to the relevant instructions, and without inflicting damage to the equipment.

Topics

Unpacking standard parts and units

Prior to installation or use, parts and units must be inspected, and then unpacked from their transport boxes. It is important that this unpacking is done without inflicting damage to the equipment.

Context

This procedure provides the basic tasks of unpacking units (main unit, spare parts etc) from boxes shipped from Kongsberg Maritime.

Note

If the unit in question is not unpacked for immediate use, you may consider storing it unopened in its original box. However, it may be useful to open the box to check its contents for damage and retrieve any accompanying documentation.

Do not use a knife to open cardboard boxes - the contents may be located close to the surface, and can then be damaged by the blade.

Procedure

1 Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling.

   1 If external damage is detected, open the box to check its contents.

   2 Request that a representative of the carrier to be present while the box is opened, so any transportation damage can be identified and documented.

   3 If a unit has been damaged, prepare an inspection report stating the condition of the unit and actions taken.

     Describe the damage, and collect photographic evidence if possible. Return the inspection report to Kongsberg Maritime as soon as possible.

2 Place the box on a stable work bench or on the floor with the top of the box facing upwards.

3 In the absence of other instructions, always open the top of the carton first.

   The contents of the box will normally have been lowered into the carton from above, so this will usually be the easiest route to follow. Be careful when you open the box, and make sure that the contents are not damaged. Do not use a knife to open cardboard boxes.

4 If the box has been closed using staples, remove the staples from the carton as you open it.

   This will reduce the possibilities of scratch injury to yourself and damage to the contents.

5 If a wooden box has been closed using screws, always remove them using a screwdriver.

   Do not attempt to force the lid open with a crowbar or similar tool.

6 Once the carton is open, carefully remove all loose packing and insulation material.

7 Check for user manuals and other documents that may have been added to the carton during packing.

8 Check also for special tools, door keys etc.

Unpacking mechanical units

Prior to installation or use, mechanical units must be unpacked from their transport boxes. It is important that this unpacking is done without inflicting damage to the equipment.

Prerequisites

Observe the procedure for unpacking of standard parts and units.

Context

Mechanical and electromechanical units may be heavy.

Procedure

1 Obtain the necessary lifting equipment, and make sure that the equipment is certified for the weight.

2 Lift the unit out of the transportation box.

3 Place it in a stable position on the floor/work bench.

4 Inspect the unit for visual damage.

5 Remove any packing material that may be inside the unit.

6 Collect and keep the relevant user manuals and/or documents provided with the unit.

Unpacking electronic and electromechanical units

Prior to installation or use, electronic and electromechanical units must be unpacked from their transport boxes. It is important that unpacking is done without inflicting damage to the equipment.

Context

Electronic and electromechanical units are normally wrapped in clear antistatic plastic bags.

Do not break the seal to open a printed circuit board, an electronic module or a unit before it shall be used. If the unit is returned with a broken seal we will assume that it has been used. You will then be billed accordingly.

Note

Beware of Electrostatic Discharge (ESD)!

When you handle electronic circuit boards and modules, you must beware of the dangers of electrostatic discharge (ESD), both to yourself and to the equipment. In order to ensure safe transport and storage, circuit boards and other electronic units will always be wrapped in a clear plastic protective bag, and the bag will be sealed.

Procedure

1 Lift the unit, in its protective bag, out of the transport box.

Note

You must never use the cables to lift or carry a unit.

2 Place it in a stable position on the floor or on the workbench.

3 Inspect the unit for damage.

a If a unit has been damaged, prepare an inspection report stating the condition of the unit and actions taken.

b Describe the damage, and collect photographic evidence if possible. Return the inspection report to Kongsberg Maritime as soon as possible.

4 Assuming all is well, open the bag and remove the unit.

5 Take out and keep the documentation.

You will need the documentation if the item shall be returned to us.

6 If applicable, open the unit and check inside.

7 Remove any packing and desiccant material that may be found inside the shipping container or bag.

8 Collect and keep the relevant user manuals and/or installation documents provided with the unit.

Unpacking transducers

Prior to installation or use, transducers, sonar heads and hydrophones must be unpacked from their transport boxes. It is important that this unpacking is done without inflicting damage to the equipment.

Prerequisites

Observe the procedure for unpacking of standard parts and units.

Context

Transducers may be supplied mounted to a hull unit (if any), or packed separately. Sonar heads and hydrophones are normally packed and shipped in separate boxes. Boxes are identified by the order number and the serial number of the unit inside.

Note

Once a transducer, sonar head or hydrophone is unpacked, make sure that the body and the cabling are not exposed to any mechanical stress. Protect the transducer face with a padded cover plate to prevent damage.

Transducers may be heavy.

A transducer must always be handled as a delicate instrument. Incorrect actions may damage the transducer beyond repair.

Observe these transducer handling rules:

- **Do not** activate the transducer when it is out of the water.
- **Do not** lift the transducer by the cable.
- **Do not** step on the transducer cable.
- **Do not** handle the transducer roughly. Avoid impacts.
- **Do not** expose the transducer to direct sunlight or excessive heat.
- **Do not** use high-pressure water, sandblasting, metal tools or strong solvents to clean the transducer face.

Procedure

1 Obtain the necessary lifting equipment, and make sure that the equipment is certified for the weight.

2 Lift the transducer, sonar head or hydrophone out of the transportation box.

3 Place it in a stable position on the floor/work bench.

4 Inspect the unit for visual damage.

5 Make sure that the relevant protection is kept in place until the final stages of the installation.

6 Collect and keep the relevant user manuals and/or documents provided with the unit.

7 Observe the handling rules for transducers.

Specifications for storage after unpacking

The unit must whenever possible be stored in its original transportation crate until ready for installation.

General specifications

During storage, each box must not be used for any purpose for which it was not intended (work platform, table, steps etc.).

Once unpacked, all equipment must be kept in a dry, non-condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to Kongsberg Maritime with the seal broken, we will assume that the unit has been used and you will be billed accordingly.

Each unit must be installed in its intended operating position as soon as possible after unpacking. If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must then be reconnected during the installation procedure. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them, or dispose of them by incineration.

Refer to the applicable product data sheets or battery handling procedures for further details.

Temperature protection

Any units that requires protection against extreme temperatures are identified as such in the applicable documentation. The box used to transport and store such units are clearly marked, for example:

Must not be transported or stored in temperatures below -5 °C.

Other temperature limits may be used if applicable.

If a unit needs temperature protection, the box to be used for storage and transportation must be lined on all walls, base and lid, using minimum 5 cm thick polyurethane or polystyrene foam.

Most system units can normally be stored in temperatures between -30° C and +70° C. Refer to the relevant technical specifications for details.

Note

Unless otherwise specified, transducers and hydrophones must not be stored in temperatures below −10°C and above +50°C.

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