Instruction Manual

KONGSBERG

MBR 179 MK2

Maritime Broadband Radio

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Instruction Manual

G210–55/4

Document information

- Product: MBR 179
- Hardware version: MK2
- Document: Instruction Manual
- Document part number: G210–55

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

Disclaimer

Kongsberg Seatex 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 contact us using the following address: km.support.seatex@km.kongsberg.com. If you need information about our other products, visit http: //www.kongsberg.com.

Table of contents

About this manual

Purpose of manual

The purpose of this manual is to provide the descriptions and procedures required to install, configure, operate and maintain the MBR 179.

Target audience

This publication is intended for all users of the MBR 179 system. This includes project engineering personnel, installation personnel, IT administrators and operators.

License information

The MBR 179 is not subject to product licensing. The product is a radio transmitting device. A frequency license is required for operation.

Maintenance purposes

This manual is also intended as reference material for the maintenance personnel. Keep this manual for later use.

Software version

The **Operation** chapter in this document is for Maritime Broadband Radios with software version 2.18 or higher.

This document describes the web interface configuration. For use of API (Application Programming Interface), refer to the API documentation.

MBR 179

Topics

System description

The MBR 179 is a Maritime Broadband Radio (MBR). It is a part of the Maritime Broadband Radio (MBR) product family of real-time steerable phased array digital radio units. It is developed for use in maritime applications where reliable communication and data transfer are crucial for efficient and safe operations. The MBR 179 is a radio type suitable for all types of vessels requiring long-range communication.

The MBR 179 is an Ethernet based radio that requires no extra infrastructure to operate. It operates on OSI layer 2 as a network bridge transporting IP packets over the air interface connecting computers, sensors and systems together. The radio has a TDMA access protocol with user configurable time slot allocation. The MBR 179 supports Internet Protocol version 4.

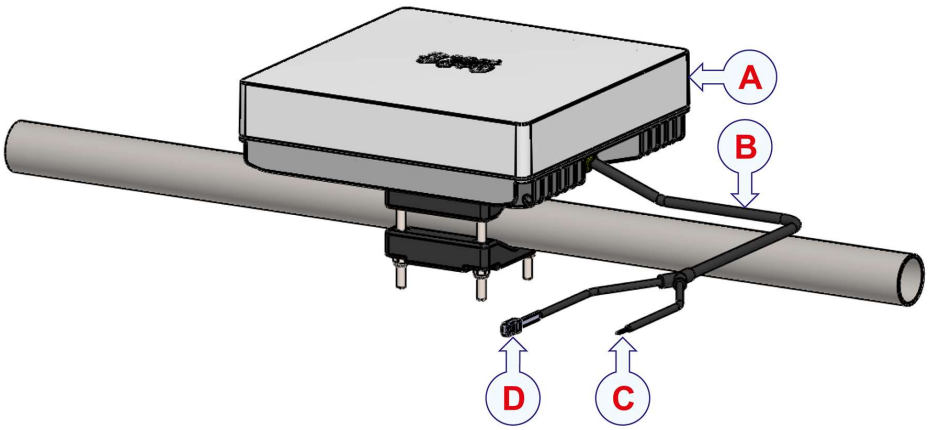
A *radio network* is a network of several MBR Units communicating together. The radio network operates as a wireless radio mobile ad hoc network (MANET) which can be used as a stand-alone network or as an extension of your existing radio network, or fixed

networks. The radio network is defined by network name, network id and encryption key. The MBR 179 can be used together with all other MBR Units in the product family.

A *radio site* is one or several radio units connected together by a local Ethernet connection at the same location. The benefits of a radio site with several radio units is an increased coverage area or redundancy with radios covering the same area. Data links to remote MBR units will seamlessly be handed over from one Radio Unit to another Radio Unit on the same radio site.

All antennas, radio transceivers and signal processing are contained in the radio unit. The interface to the radio unit is power and Ethernet. The MBR 179 can be powered from a 24 – 48 V DC power source or from an MBR Power Supply unit with AC input. The MBR Power Supply can be purchased from Kongsberg Seatex AS. The MBR 179 is set up via a web interface which is available on each radio unit. It can also be set up from an API (application programming interface). Contact Kongsberg Seatex AS for information on API.

System diagram



A *Radio Unit*

B *Combined Ethernet and power cable*

C *Connection to power source on vessel/ MBR Power Supply*

D *Ethernet connection to user equipment*

Scope of supply

The basic items are included in the delivery. Additional optional items can be purchased from Kongsberg Seatex AS.

Basic items

- 1 ea Radio Unit
- 1 ea Combined Ethernet and power cable, 10 m
- 1 ea End-user documentation

Additional required items

Observe these additional items which are required for installation and/or operation. They can be ordered from Kongsberg Seatex AS, or another Kongsberg office, or purchased locally.

- Power supply
- Computer

  For configuration purposes.

Additional optional items

Observe these additional optional items which can be used together with the MBR 179.

- MBR Power Supply
- Junction Box
- Power cable
- Ethernet cable
- Combined Ethernet and power cable, 30 m

Restrictions in guarantee

Changes or modifications to the product not explicitly approved by Kongsberg Seatex AS will void the guarantee.

The liability of Kongsberg Seatex AS is limited to repair of this product only under the given terms and conditions stated in the sales documents. Consequential damages such as customer's loss of profit or damage to other systems traceable back to this product's malfunctions, are excluded.

The warranty does not cover malfunctions of the product resulting from the following conditions.

- Incorrect power connection.
- Incorrect installation of galvanic isolation from vessel structure.

Radio frequency license

This product contains a radio transmitting device. A frequency license for the use of radio frequencies is required for operation. Use in national waters will require a frequency license issued by the relevant national authorities. The owner and user of the equipment are responsible for obtaining such a license prior to switching the product ON.

This product is in compliance with the standard ETSI EN 303 276. This applies to the frequency channels 5862 and 5890 MHz.

FCC compliance statement

This device complies with Part 15 of the FCC (Federal Communications Commission) Rules. Operation of the device is subject to the following conditions.

1 This device may not cause harmful interference.

2 This device must accept any interference received. Including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a marine and/or commercial environment. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions, the equipment may cause harmful interference to radio communication.The equipment is not intended for operation in a residential area. Operation in such an area is likely to cause harmful interference. In which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance, could void the user's authority to operate the equipment.

Health and safety

Operation or troubleshooting of this equipment will not imply any risk for high voltages, explosions or exposure to gas. The equipment complies with IEC 61010-1/EN 61010-1 standards regarding product safety. The equipment complies with IEC 60945/EN 60945 standards regarding environmental conditions.

Caution

RF exposure: According to EN 50385 the safety distance for the MBR 179 is 1.5 metres.

Network security

If a MBR 179 system is connected to a local area network, data security is important.

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

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

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

1 The likelihood that any remote computer will do any of the above.

2 The damage done if a remote computer succeeds doing this.

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

Note

No network safety applications are installed on Kongsberg Seatex computers. The computers are therefore not protected against viruses, malware or unintentional access by external users.

Securing the MBR 179 system itself has no meaning unless there is a policy in place that secures all computers in the network. This policy must include physical access by trained and trusted users. The customer/end user of the MBR 179 system will always be in charge of defining and implementing a security, policy and providing the relevant network security applications.

Note

Kongsberg Seatex will not accept any responsibility for errors and/or damages caused by unauthorized use of or access to the MBR 179.

Support information

If you need technical support for your MBR 179 system you must contact your local dealer, or one of our support offices.

- **Company name**: Kongsberg Seatex AS

- **Address**: Havnegata 9, 7010 Trondheim, Norway
- **Telephone**: +47 73 54 55 00
- **Telephone, 24h support**: +47 33 03 24 07
- **E-mail address**: km.support.seatex@km.kongsberg.com
- **Website**: http://www.kongsberg.com/maritime

Operation

Topics

Getting started

Topics

Turning on the Radio Unit

The Radio Unit can either be powered directly from a power source on the vessel or from the MBR Power Supply unit. The MBR Power Supply can be purchased from Kongsberg Seatex AS.

Context

The software is pre-installed and the system will start automatically after it has been turned on.

Procedure

1 Make sure that the Ethernet cable is properly connected.

2 Apply power to the Radio Unit.

   a Insert the power connector into the power source on the vessel.

   b Press the ON/OFF swtich located under the lid at the front of the MBR Power Supply.

Related topics

Enabling contact with the Radio Unit, page 15
Defining the IP address on the computer's network adapter, page 16
Setting to work summary, page 54
Installation with MBR Power Supply, page 55

Enabling contact with the Radio Unit

To be able to set up and communicate with the Radio Unit you must enable contact with the unit via a browser.

Prerequisites

In order to set up the Radio Unit you need these items.

- Computer with an Ethernet adapter.
- Up-to-date browser. For example Chrome or Firefox.

The IP address of the Radio Unit is found on a label at the rear of the unit.

You must define which IP Address and Subnet mask the Ethernet adapter in the computer shall use for this communication.

Context

You only need the computer for configuration or re-configuration purposes.

Note

The **MBR Configuration Wizard** *page only appears the first time you set up your site. After the configuration is completed, the web interface takes you directly to the* **Main** *view.*

Procedure

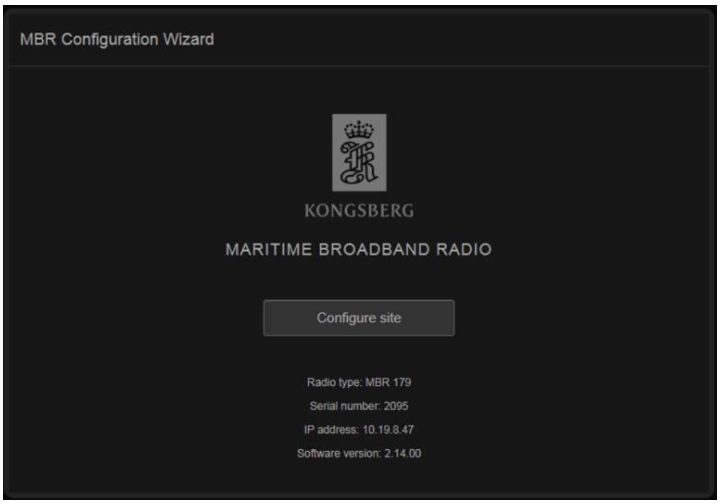
1 Set up the computer with:

   - **IP Address**: 10.19.127.10
   - **Subnet mask**: 255.255.0.0

2 Connect the computer to the Radio Unit via Ethernet.

3 Type the IP address of the Radio Unit in the browser address bar.

Observe that the **MBR Configuration Wizard** page appears.



For previously configured systems the **Main** view appears.

Result

You are now connected to the web interface on your local radio.

Related topics

Turning on the Radio Unit, page 14
Defining the IP address on the computer's network adapter, page 16
Setting up the radio site for operation, page 18
MBR Configuration Wizard, page 37
Setting to work summary, page 54

Defining the IP address on the computer's network adapter

You must define which IP Address and Subnet mask the Ethernet adapter in the computer shall use for this communication. As long as you do not replace the computer or the network adapter, you only need to do this once.

Prerequisites

This procedure is made for the Microsoft® Windows® 7 and 10 operating systems. It is assumed that you are familiar with the Windows® operating systems, computer technology, and interface principles.

Procedure

1 Close all the programs that are running on the computer.

2 Open the **Network Connections** dialog box.

This procedure is made for the Microsoft® Windows® 10 operating system.

a In the bottom-left corner of your desktop, select the Windows® search function.

b In the search box, type "Network Connections", and open the **Network Connections** dialog box.

c Right-click the network adapter you are going to use and select **Properties** on the shortcut menu.

d On the list of connections, select **Internet Protocol 4 (TCP/IPv4)**, and then **Properties**.

This procedure is made for the Microsoft® Windows® 7 operating system.

a In the bottom-left corner of your desktop, select the Windows® **Start** button.

b On the right-hand side of the **Start** menu, select **Control Panel**.

c Observe that the Control Panel opens.

d Select **Network and Sharing Center**.

(If the Control Panel is shown with categories, select **View network status and tasks**.)

e On the left-hand menu, select **Change adapter settings**.

f Click once on your network adapter to select it, then right-click and select **Properties** on the shortcut menu.

g On the list of connections, select **Internet Protocol 4 (TCP/IPv4)**, and then **Properties**.

3 Select **Use the following IP address**, and type the IP address and network mask.

- IP Address: **10.19.127.10**
- Subnet mask: **255.255.0.0**

4 Select **OK** to save the selected settings, and then close all the dialog boxes.

Related topics

Turning on the Radio Unit, page 14
Enabling contact with the Radio Unit, page 15
Setting up the radio site for operation, page 18
Setting to work summary, page 54

Operating procedures

Topics

Setting up the radio site for operation

The setup is done using a wizard. The **MBR Configuration Wizard**. A *radio site* is one or several radio units connected together by a local Ethernet connection at the same location. A *radio network* is a wireless network of radio sites. You must set up the radio site before you can start the radio network configuration. All configuration of the MBR 179 Maritime Broadband Radio (MBR) is done through the web interface.

Prerequisites

The IP address for the Radio Unit is located on a label at the rear of the unit. You must have enabled contact with the Radio Unit.

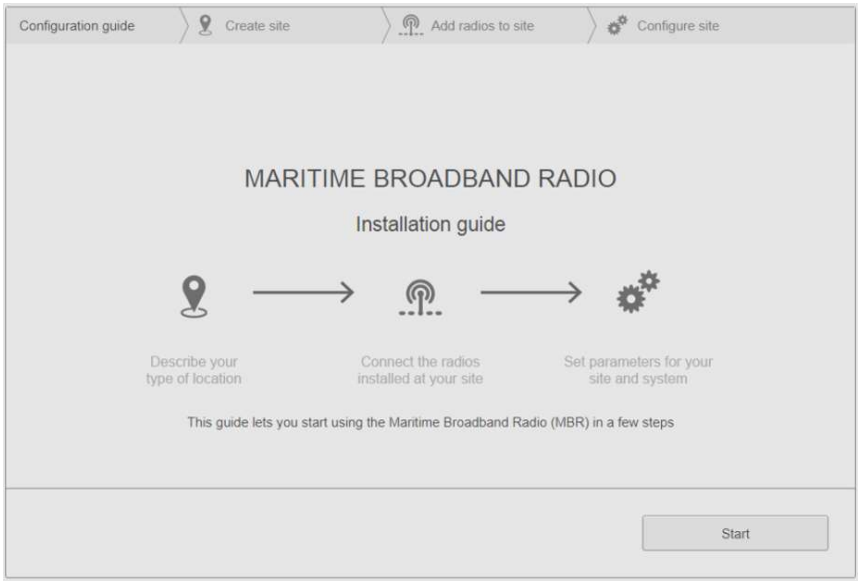
The IP address and the MAC address for the third party equipment must be known.

Context

The MBR 179 Maritime Broadband Radio (MBR) uses static layer 2 bridging (OSI model - Open Systems Interconnection Basic Reference Model). It needs both the IP address and the MAC address of the equipment in order to establish an IP connection over the wireless network.

Procedure

1 On the **MBR Configuration Wizard** page, which appears after you have enabled contact with the Radio Unit, select **Configure site** to start the installation wizard.

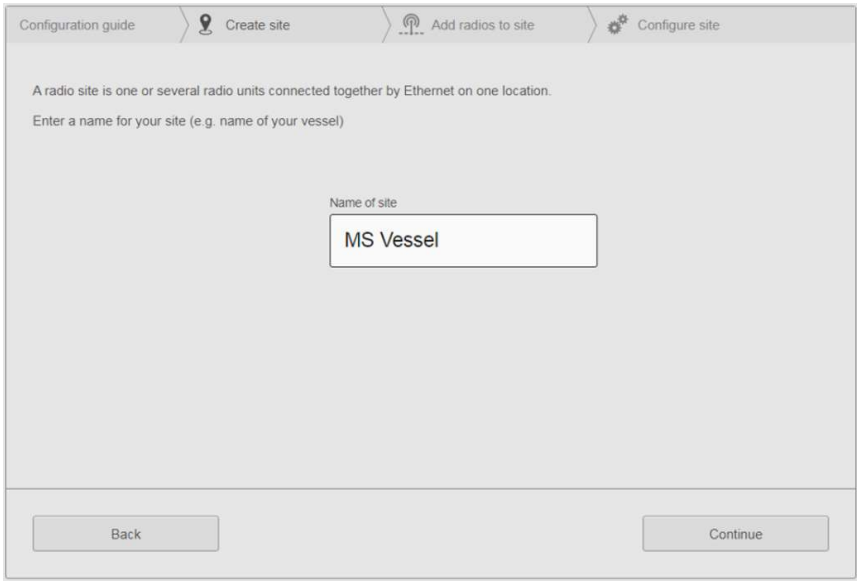


Note

The default colour palette setting is with dark background. If your current light conditions require white background, select the white colour palette in the **Palette** *group.*

2 Select **Start** on the **Configuration guide** page to start the step-by-step configuration of your radio site.

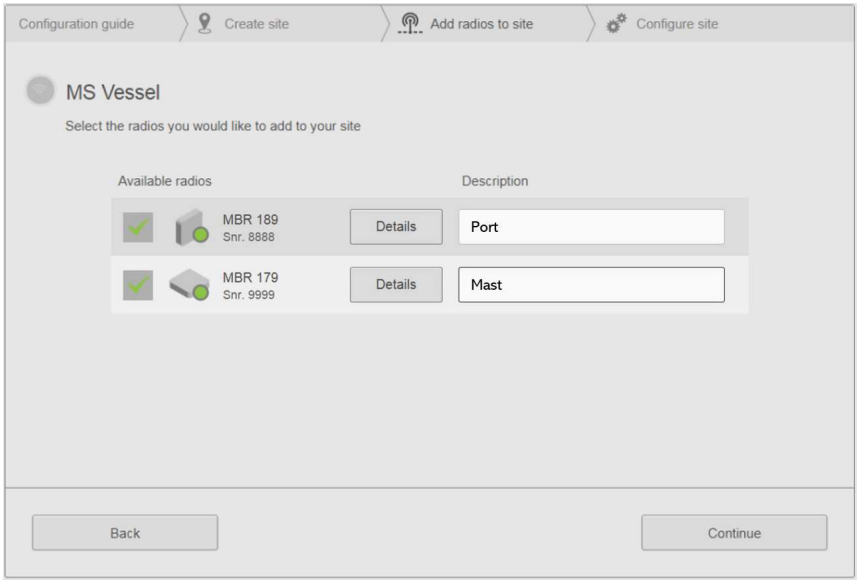
3 Type a suitable name for your radio site and select **Continue**.



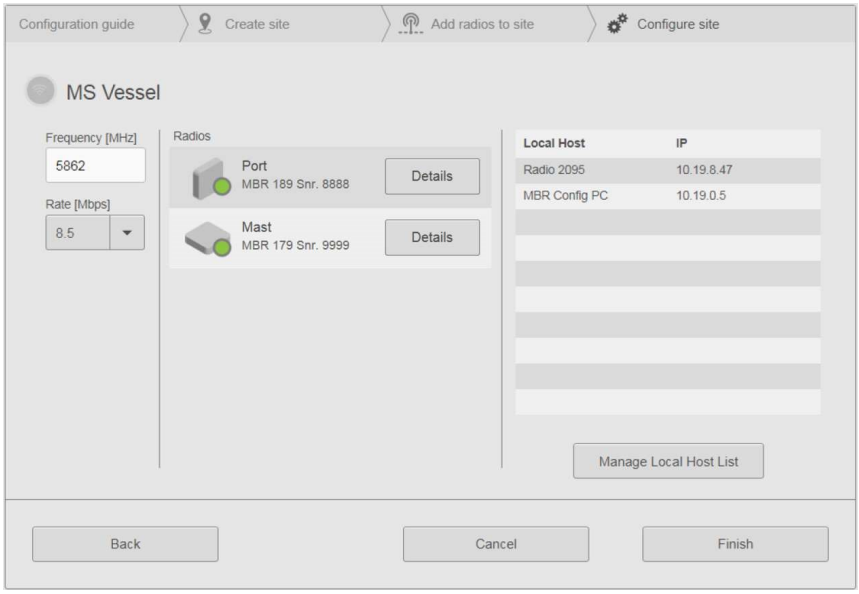
4 Select the radios you want to add to the site. Type a description of the location of the Radio Unit. Select **Continue**.

Note

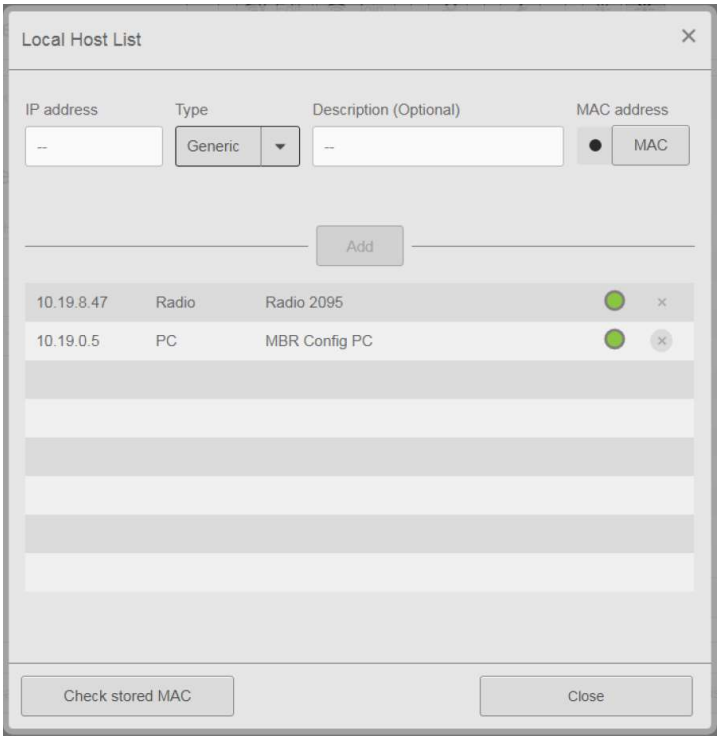
Radio units connected on the local Ethernet will appear automatically. They are by default selected.



5 Type the radio frequency. Select the data rate for the radio site from the **Rate** list.



6 Select **Manage Local Host List** to open the **Local Host List** dialog box. This is where you add the equipment to your radio site which shall be available in the wireless network.



7 Type the IP address of the equipment you want to connect. Select type of equipment from the **Type** list. Type a description of the equipment for identification purposes.

If the equipment is switched on, the MAC address appears automatically. If not, type the MAC address. Select **Add** to add the equipment.

Note

You can add and/or change information later by selecting the equipment, making the changes and selecting **Update**. *You can also delete equipment by selecting the* **X** *symbol at the end of the line.*

8 Continue for all the equipment you want to add. Select **OK** to save the selected setting and close the dialog box.

9 Select **Finish** to complete your radio site configuration.

Result

The **Main** view appears and you are now ready to start using the radios.

Related topics

Enabling contact with the Radio Unit, page 15
Defining the IP address on the computer's network adapter, page 16
Configuration guide, page 37
Create site, page 38
Add radios to site, page 39
Configure site, page 40
Setting to work summary, page 54

Joining a wireless network

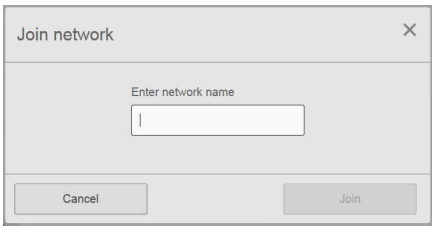
You must join the wireless network which you want your site to be a part of. If another radio site has created a new wireless network, you might want to join this network.

Context

If you are out of range of the wireless network at the time you carry out this procedure, the radio will automatically detect the wireless network and establish a connection when you are within reach of this network.

Procedure

1 On the **System** menu —> **Network**, select **Join** to open the **Join network** dialog box.



2 Type the name of the wireless network you want to join.

Note

The wireless network name is in upper case.

3 Select **Join** to join the wireless network.

Related topics

Setting to work summary, page 54
Join network, page 47

Editing an existing radio network

During operation you might want to administer and make changes to the wireless network. If a new site has been established or you want to change the distribution of resources.

Prerequisites

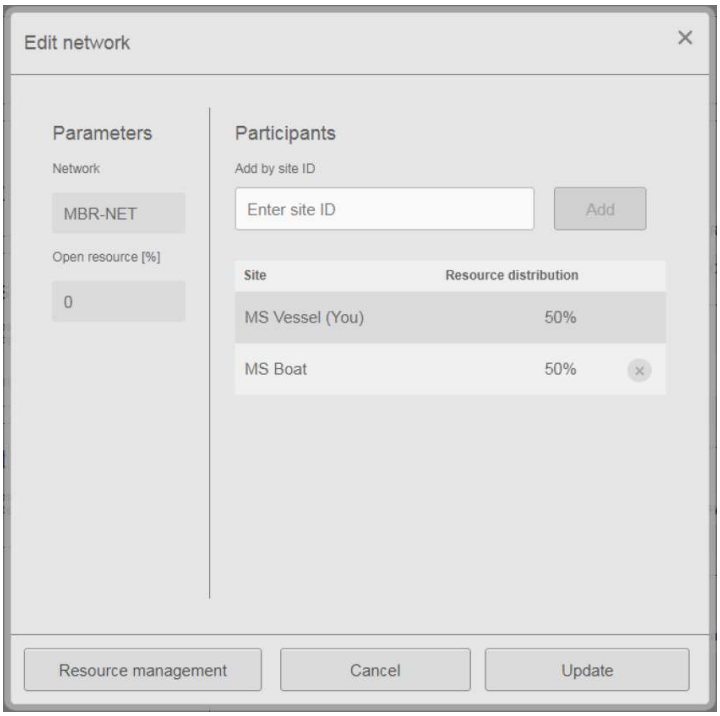
A wireless network must have been set up previously.

Context

The site ID is equal to the serial number of the Radio Unit. For multiple-panel sites, the site ID is equal to the lowest serial number.

Procedure

1 On the **System** menu —> **Network**, select **Edit** to open the **Edit network** dialog box.



2 If you want, type a new site name in the **Add by site ID** box. Select **Add** to add a new site to the existing network.

3 If you want to change the bandwidth resources, or the superframe length for the wireless network, select **Resource management** to enter the **Resource management** dialog box.
If you want to adjust the superframe, type the wanted **Superframe length**. Type the wanted **Resource distribution**in the Site list.

Note

For Superframe length it is recommended to use 50 – 100 ms. However, for special applications the superframe can be adjusted. This will affect the data throughput.

4 Select **OK** to store the bandwidth settings and return to **Edit network**.

5 Select **Update** to save the network settings.

Related topics

Edit network, page 44
Resource management, page 45

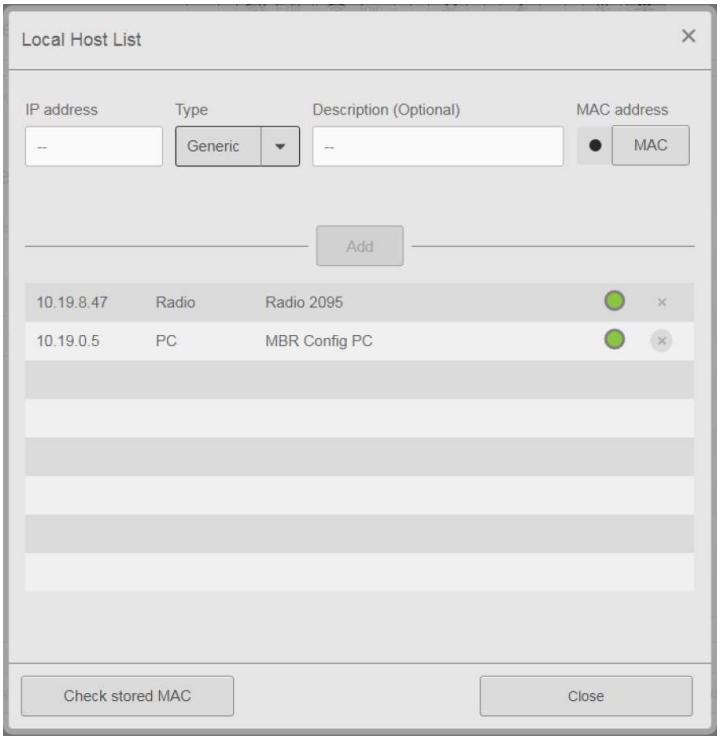
Adding or removing equipment

If you want to communicate with other types of equipment, for example sensors, you can add this equipment to your radio site. When third party equipment is no longer in use on your site, you can remove it.

Procedure

1 On the **System** menu, select **Site** to enter the **Configure site** page.

2 Select **Manage Local Host List** to open the **Local Host List** dialog box.



3 Type the IP address of the equipment you want to connect. Select type of equipment from the **Type** list. Type a description of the equipment for identification purposes. If the third party equipment is switched on, the MAC address appears automatically. If not, type the MAC address.
Select **Add** to add the equipment.

4 To remove equipment, select the X symbol at the end of the line.

5 Continue for all the equipment you want to add or remove. Select **OK** to close the dialog box.

6 Back to the **Configure site** page. Select **OK** to save the chosen settings.

Related topics

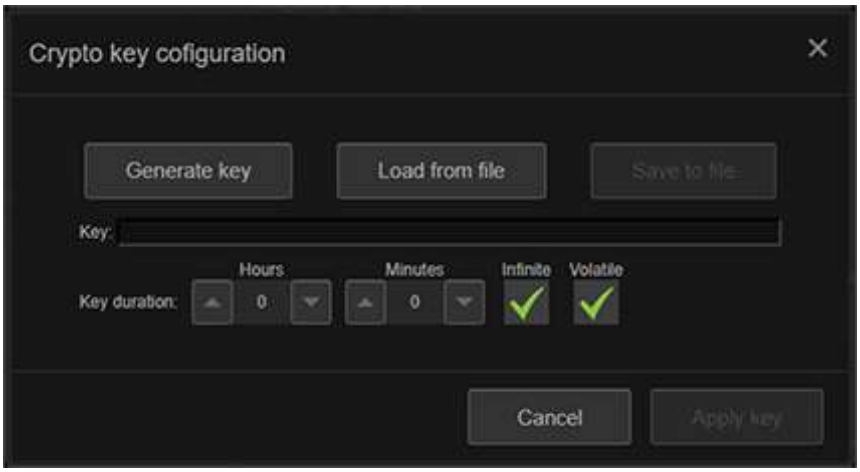
Local Host List, page 42

Enabling the embedded MBR link crypto

Here you can generate, upload or download the symmetrical crypto keys for the MBR embedded link crypto. The same crypto key must be entered on all radios in the same wireless network so the radios can communicate with each other.

Context

The crypto key length is 56 bits. The crypto key can be set to **infinite** duration or a time specific duration. The **Volatile** option specifies whether the key is stored in the MBR configuration indefinitely, or if the key is lost on the next power cycle, or until the key is re-configured.



Procedure

1 On the **System** menu, select **Crypto**.

2 Select **Generate key** if you want to generate a new key. Select **Load from file** if you want to upload a crypto key from a text file.

3 Set a specific duration for the crypto key or select **Infinite** if you do not want an expiry date for the key.

4 Select **Volatile** if you want indefinite storage of the key.

5 Select **Apply key** to save the setting.

Related topics

Crypto key configuration , page 47

Checking the status of the MBR network

During operation you can check the status of the local radio site, the remote site(s) and the entire network of radio sites.

Prerequisites

The radio site(s) must have been set up for operation. If not, there is no status information to display.

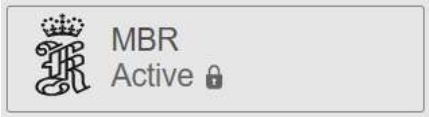
Context

The status information is located to the left of the Main view. It is easily visible to the operator.

Procedure

1 Look at the system status information to view the status about your local site.

The status is **Active** when the radio site is set up for operation. The status is **Not configured** when the radio site is not set up for operation.

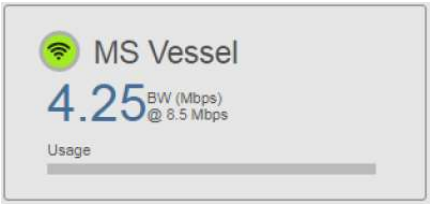


2 Look at the network information to view the status of the current radio network.

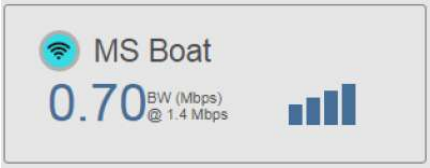
The current name and the frequency of the network are displayed.

3 Look at the **Site list** to view information about each site in the radio network.

The **Site list** holds information about your local site and remote radio sites.



BW indicates the bandwidth resource allocated to the local radio site. The **Usage** bar indicates the instantaneous usage of the bandwidth resource.



BW indicates the bandwidth resource allocated to the remote radio site. The signal strength bar indicates the signal strength of each local site.

Related topics

System status, page 48
Network status, page 48
Individual radio site status, page 49
Display organisation, page 29

User preference procedures

Topics

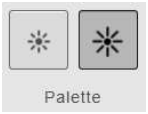
Selecting colour palette for display, page 28

Selecting colour palette for display

You can select a colour scheme for the display which suits your current light conditions.

Context

The **Palette** function provides colour schemes for the display presentation. Two palettes are available. Day black and Day white.



Procedure

1 Select **Palette** on the **System** menu.

2 Select the colour scheme you want to use.

User interface

Topics

Operational principles

The MBR 179 has a graphical configuration and user interface. Use a mouse and keyboard to navigate, select and operate the system.

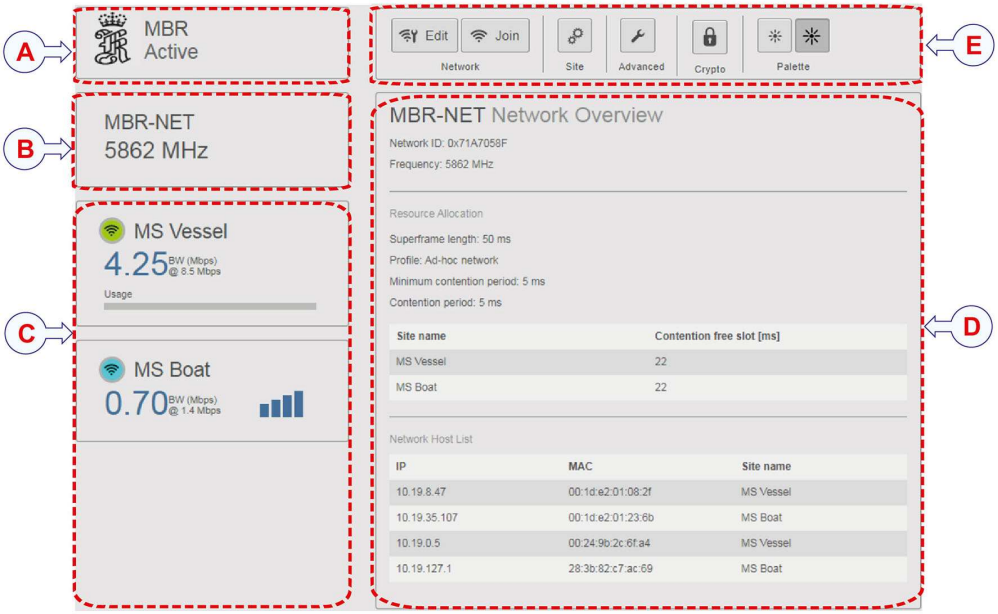
The MBR 179 is operated and configured from the **System** menu.

Related topics

Menu system, page 36

Display organisation

The display is made up of five main parts. Information boxes with information about the status of the overall system, the networks and the radio sites to the left. A **System menu**, from which you operate and configure the system, at the top. Below the **System menu** various views will appear, depending on which of the information boxes to the left are selected. These views contain more detailed information about the overall system, the networks and the local radio sites.



A **System status**: *It shows the overall radio system status.*

B **Network information**: *It shows the name and frequency of the current network.*

C **Site list:** *A list of radio sites in the current network.*

D **Status information views**: *Three views may appear here, depending on which box is selected to the left. System Overview, Network Overview or Local Site information.*

E **System menu**: *It provides various system settings and operational functions.*

Related topics

Checking the status of the MBR network, page 27

Display views

Topics

System Overview view, page 31

Network Overview view, page 32

Local Site view, page 33

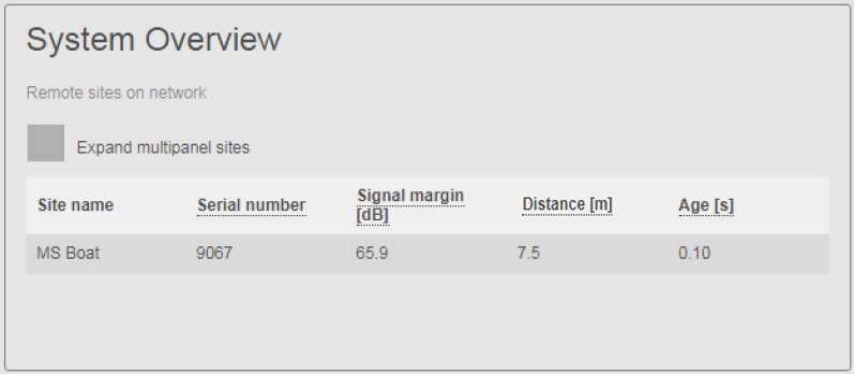
System Overview view

The *System Overview* view shows all sites in the wireless network. It also shows the radio serial number, signal margin, distance and data age for every site.

How to open

Select the **System status** box to the left in the **Main** view.

Example



Details

Expand multipanel sites

This option applies to sites with more than one Radio Unit (panel). Select this option to show more information about the other Radio Units which belong to this multipanel site.

Site name

This is the name of the remote radio sites in the network.

Serial number

This is the serial number of the radios on each individual remote site.

Signal margin [dB]

This is the receiver signal margin for the remote radio site (s).

Distance [m]

This is the distance in metres to the remote radio site(s).

Age [s]

This is the age of the data which are shown for this site.

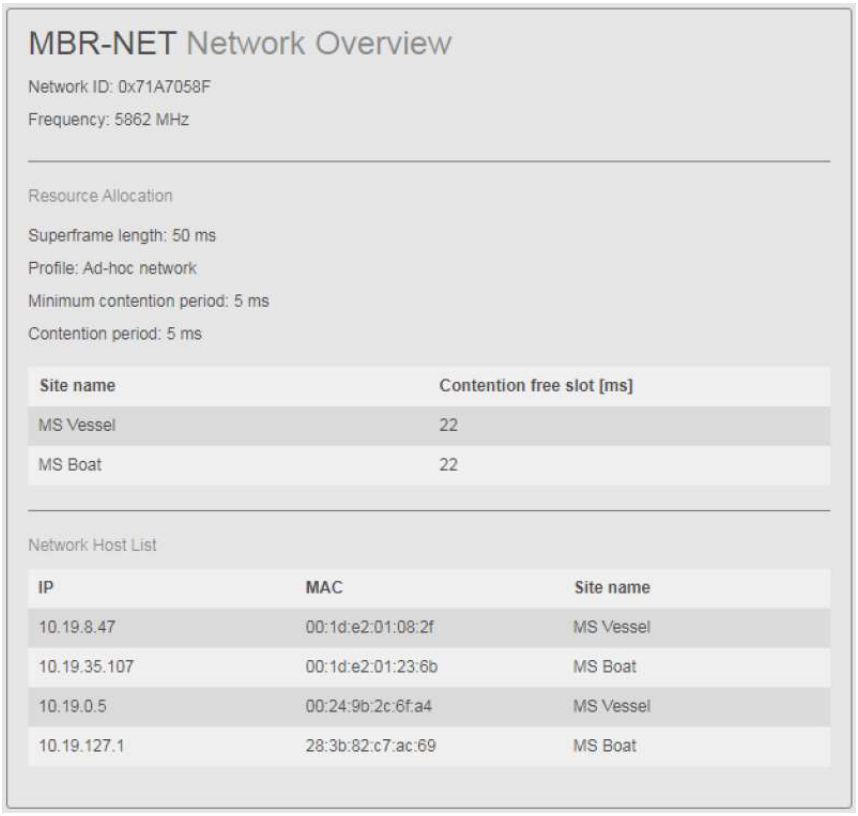
Network Overview view

The *Network Overview* view is useful to monitor details about the wireless network. It shows the network parameters and the Network Host List. The Network Host List is the combination of all the Local Host Lists in the wireless network.

How to open

Select the **Network status** box to the left in the **Main** view.

Example



Details

Network ID

This is the hexadecimal value of the network name used for identifying that each radio is on the same logical network.

Frequency

This is the configured operating frequency of the network.

Superframe length

This is the length of the repeating superframe of bandwidth allocation in milliseconds.

Profile

This is the current network profile.

Minimum contention period

This is the minimum contention period in the superframe. It shows the percentage of the bandwidth which is an open resource. Open resource is a contention-based multiple access protocol which allows radio sites to communicate without having a fixed allocated time slot.

Contention period

It shows the contention period in milliseconds. Contention period is also called Open period, and is a contention-based multiple access protocol which allows radio sites to communicate without having a fixed allocated time slot.

Site name

This is the name of the radio sites in the wireless network.

Contention free slot [ms]

This is the reserved transmission time for a radio site.

IP

This is the IP (internet protocol) address of the equipment in the Network Host List.

MAC

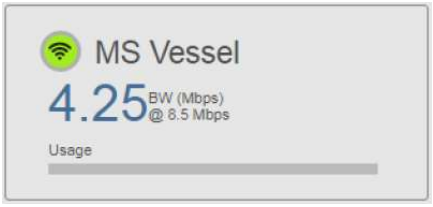
This is the MAC (media access control) address of the equipment in the Network Host List.

Local Site view

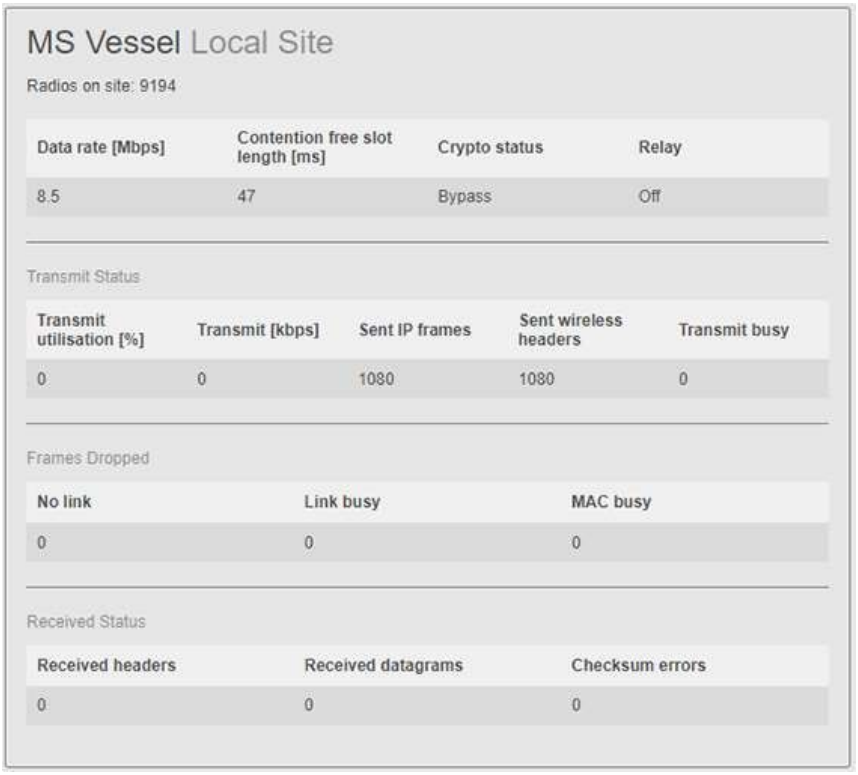
The *Local Site* view is useful to monitor information about the local radio site. It shows local site setup parameters and information about sent and received datagrams.

How to open

Select the **Local site** box to the left in the **Main** view.



Example



MS Vessel Local Site

Radios on site: 9194

Data rate [Mbps]	Contention free slot length [ms]	Crypto status	Relay
8.5	47	Bypass	Off

Transmit Status

Transmit utilisation [%]	Transmit [kbps]	Sent IP frames	Sent wireless headers	Transmit busy
0	0	1080	1080	0

Frames Dropped

No link	Link busy	MAC busy
0	0	0

Received Status

Received headers	Received datagrams	Checksum errors
0	0	0

Details

Data rate [Mbps]

This is the configured data rate.

Contention free slot length [ms]

This is the configured reserved transmission time for the local site.

Crypto status

This is the status of the link crypto functionality.

Relay

This shows the status of the relay functionality for this site, if the relay functionality has been enabled.

Transmit utilisation [%]

This is the current transmission utilisation percentage of the allocated resource (contention free slot).

Transmit [kbps]

This is the current transmission in kbps.

Sent IP frames

This is the number of sent IP frames from this site.

Sent wireless headers

This is the number of wireless frames sent from this site (IP frames and management data).

Transmit busy

This shows the number of datagrams currently in queue for transmission.

No link

This shows the frames which have not been sent due to no link.

Link busy

This shows the frames which have not been sent due to a full transmission queue.

MAC busy

This shows the frames which have not been sent due to a busy MAC (media access control) controller.

Received headers

This is the counter for received wireless headers.

Received datagrams

This is the counter for received decoded datagrams.

Checksum errors

This is the counter for Checksum errors.

Functions and dialog boxes

Topics

Crypto key configuration , page 47

System status, page 48

Network status, page 48

Individual radio site status, page 49

Menu system

The **System** menu is always visible at the top of the display. The menu provides various system settings and operational functions.

The **System** menu provides access to four groups of functions.

Network

Network allows you to join an existing network or edit an existing network.

Site

Site allows you to configure the radio site. Select **Site** to return to the configuration of your radio site. Here you can update the frequency, the data rate the third party equipment for the local radio site. You can also see the radio details for the radios on the local site.

Advanced

Advanced contains a web page with a set of advanced functions, tuning and diagnostics. These settings are for experienced users only. They are not intended for use under normal conditions. Therefore, they are not described in this document.

Crypto

Crypto opens the **Crypto key configuration**. Here you can generate, upload or download the symmetrical crypto keys for the MBR embedded link crypto.

Palette

Palette provides you with colour schemes for the display presentation. Select the colour scheme which suits your light conditions.

Related topics

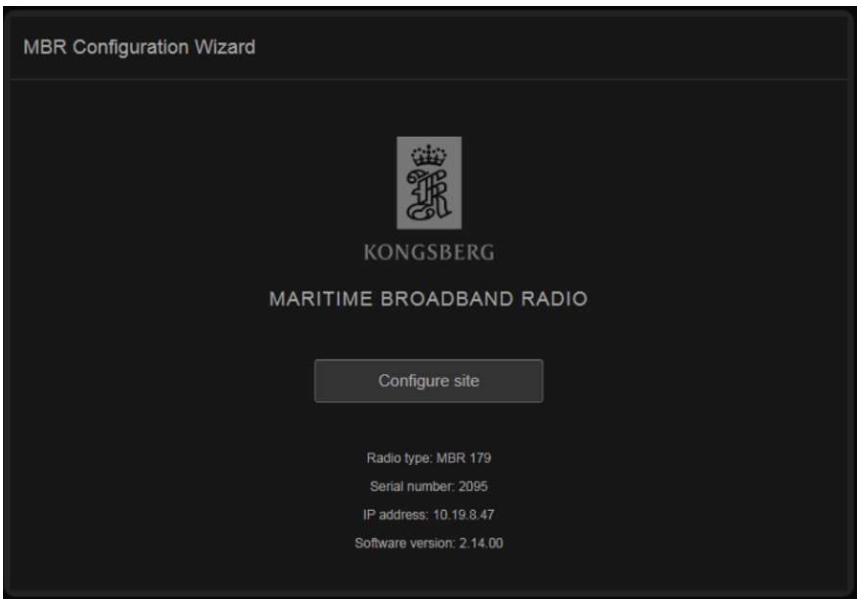
Operational principles, page 29

MBR Configuration Wizard

The **MBR Configuration Wizard** page is the start page of your radio unit configuration. It only appears when the radio site is not configured. It is either the first time the radio is started, or after configuration is reset.

How to open

The **MBR Configuration Wizard** page appears when you have enabled contact with the radio unit via the web interface.



Details

Configure site

Select the **Configure site** button to open the installation wizard. The wizard takes you through the step-to-step configuration of your radio site.

Related topics

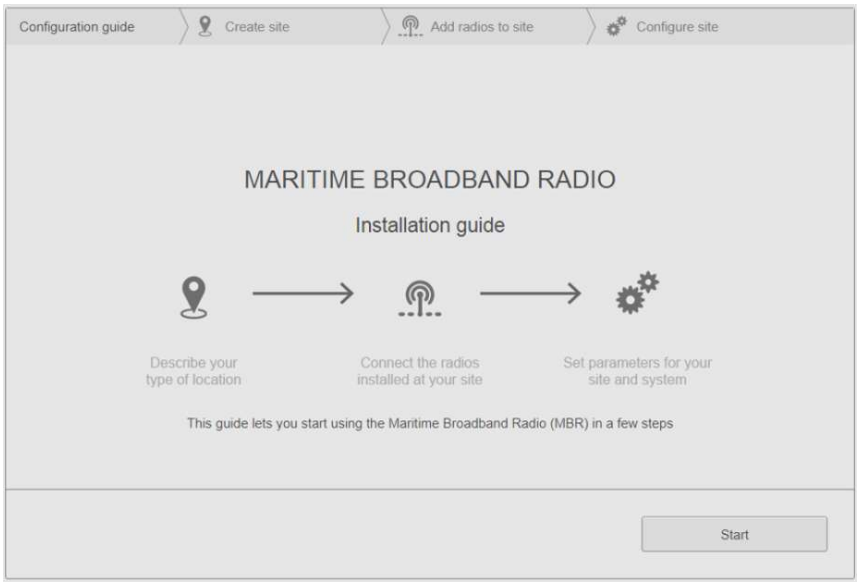
Enabling contact with the Radio Unit, page 15

Configuration guide

An installation wizard takes you through the setup of the radio site. The **Configuration guide** page is the first page in the step-to-step configuration of your radio site.

How to open

Select the **Configure site** button on the **MBR Configuration Wizard** page to open the installation wizard.



Details

Start

Select the **Start** button to start the step-to-step configuration of your radio site.

Related topics

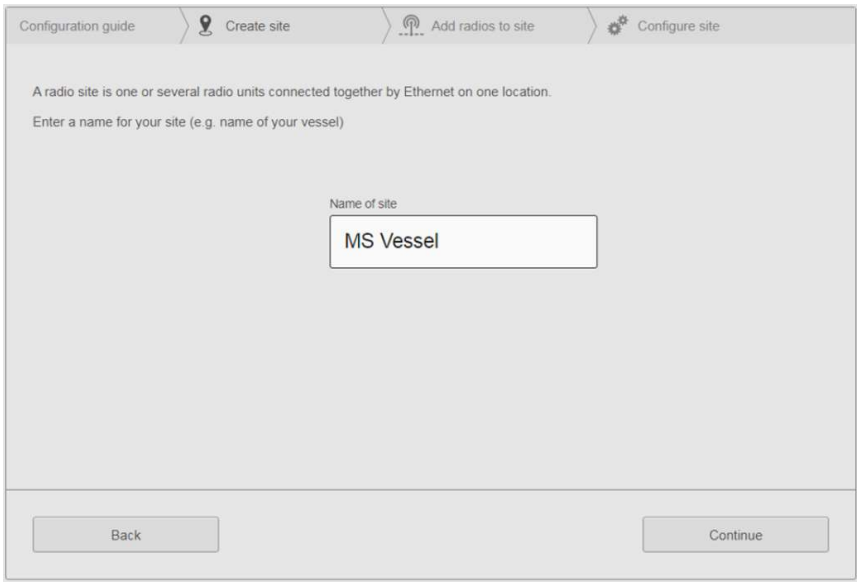
Setting up the radio site for operation, page 18

Create site

Here you can type the name of your radio site.

How to open

This page is step 2 in the step-to-step configuration of your radio site.



Details

Name of site

Type a suitable name for your radio site. This name will be displayed in the **Site list** and in the **Network** view.

Related topics

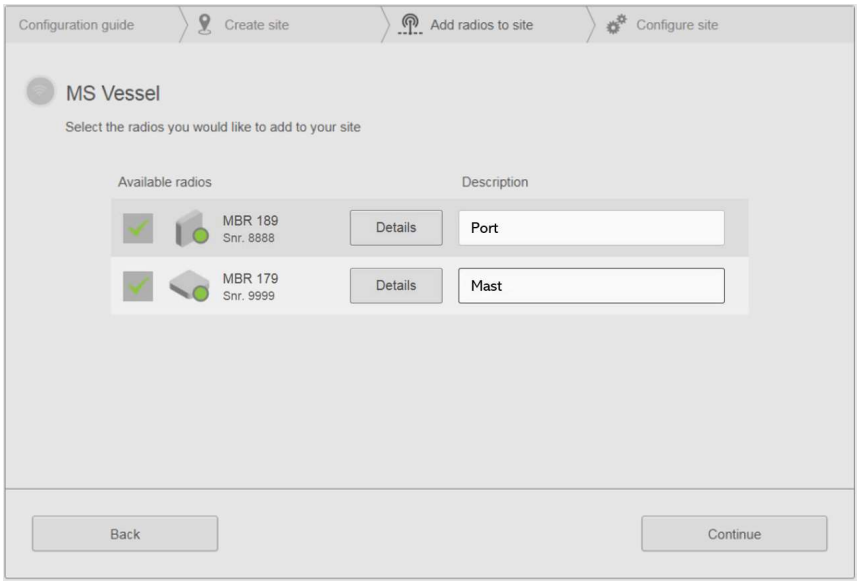
Setting up the radio site for operation, page 18

Add radios to site

Here you can add radios to your radio site.

How to open

This page is step 3 in the step-to-step configuration of your radio site.



Details

Available radios

This is a list of available radios. Radio units connected on the local Ethernet will appear automatically. They are by default selected.

Details

Select the **Details** button to open the radio **Status** box. This dialog box shows the serial number, product version, configured values and diagnostics for the Radio Unit.

Name/description

Here you can type a description of the location of the Radio Unit.

Related topics

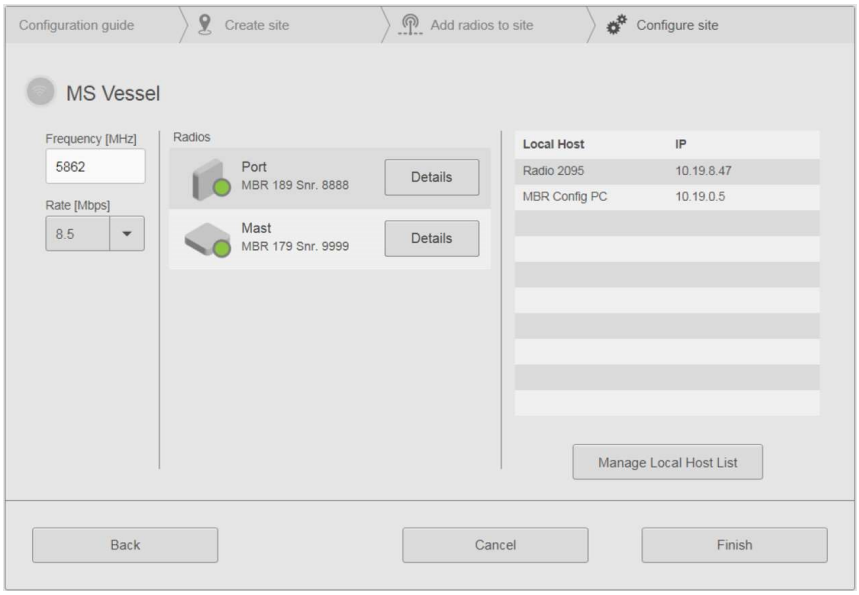
Setting up the radio site for operation, page 18
Status, page 43

Configure site

Here you can set the frequency, the data rate and select third party equipment for the local radio site. You can also see the radio details for the radios on the local radio site. This is also where you make changes to the radio site setup.

How to open

This is the last page in the step-to-step configuration of your radio site.



Details

Frequency

This is the operating frequency of the radio site.

Rate

This is the operating data rate of the radio site.

Radios

This is a list of radios which are added to the radio site.

Details

Select the **Details** button to open the radio **Status** box. This dialog box shows the serial number, product version, configured values and diagnostics for the Radio Unit.

Local Host & IP

The **Local Host List** shows the current host name(s) and associated IP addresses in the Local Host List.

Manage Local Host List

This button opens the **Local Host List** dialog box. Here you can manage equipment which is connected to the radio site.

Related topics

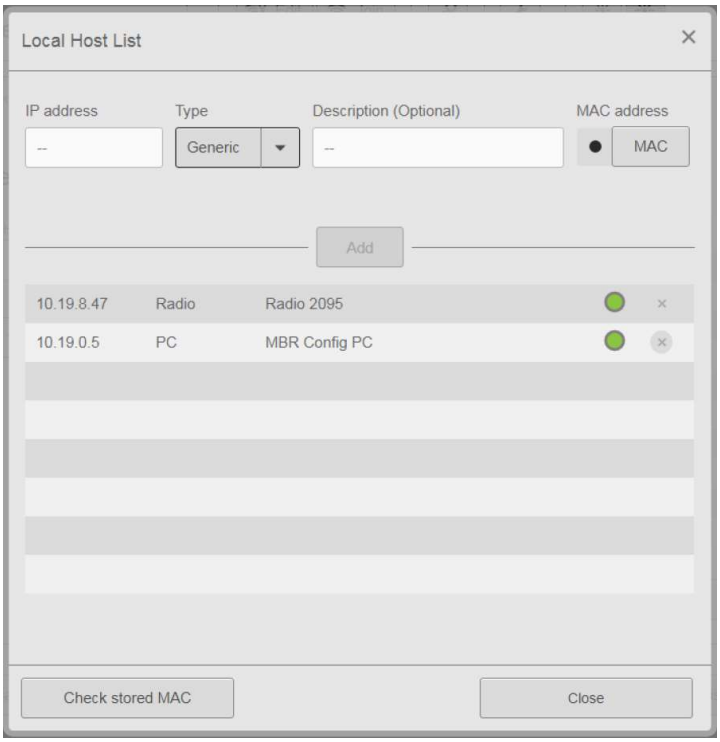
Setting up the radio site for operation, page 18
Local Host List, page 42
Status, page 43

Local Host List

In the **Local Host List** dialog box you can manage equipment connected to your radio site. It contains a list of equipment where the radio site provides IP connectivity in the MBR network.

How to open

This dialog box is opened from the **Configure site** page.



Details

IP Address

This is the IP address of the equipment you want to add to your radio site.

Type

This is a drop-down list of various metadata information about the equipment which can be useful to add to your radio site. For example computers and motion sensors.

Description

Here you can type a name which describes the equipment you want to add to your radio site. When you type in this box, the **Add** button becomes active.

MAC address

This is the MAC (media access control) address of the equipment you want to add to your radio site. The circle becomes green when a MAC address is found

automatically for the entered IP address. Select the **MAC** button to change or view the MAC address.

Check store MAC

Select this button if you want to recheck the MAC address for every equipment added to the list in order to verify current status on the local network.

Related topics

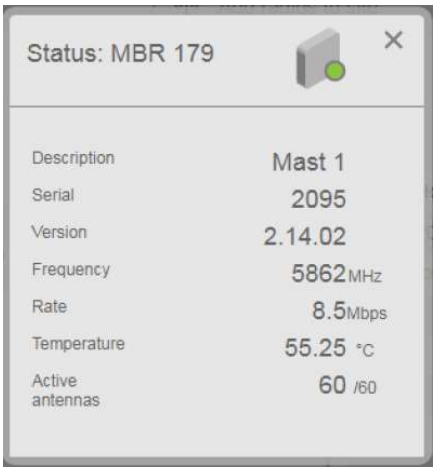
Adding or removing equipment, page 25
Configure site, page 40

Status

The radio **Status** box shows the serial number, product version, configured values and diagnostics for the Radio Unit.

How to open

This box is opened by selecting the **Details** button in the **Add radio to site** page or the **Configure site** page in the step-to-step configuration.



Details

Description

This is the description of the location of the current Radio Unit.

Serial

This is the serial number of the Radio Unit.

Version

This is the software version of the Radio Unit.

Frequency

This is the operating frequency of the Radio Unit.

Rate

This is the configured data rate for the Radio Unit.

Temperature

This is the internal temperature of the Radio Unit.

Active antennas

This is the number of active antenna elements.

Related topics

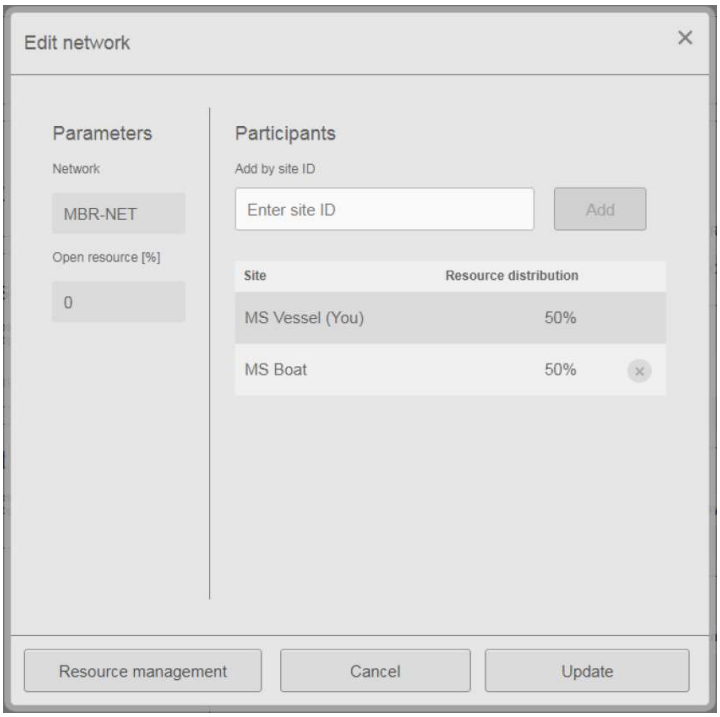
Add radios to site, page 39
Configure site, page 40
Checking the product version, page 70

Edit network

Edit network allows you to edit the wireless network.

How to open

This dialog box is opened from the **System** menu.



Details

Network

This is the name of the current wireless network.

Open resource

It shows the percentage of the bandwidth which is an open resource. Open resource is a contention-based multiple access protocol which allows radio sites to communicate without having a fixed allocated time slot.

Add by site ID

You can add a radio site to the site list of the network by typing the site ID for the remote site.

Site list and resource distribution

They show all sites in the current network with the same network name and the resource distribution between the radio sites.

Resource management

This button opens the **Resource management** dialog box. This is where you can change the resource distribution between the radio sites.

Related topics

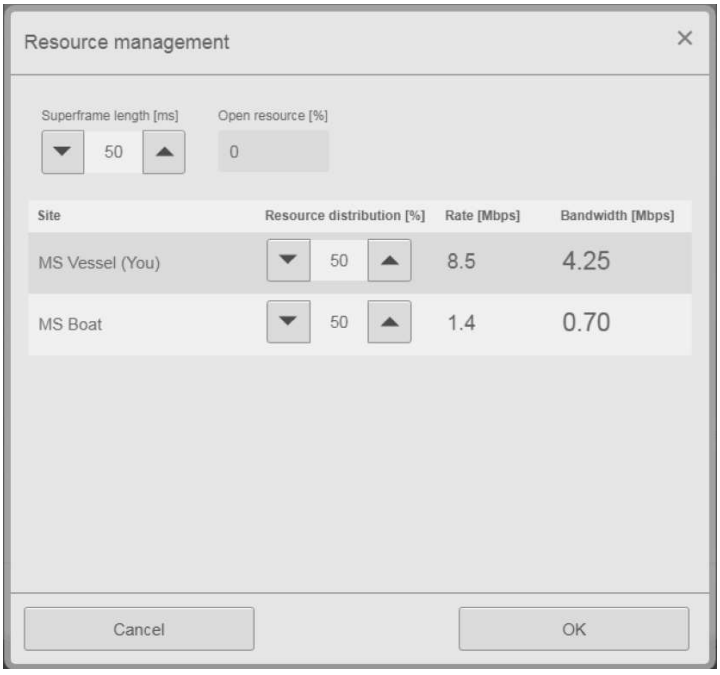
Editing an existing radio network, page 23
Resource management, page 45

Resource management

Resource management allows you to change the resource distribution between the radio sites in the radio network.

How to open

This dialog box is opened from the **Edit network** dialog box.



Details

Superframe length

This is the length of the repeating superframe of bandwidth allocation in milliseconds.

Open resource

It shows the percentage of the bandwidth which is an open resource. Open resource is a contention-based multiple access protocol which allows radio sites to communicate without having a fixed allocated time slot.

Site list and resource distribution

They show all sites in the current network with the same network name and the resource distribution between the radio sites.

Rate

This is the operating data rate of the radio site.

Bandwidth

It shows the bandwidth of the radio site for the selected resource distribution and the data rate.

Related topics

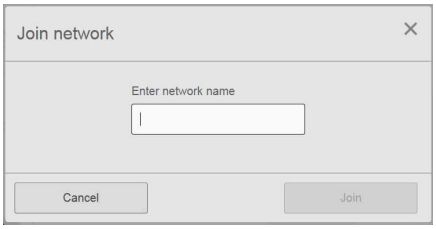
Editing an existing radio network, page 23
Edit network, page 44

Join network

The **Join network** dialog box allows you to join an existing MBR network (Maritime Broadband Radio) by typing the network name.

How to open

This dialog box is opened from the **System** menu.



Details

Enter network name

This is the name of the wireless network you want to join. The wireless network name is in upper case.

Related topics

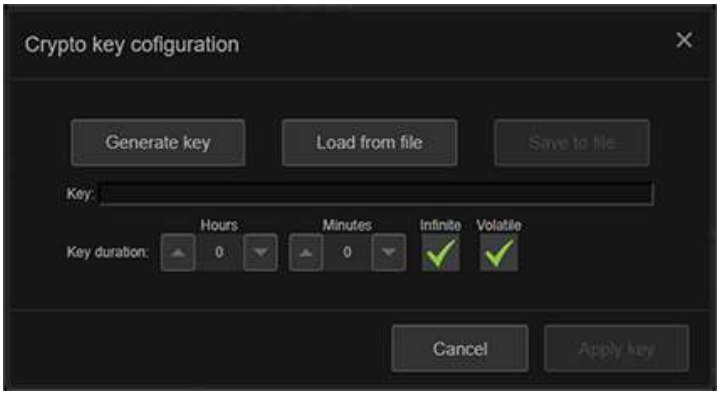
Joining a wireless network, page 22

Crypto key configuration

The MBR link crypto encrypts the wireless link with the use of 56-bit symmetrical keys. The same crypto key must be entered on all radios in the same wireless network so the radios can communicate with each other.

How to open

Select the **Crypto** button on the **System** menu to open the dialog box.



Details

Generate key

Select this button to generate a new crypto key.

Load from file

Select this button if you want to upload a crypto key from a text file.

Key

Here you can type the crypto key manually.

Save to file

Select this option if you want to save a crypto key to a text file.

Key duration

Here you can set a specific duration for the crypto key.

Infinite, Volatile

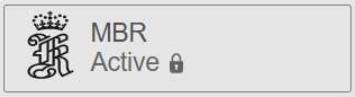
If you select **Infinite**, the key has no expiry date. If you select **Volatile**, the key is not active after the next power cycle.

Related topics

Enabling the embedded MBR link crypto, page 26

System status

The **System status** shows the status for the local radio site. The status is **Active** when the radio site is configured. The status is **Not configured** when the radio site is not configured.



The **System status** is located to the left in the **Main** view.

The padlock symbol indicates that a crypto key has been enabled.

Related topics

Checking the status of the MBR network, page 27

Network status

The **Network status** shows the current network name and the frequency of the network. The Network status is located to the left in the **Main** view.

Related topics

Checking the status of the MBR network, page 27

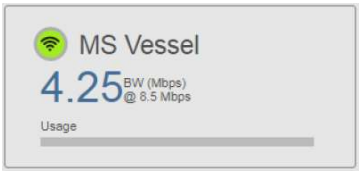
Individual radio site status

The **Site list** contains information about each radio site in the network. Both for local and remote radio sites.

The **Site list** is located to the left in the **Main** view.

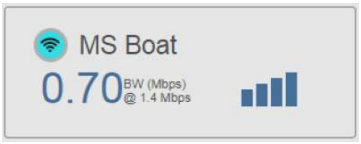
Local radio site

The site name for the local radio site is displayed. **BW** indicates the bandwidth resource allocated to the local site. The **Usage** bar indicates the usage of the bandwidth resource.



Remote radio site

The site name for the remote radio site(s) is displayed. **BW** indicates the bandwidth resource allocated to the remote site. The signal strength bar indicates the signal strength of each local site.



Related topics

Checking the status of the MBR network, page 27

Installation

Topics

Preparations

Topics

Mechanical drawings

Outline dimension drawings are included in this manual.

Unless otherwise specified, all measurements are in millimetres. The drawings are not to scale.

Related topics

Radio Unit dimensions, page 63
MBR Power Supply dimensions, page 64

Necessary tools and equipment

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.

Unless otherwise stated, all mounting hardware (such as bolts, nuts, washers, screws etc.) referred to in this document is to be supplied by the customer or the shipyard.

An external computer is required for configuration of the Radio Unit through a web interface. You also need a computer if you want to change the configuration later.

Radio Unit location

Correct location of the Radio Unit is important for the system performance. Consider these factors when installing the unit.

- The Radio Unit shall cover a sector of 360 degrees horizontally. This is the operating area of the Radio Unit.
- The Radio Unit shall not be obstructed by any objects in a sector of 360 degrees horizontally. This is the no-object area. Obstructions in the no-object area will lower the signal margin in the obstructed sector.
- Place the Radio Unit in a location where the operating area is not obstructed. No metallic or non-metallic objects, such as glass, plastic or wood, must be present in the no-object area.
- Place the Radio Unit as high as possible above sea level. A suitable location can be in the top of a mast.
- Use a stable power source with correct voltage.

Related topics

Installing the Radio Unit, page 52

Radio Unit power source

The Radio Unit can be connected to 24 - 48 V DC.Alternatively, the Radio Unit can be connected to the MBR Power Supply.

The selection of an AC or a DC power source is dependent on the available power output or user preferences. The Radio Unit is approved for both AC and DC input. Whether you use AC or DC input, does not affect the performance of the unit.

The power connection must have a circuit breaker.Recommended current rating for the circuit breaker is 15 A. The MBR Power Supply has a circuit breaker included.

Caution

With reference to the IEC/EN 61010-1 safety standard, the required current from the Power Supply Unit to the Radio Unit exceeds the limits set for a Limited Energy Circuit. This requires the use of double insulated power cables. The included combined Ethernet and power cable meets these requirements.

Related topics

Installation with MBR Power Supply, page 55

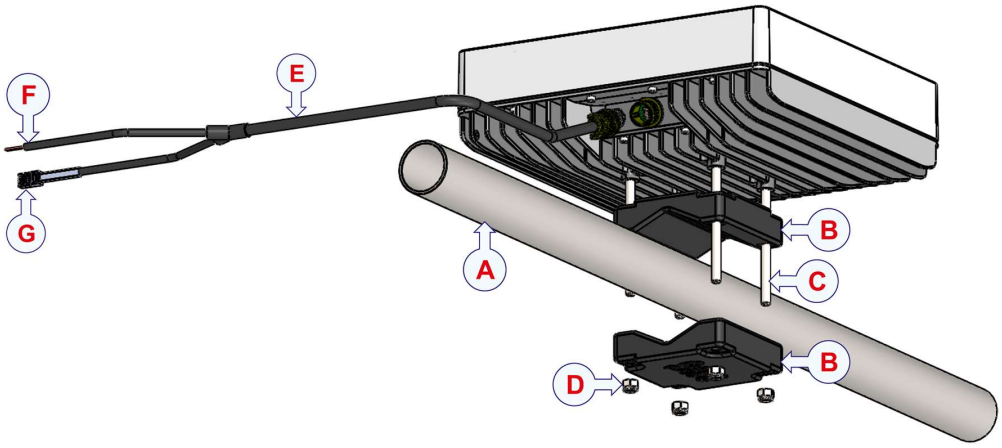
Installing the Radio Unit

The Radio Unit is designed to be mounted on a rail or similar. The unit is omnidirectional. The unit must be mounted horizontally.

Context

The Radio Unit is delivered with a mounting kit. The mounting bracket will provide galvanic isolation from the vessel structure.

The Radio Unit is connected to external equipment with the Ethernet end of the combined Ethernet and power cable. This cable is attached to the Radio Unit by a connector.



A *Rail, 30 mm – 75 mm*

B *Mounting bracket*

C *Stud bolts*

D *Nuts and washers*

E *Combined Ethernet and power cable, 10 m/30 m*

F *Connection to power source on vessel*

G *Ethernet connection to user equipment*

Procedure

1 Insert the stud bolts into the Radio Unit.

2 Fasten the stud bolts with an Allen key. 3 mm. Torque 0.1 Nm

3 Thread the upper part of the mounting bracket through the stud bolts.

4 Place the unit horizontally on the rail.

5 Thread the lower part of the mounting bracket through the stud bolts.

6 Fasten the mounting bracket with washers and nuts.

7 Connect the Combined Ethernet and power cable to the connector on the Radio Unit.

8 Run the combined power and Ethernet cable according to the mast structure to the user equipment. Secure the cable with cable ties.

9 Connect the Ethernet end of the cable to the user equipment.

10 Connect the power end of the cable to a power source on the vessel.

Related topics

Radio Unit dimensions, page 63
Installation with MBR Power Supply, page 55
Radio Unit location, page 51

Pin layout combined Ethernet and power cable

This is the pin layout for the combined Ethernet and power cable from the Radio Unit.

Connector pin	Cable colours	Signal	RJ-45 pin (T-568B)
1	Red	DC+	NC
2	Blue	DC–	NC
Chassis	Green/Yellow	GND	NC
C	Orange/White	ETH Orange/White	1
B	Orange	ETH Orange	2
F	Green/White	ETH Green/White	3
E	Green	ETH Green	6

Setting to work summary

When all hardware units have been installed, and all the cables have been connected, the Radio Unit can be turned on and set to work.

Procedure

1 Turn on the Radio Unit.

2 Enable contact with the Radio Unit.

3 Configure the radio site.

4 Join a radio network.

Related topics

Turning on the Radio Unit, page 14
Enabling contact with the Radio Unit, page 15
Defining the IP address on the computer's network adapter, page 16
Setting up the radio site for operation, page 18
Joining a wireless network, page 22

Installation with MBR Power Supply

Topics

About installation with MBR Power Supply

The Radio Unit can be connected to 24 - 48 V DC.Alternatively, the Radio Unit can be connected to the MBR Power Supply. The MBR Power Supply has AC input.

The MBR Power Supply is not a part of the standard scope of supply. The MBR Power Supply can be purchased from Kongsberg Seatex AS. Kongsberg Seatex AS part no. MBR-E-PSU_00.

Power Supply Unit description

The MBR Power Supply provides power to the Maritime Broadband Radio units. It is designed to fit standard 19" racks. The power supply unit can provide power for two radio units.

The power ON/OFF switch is located behind the lid to the left at the front of the unit. This is also where you access the air inlet filter.

The rear panel of the unit contains power input and terminals for power output.

Preparing the installation

Topics

Rack requirements

If the product is delivered without a rack, the power supply unit must be installed in a rack which is already in place on site.

Consider the following to determine whether your rack is suitable for the installation.

- The rack must be securely mounted to the floor.
- The rack must be a standard 19-inch rack.
- The minimum depth of the rack must be 600 mm.
- The rack should have air inlet on top and bottom or ventilation splits on the sides. The rack unit has ventilation of the sides. Forced ventilation may be required if the rack contains several electronic modules.
- The rack must be mounted in such a way that the minimum cable bends (on the rear side) are not exceeded.
- The rack must be connected to a grounded outlet.

Selecting the best location for the MBR Power Supply

Consider these factors when installing the unit.

- The unit is designed for indoor installation. The best location is typically in the instrument room or on the bridge.
- The unit fits on rails in a 19-inch rack or console.

- The unit has an internal fan and requires free airflow from the rear and out to the sides. It is recommended that ventilation or air conditioning is provided in order to keep the ambient operating temperature at around 20 °C.
- Avoid placing the unit in locations with heavy vibrations, strong electronic fields (close to transformers), excessive heat.
- Keep the area around the unit free from dust and static electricity.
- All connections to the unit are at the rear of the unit and available space for cable connections and servicing must be provided.

Mounting the MBR Power Supply in a rack

The MBR Power Supply is designed for mounting in a 19" rack or cabinet. All cabling is from the rear of the unit.

Prerequisites

The rack must be provided by the customer.

Context

Note

The Power Supply Unit has a plastic film on top, and it may have one underneath, to protect the unit from transportation scratches. Remove this film before operation as the plastic film will reduce the heat transfer from the unit and thus cause an increase in the temperature inside the unit.

The Power Supply Unit has an air inlet filter under the lid at the front of the unit. The air inlet filter should be inspected monthly. Clean the filter if necessary.

Procedure

1 Find a suitable location for the Power Supply Unit. Typically on the bridge or in the instrument room.

2 Remove any plastic film from the unit.

3 Place the unit on rails or shelves in a 19-inch rack.

This is to ensure that the unit is supported at the rear. Minimum 10 cm free space is needed behind the unit for connection of cables.

4 Fasten the unit with four screws in the front.

5 Connect the Power Supply Unit to AC mains.

6 Connect the chassis of the Power Supply Unit to vessel ground.

Related topics

MBR Power Supply dimensions, page 64

MBR Power Supply specifications

Weights and outline dimensions

- **Outline dimensions**:
  - **Height**: 88.1 mm (2U)
  - **Width**: 485 mm (19")
  - **Depth**: 334.75 mm
- **Weight**: 6.4 kg

Power specifications

- **Input voltage**: 100 – 240 V AC
- **Output voltage**: 48 V DC
- **Output current**: 6.3 A (Maximum)

Environmental specifications

- **Enclosure material**: Aluminium
- **Operating temperature range**: –15 °C – 55 °C
- **Storage temperature range**: –20 °C – 70 °C
- **Operating humidity**: Maximum 95% non-condensing
- **Storage humidity**: < 55 %

MBR Power Supply maintenance

Topics

Cleaning the MBR Power Supply air inlet filter, page 59

Changing the fuse in the MBR Power Supply power inlet, page 59

Changing the fuse on the MBR Power Supply circuit board, page 60

Cleaning the MBR Power Supply air inlet filter

The air inlet filter is located behind the lid to the left at the front of the Power Supply Unit. The filter needs to be cleaned regularly. This is to avoid overheating of the unit.

Context

The period between each cleaning is dependent on the air quality where the unit is installed. We recommend that the filter is cleaned or inspected at least every six months.You can also replace the air inlet filter with a new one if it is too dirty. A new air inlet filter can be purchased from Kongsberg Seatex AS.

Procedure

1 Push to open the front lid.

2 Pull the handle to remove the filter.

3 Clean the filter or replace it with a new one.
Clean the filter by washing it with a mild detergent. Or you can vacuum the filter.

4 Close the front lid.

Changing the fuse in the MBR Power Supply power inlet

If the unit does not receive power, it could be because of a blown fuse in the power inlet.

Prerequisites

A spare fuse is present in the power inlet or you have purchased a spare fuse.

Context

The power inlet has two 5 x 20 mm replaceable glass tube fuses. 6.3 A. The fuse type is Nano2. The fuse must be compliant to the safety standard for fuses.

If you have replaced the fuse it is recommended to buy a new spare fuse. Fuses can be purchased from Kongsberg Seatex AS or any third party supplier.

Procedure

1 Disconnect the power connector.
Open the fuse holder below the power inlet gently with a screw driver. Within the holder there are two fuses. One which is in use and one spare.

2 Remove the innermost fuse and replace it with the spare fuse.

3 Close the fuse holder.

4 Reconnect the power connector. Turn on the power switch.

Changing the fuse on the MBR Power Supply circuit board

The MBR Power Supply is provided with fuses to protect the circuit boards and modules.

Prerequisites

A spare fuse must be present on the circuit board or you have purchased a spare fuse.

Context

There are four fuses on the power outlet circuit board.Two 2 x 6.3 A fuses and two 2 x 500 mA fuses. The fuse type is Nano2. One spare fuse is supplied for the 2 x 6.3 A fuse.

If you have replaced the fuse it is recommended to buy a new spare fuse. The fuse must be compliant to the safety standard for fuses. Fuses can be purchased from Kongsberg Seatex AS or any third party supplier.

Note

The fuses shall only be replaced by fuses with the same type and rating.

Procedure

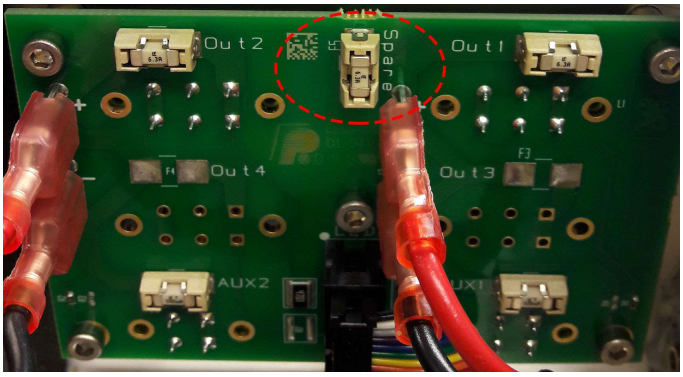
1 Remove the four front screws which hold the power supply unit to the rack.

2 Disconnect the connectors at the rear of the unit.

3 Pull the unit out of the rack from the front.

4 Unscrew the 10 screws at the top of the unit which hold the lid. Remove the lid.

5 Remove the blown fuse. Replace it with the spare fuse.



6 Replace and refasten the lid.

7 Reconnect the connectors. Refasten the unit to the rack.

8 Order a new spare fuse when you have used the spare one.

Drawings

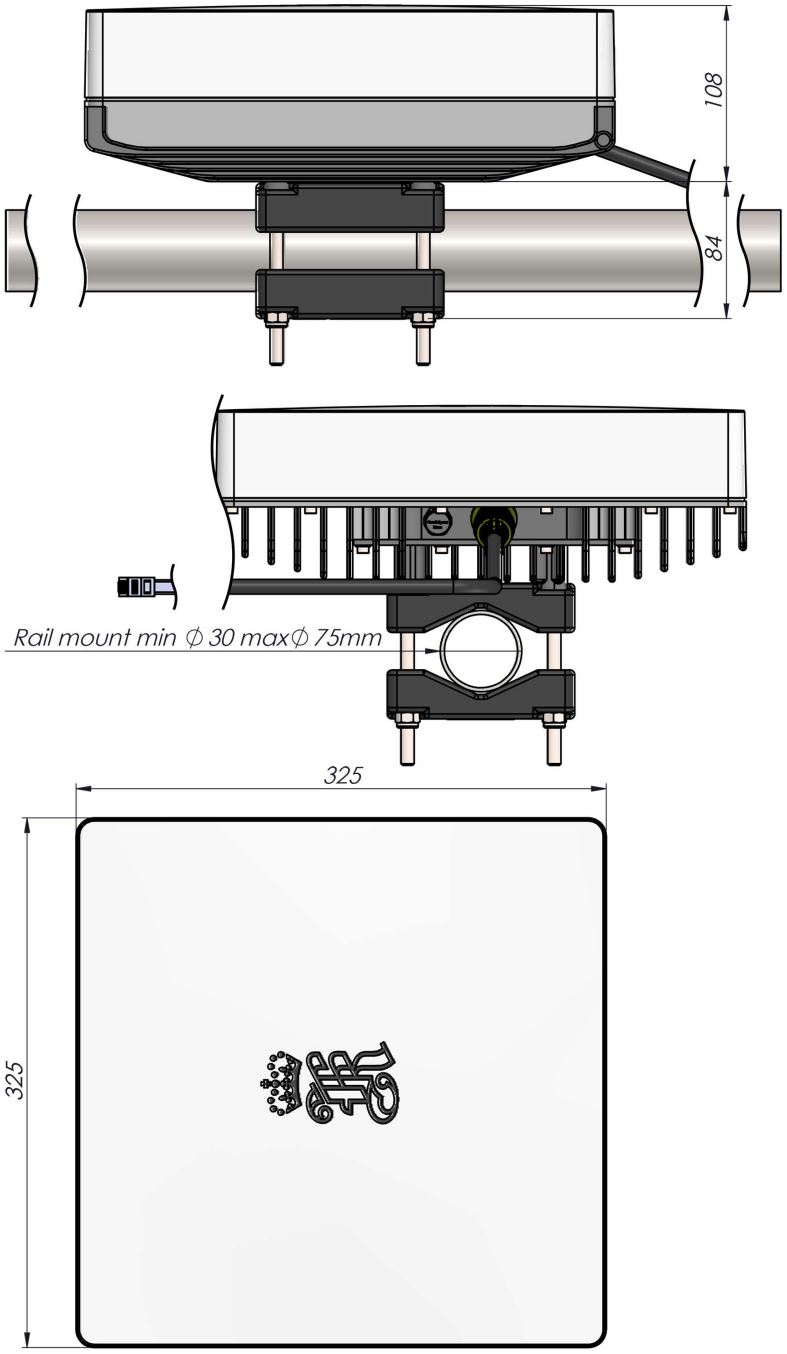
Topics

About drawings

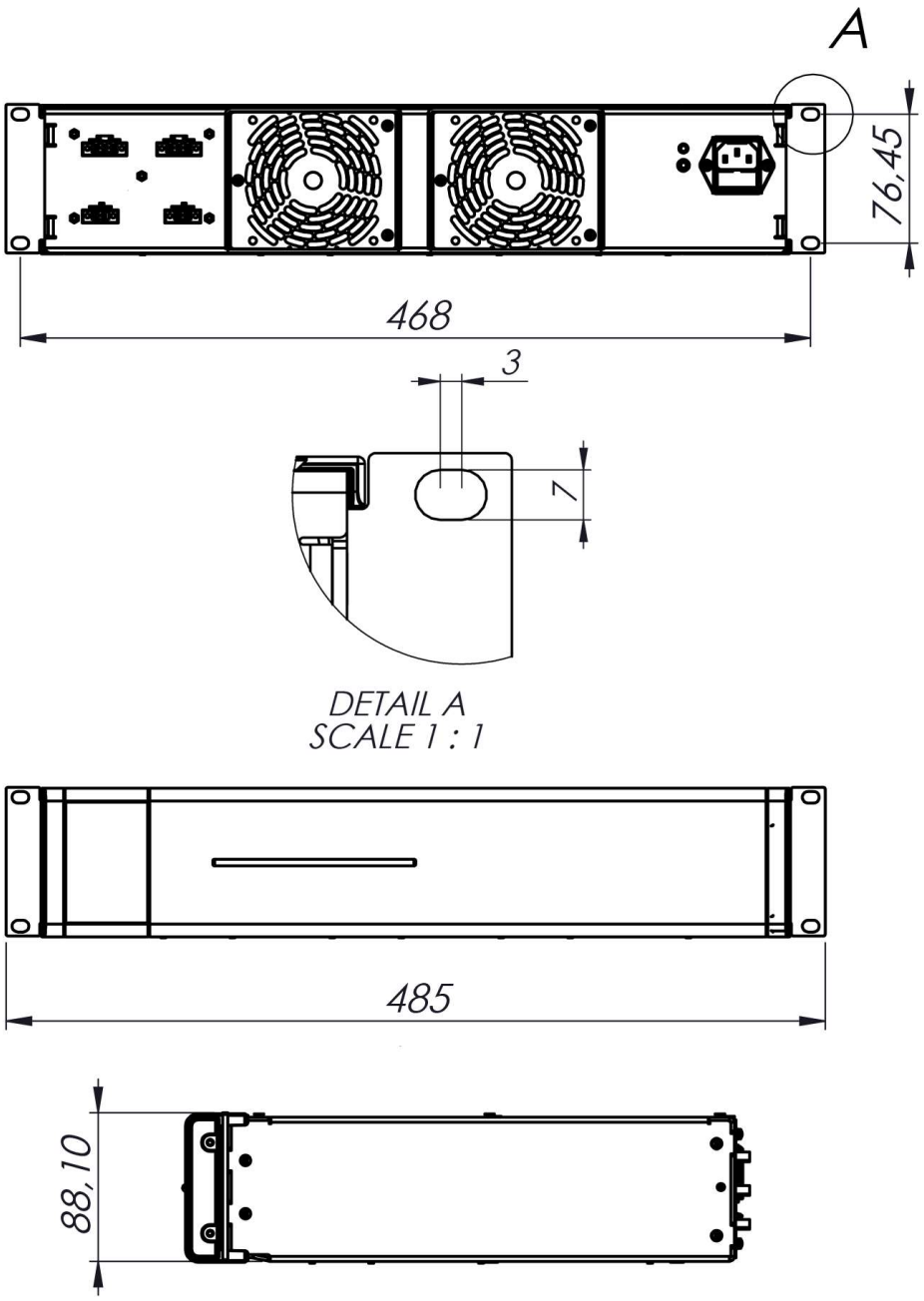
These drawings are for information and planning purposes only.

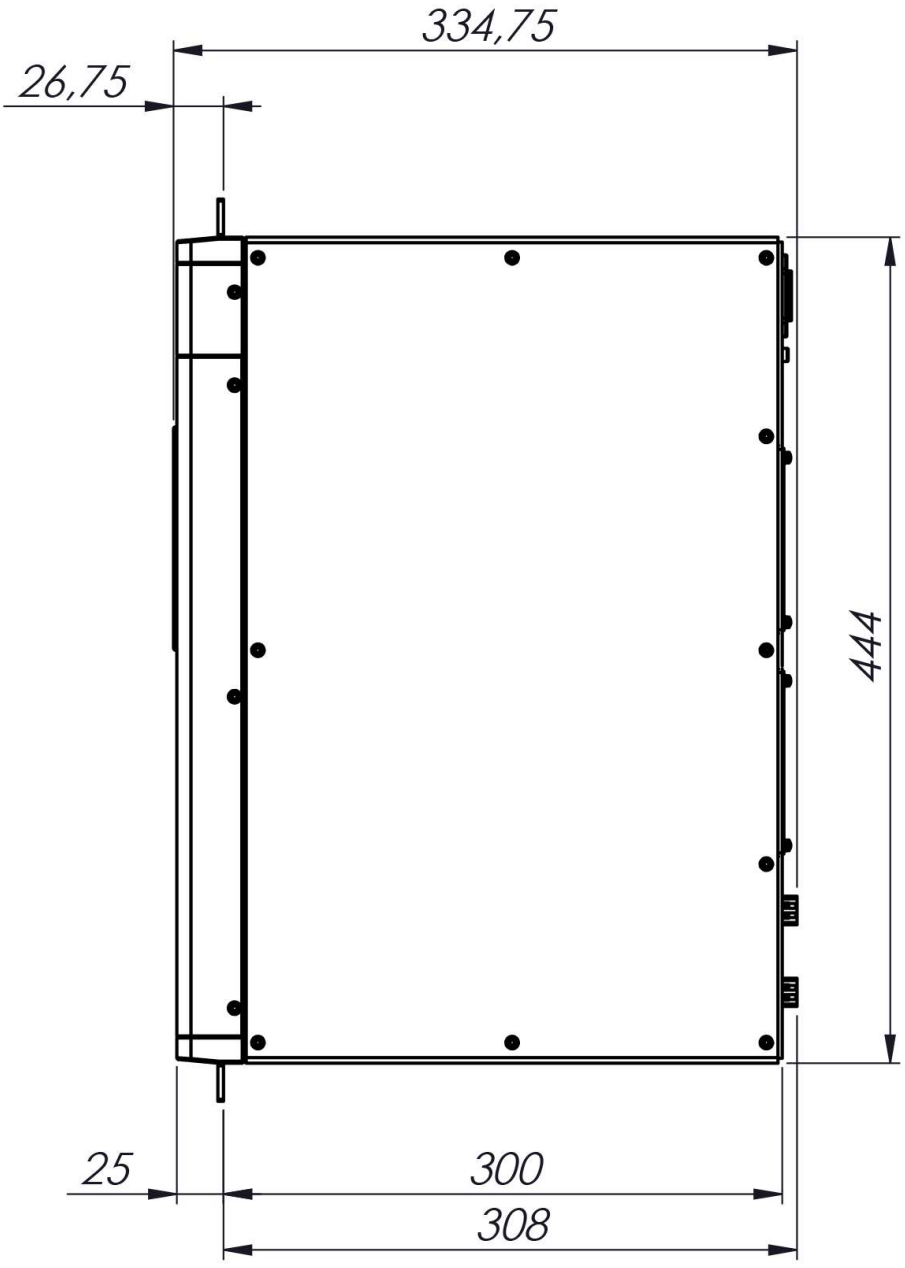
Unless otherwise specified, all measurements are in millimetres. The drawings are not to scale.

Radio Unit dimensions



MBR Power Supply dimensions




334,75
26,75
444
25
300
308

Technical specifications

Topics

Performance specifications

These performance specifications summarize the main functional and operational characteristics of the MBR 179.

- **User data**: 0.7 – 16.5 Mbps
- **Antenna coverage**: 360 degrees azimuth, omnidirectional

Interface specifications

The system will interface with external systems and sensors via Ethernet.

- **Ethernet/LAN**: 1 Port

Weights and outline dimensions

These weights and outline dimension characteristics summarize the physical properties of the MBR 179.

- **Outline dimensions**:
  - **Length**: 323 mm
  - **Width**: 323 mm
  - **Height**: 111 mm
- **Weight**:
  - **Includes mounting bracket**: 10.9 kg
  - **Without mounting bracket**: 8.85 kg

Power specifications

These power characteristics summarize the supply power requirements for the MBR 179 system.

- **Voltage**: 24 – 48 V DC
- **Power consumption**: 210 W (maximum)

Frequency specifications

The radio frequency specifications summarize the frequency specifications for the receivers in the system.

- **Frequency Band**: 4900 MHz - 5900 MHz

  Configurable range for the single 20 MHz channel.
- **Channel bandwidth**: 20 MHz
- **TX power**: Up to 4 W
- **Antenna gain**: 21 dBi
- **EIRP**: 52 dBm (maximum)
- **Modulation**: GMSK
- **Antenna elements**: 60
- **RF exposure**: According to EN 50385 the safety distance for the MBR 179 is 1.5 metres.

This product is in compliance with the standard ETSI EN 303 276. This applies to the frequency channels 5862 and 5890 MHz.

Environmental specifications

These environmental specifications summarize the temperature and humidity specifications for the MBR 179.

- **Operating temperature**:-40 ºC – 55 ºC
- **Operating humidity**: 20 – 100 % RH
- **Storage humidity**: 20 – 70 % RH
- **Ingress protection (IP) code**: IP66

Standards and regulations

This product is in compliance with relevant directives and product standards.

- **Radio Equipment Directive (RED) 2014/53/EU**:
  - Electromagnetic compatibility:
    - ETSI EN 301 843–1
    - ETSI EN 301 843–7
    - IEC 60945/EN 60945
  - Radio spectrum:
    - ETSI EN 303 276
  - Product safety:
    - IEC 61010–1/EN 61010–1
- **Environmental standards**:
  - IEC 60945/EN 60945
  - DNVGL-CG-0339 (48 V DC)
  - IACS E10 (48 V DC)

Manufacturer’s conformity declaration

This product is in compliance with relevant directives and product standards.

KONGSBERG

EU DECLARATION OF CONFORMITY

Manufacturer's name:	**Kongsberg Seatex AS**
Manufacturer's address:	**Havnegata 9, N-7010 Trondheim, Norway**

declares that the product:

Product name:	**Maritime Broadband Radio, MBR**
Model number*):	**MBR 179 and MBR 189**

is in conformity with the **Radio Equipment Directive, RED, 2014/53/EU** and with reference to ETSI guide **ETSI EG 203 367,** using relevant sections of the following product standards:

Essential requirements	**Standards**
Health and Safety (Article 3.1(a)	EN 61010-1:2010/IEC 61010-1:2010
EMC (Article 3.1(b)	EN 301 843-1 V2.2.1, EN 301 843-7 V1.1.1
Spectrum (Article 3.2)	EN 303 276 V1.1.1 (MBR) EN 303 413 V1.1.1 (GNSS receiver)

Further, the product is compliant to RoHS Directive **2011/65/EU** with reference to standard **EN 50581:2012**.

Test references
Technical File: MBR_179_189_MK2_TCF; issued by Kongsberg Seatex AS.

Supplementary information
*) This declaration applies to the MK2 version of the product.

Date and signature
2019-02-14

Erlend Vågsholm, Vice President R&D

Maintenance

Topics

Checking the product version

For software updates, or contact with customer support, it is useful to know the product version of the Radio Unit.

Procedure

1 On the **System** menu, select **Site** to enter the **Configure site** page.

2 Under **Radios**, select the **Details** button for the radio for which you want to see the product version.
Observe that the radio **Status** box appears. Here you can see both the serial number and the product version of the Radio Unit.

3 Close the dialog box by selecting [**X**] in the upper-right corner.

Related topics

Status, page 43

Updating the system software

We recommend that you keep your product updated with the latest software version.

With the newest product software you will be able to enjoy the latest features and functionalities.

You will either be contacted, or receive the software upon request, when updates are available.

Software updates will be made available for download. The software updated package includes the necessary files and procedures you need for update the product software.

Related topics
Support information, page 12

Cleaning the Radio Unit cover

The Radio Unit is designed to withstand the elements. Such as rain, snow and dust. However, to ensure optimal performance you must keep the surface of the Radio Unit clean. Brush off any ice or snow.

Repairing the Radio Unit

The Radio Unit is not designed for repair in the field. All repairs and modifications of the unit, except for installation of new software versions and system setup, must be done by qualified personnel. A failed Radio Unit should be shipped back to Kongsberg Seatex AS or other agreed service point for repair.

Related topics
Support information, page 12

Equipment handling

Topics

Taking delivery

When the equipment arrives at its destination:

- Perform an inspection immediately to register any damage that may have occurred in transit.
- If you find any damage, both the insurance company and the shipping agent must be informed immediately.

Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to check that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

The equipment contains delicate electronic components – handle with care and avoid shocks.

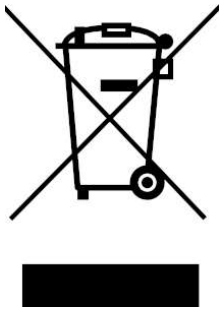
The equipment can be lifted by hand.

Storage

After the equipment in the boxes has been inspected and it has been verified that no damage has occurred, the equipment must be stored in its original packaging until the time of installation. The storage premises must be dry and well protected.

Disposal

At the end of the product lifetime, all Kongsberg Seatex AS products must be disposed of in an environmentally-friendly way.



All electrical and electronic components must be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. This is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.

All disposal of mechanical, electromechanical, electronic and chemical waste - including all types of batteries - must take place according to national and international rules and regulations. Observe the relevant Waste Electrical and Electronic Equipment (WEEE) regulations.

The equipment can be returned to Kongsberg Seatex AS if there is no local WEEE collection. The equipment is marked with this waste pictogram.

Index

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W