Figure 74. Frequency information dialog

- o The frequency bands that are marked with „Std." are <u>basic</u> frequency ranges. These frequencies are always licensed in the standard version of RT-500-M and thus always appear as "Available".
- o The frequency ranges designated with "F1 .. F4" are <u>optional</u> extended ranges. In the standard version of RT-500-M, they are not licensed and thus marked as "Not available".
  These optional frequency bands can be acquired separately (please contact RHOTHETA).
- o However, it is possible to <u>lock</u> some particular frequencies as well as certain frequency bands, if these are licensed. After a frequency has been locked by the user, it will not be possible to set this frequency for the bearing operation.
- o Locking of frequencies is the responsibility of the administrator.
  The operator can only view the frequencies which have been locked by the administrator.

Figure 75. Locked frequencies. Operator view

Locked frequencies can be viewed in the embedded separate dialog, which is available over the hotkey "See locks" (s. Figure 74).
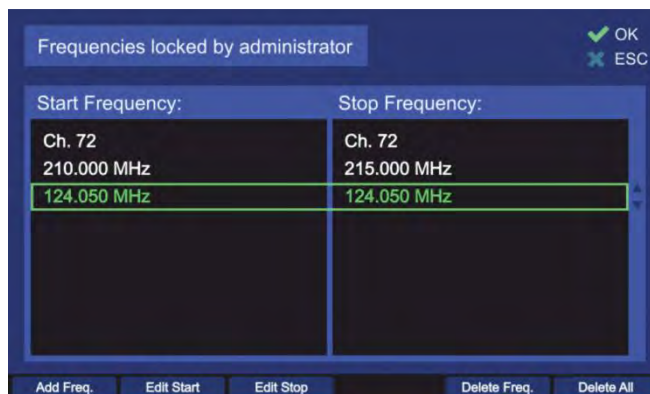

Figure 76. Locked frequencies. Administrator view

Lock / Unlock Frequencies Procedure

Locking or unlocking of frequencies is only available over the administrator access level.
To mark any frequency as locked/unlocked following steps are required:

1) Press the "See locks" hotkey in the "Freq. Info" dialog. The window, which is shown in Figure 76 appears.
2) To lock a single frequency, press the hotkey "Add Freq." The "Frequency input" dialog appears (for further information s. 7.1.2.2), where a frequency, channel number or a Cospas-Sarsat frequency can be entered. After confirming with "OK" a single frequency is added. It appears then in the list of locked frequencies as "Start Frequency" as well as "Stop Frequency".
3) To lock a certain frequency band proceed with step 2), adding the start frequency first. Then by pressing "Edit Stop" hotkey the last frequency of the to-be -locked band can be entered. In the same way, the start frequency can be changed using the "Edit Start" hotkey.
4) Unlocking (deleting) of a frequency or a frequency band is accomplished with pressing the hotkey "Delete Freq".

   Note
   Pressing this hotkey will delete the marked frequency immediately without asking for confirmation!

5) To unlock the whole list of frequencies, use the hotkey "Delete All".
   a. The difference to deleting the single frequency or frequency band is that for leaving the dialog the action has to be confirmed with "OK".

   Note
   If after deleting all locked frequencies the dialog will be left by pressing "ESC", the dialog will be closed without saving any changes. That means, the list will not be deleted and is accessible again after pressing the hotkey "See locks".

7.4.2 Display

On the "Setup" page, the "Display" menu can be selected via the administrator access level only.
The "Display" page enables modifying of settings that affect the graphical representation of the application.
After pressing the "Display" navigation key, following menu page opens (s. Figure 77).
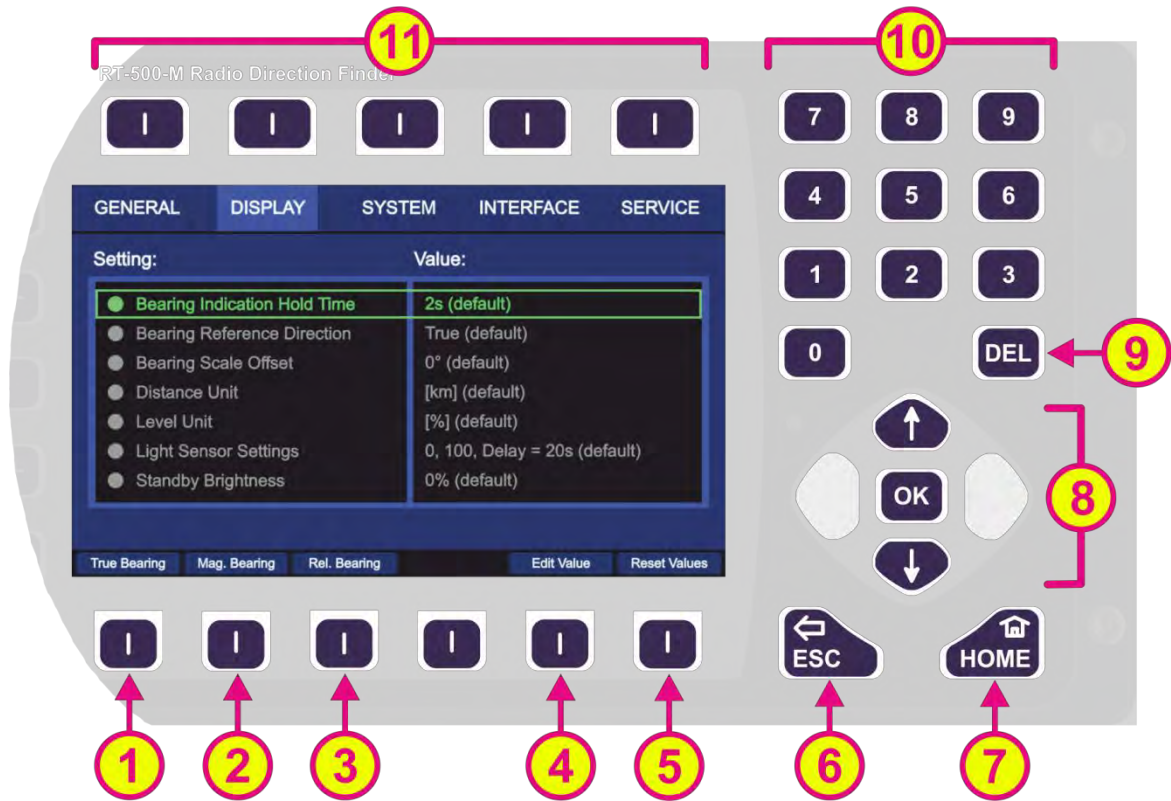
Figure 77. Setup page. Display settings

Indication on Setup Page, Display Settings

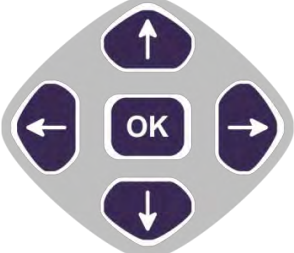| Pos.	Element	Meaning / Description	Page
①	"True Bearing"	Sets the bearing reference direction to "TRUE" without opening the corresponding dialog (s. Table 5. Bearing reference directions").	
②	"Mag. Bearing"	Sets the bearing reference direction to "MAGNETIC" without opening the corresponding dialog (s. Table 5. Bearing reference directions").	
③	"Rel. Bearing"	Sets the bearing reference direction to "RELATIVE" without opening the corresponding dialog (s. Table 5. Bearing reference directions").	
④	"Edit Value"	Depending on currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below)	
⑤	"Reset Values"	Resets all values to the default settings. The default setting values cannot be changed by the user.	
⑥	ESC	When there is a dialog opened, pressing this button will close the dialog without adopting new values. When there is no dialog opened, pressing this button will go back to the last activated page. The "Bearing" page is the end-point.	
⑦	HOME	Pressing this button always leads to the Bearing Page. Even an opened dialog will be closed, without adopting the changed values.	

8		"Up" and "Down" arrows are used to move between the display settings. "Right and "left" arrows have no function inside the display settings" page. With the "OK" button confirming of values or opening the display settings dialogs is accomplished.	
9	DEL	Inside the display settings dialogs, the "DEL" button is used to clear the whole input at once. On the top level of this page, this button has no function.	
10		Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the page, they have no function.	
11	Top line	Navigation line of the screen, which allows switching between setup menus ("General", "Display", "System", "Interface" and "Service").	

Table 12. Setup page, display settings. List of elements

7.4.2.1 Bearing Indication Hold Time

The "bearing indication hold time" defines how long the bearing value is indicated after the signal fell under the squelch level.

If there is no more valid bearing information available, the last bearing data (bearing arrow, life values and digital bearing display) are displayed on the "Bearing" page for a defined period of time. This time is set to 2 seconds by default and configurable via this setting.

By pressing the "OK button or the hotkey "Edit Value", the following dialog is opened.
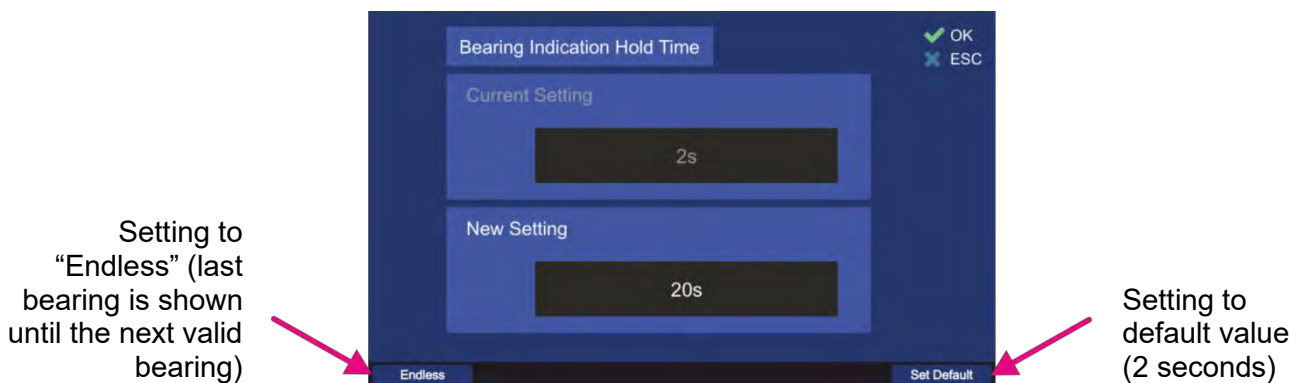

Figure 78. Editing the bearing indication hold time

- o The new value for the bearing hold time can be entered in the input field "New Setting", using the numeric keys of the keypad.
- o Use the hotkey "Endless" to set the bearing hold time to an "endless" value, which means that (after the signal was interrupted) the last valid bearing information will be shown as long as the new valid bearing needs to arrive.
- o To set the bearing hold time to the default value (2 s), press the hotkey "Set Default".
- o For the final confirmation, press "OK" or use the "ESC" button to leave the dialog without adopting the new value.

7.4.2.2 Bearing Reference Direction

The bearing reference direction is significant for the bearing indication. The direction of the bearing arrow in the 360° display (and compass rose indication) is always referred to a defined point in space. This reference point can be the **magnetic** north position, **true** north position and **relative** (reference is the direction to the vessels bow. For further explanation refer to chapter 7.1.2.

Pressing "OK" or "Edit Value" while the line "Bearing Reference Direction" is marked opens the corresponding dialog.

Choosing the "Magnetic" reference direction

Choosing the "True" reference direction

Choosing the "relative" reference direction   Choosing the default reference direction ("True")
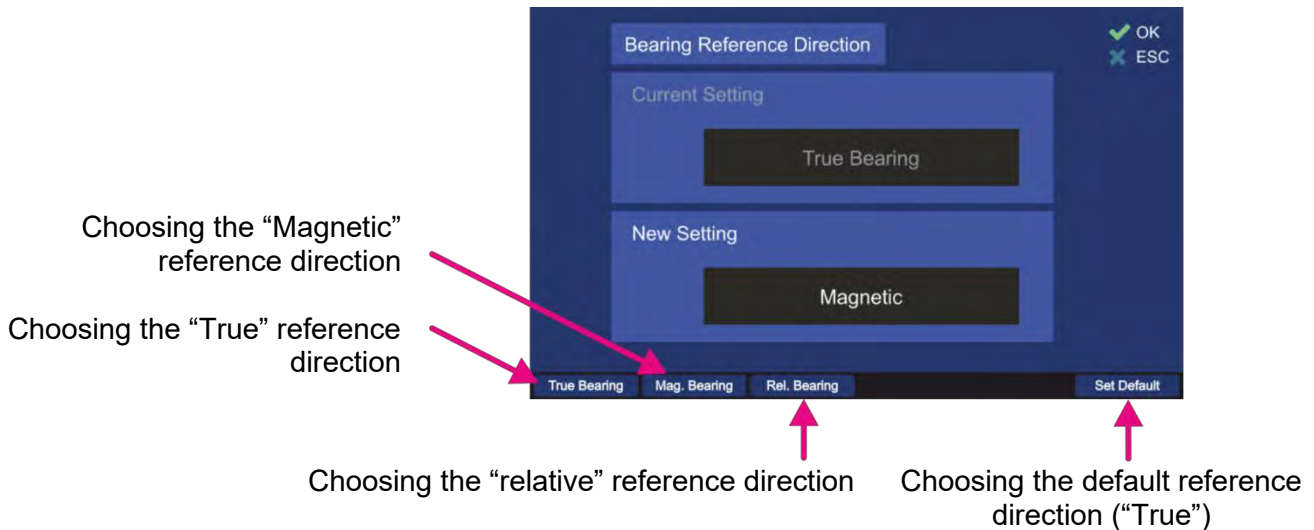
Figure 79. Bearing reference direction dialog

- o   Press the hotkey "True Bearing" to set the bearing reference direction relative to true (geographic) north (only if compass data is available). If no compass data is available, the bearing page will not adopt the "True" setting. The relative bearing and "No Compass" warning will be shown.
- o   Press the hotkey "Mag. Bearing" to set the bearing reference direction relative to magnetic north (only if compass data is available). If no compass data is available, the bearing page will not adopt the "Magnetic" setting. The relative bearing and "No Compass" warning will be shown.
- o   Press the hotkey "Rel. Bearing" to set the bearing reference direction relative to the heading of the vessel.
- o   Press "Set Default" to use the default value (true north direction, only if compass data is available).
- o   To save the changed value, press "OK".
- o   Pressing the "ESC" button will leave the dialog without adopting the changed value.

7.4.2.3 Bearing Scale Offset

In this menu an offset for the bearing rose can be set. This is useful for e.g. better visual comprehension of the bearing direction indication. It can be used, for instance, if the window of the vessel's control cabin shows to another direction than the bow of the ship and it is desired to take this direction as the relative direction.

After setting the bearing scale offset to a certain value that differs from 0°, the bearing rose will turn according to this value.

To set the bearing scale offset, press OK" or "Edit Value" while the line "Bearing Scale Offset" is marked. The corresponding dialog will open.
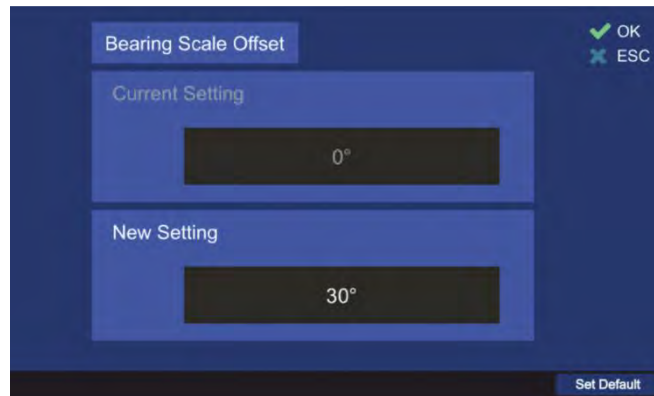
Figure 80. Bearing scale offset editing dialog

- o Type any value in the "New Setting" input field by using the numeric keys of the keypad to set the value of the scale offset.
- o Press the hotkey "Set Default" to set the default value for the bearing scale offset (0°).
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous value.

7.4.2.4 Distance Unit

The indicating of distances can be either in kilometers [km] or in nautical miles [NM]. The default value is "[km]".
To change the indication of the distance unit, press either the "OK" or "Edit value" while the setting is marked by the green frame.
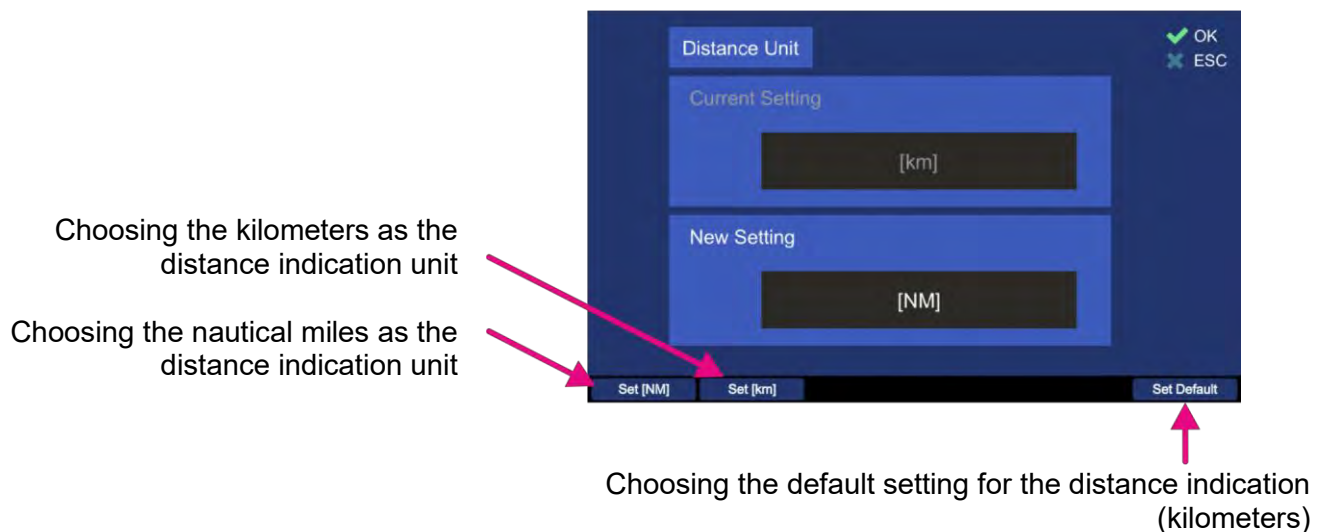

Figure 81. Changing the distance unit

- o Press the hotkey "Set [NM]" to set the distance unit to "[NM]" (Nautical Miles). Each distance indication in the application will be indicated in nautical miles.
- o Pressing the hotkey "Set [km]" will set the distance unit to "[km]" (kilometers). Each distance indication in the application will be indicated in kilometers.
- o Press the hotkey "Set Default" to set the distance indication to the default value (kilometers).
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

7.4.2.5 Level Unit

Indicating of levels (like signal level, or squelch level) can be either in "[%]" or in "[dB]".
To change the currently chosen unit for the levels indication press either the button "OK" or "Edit Value", during the setting "Level Unit" is marked.
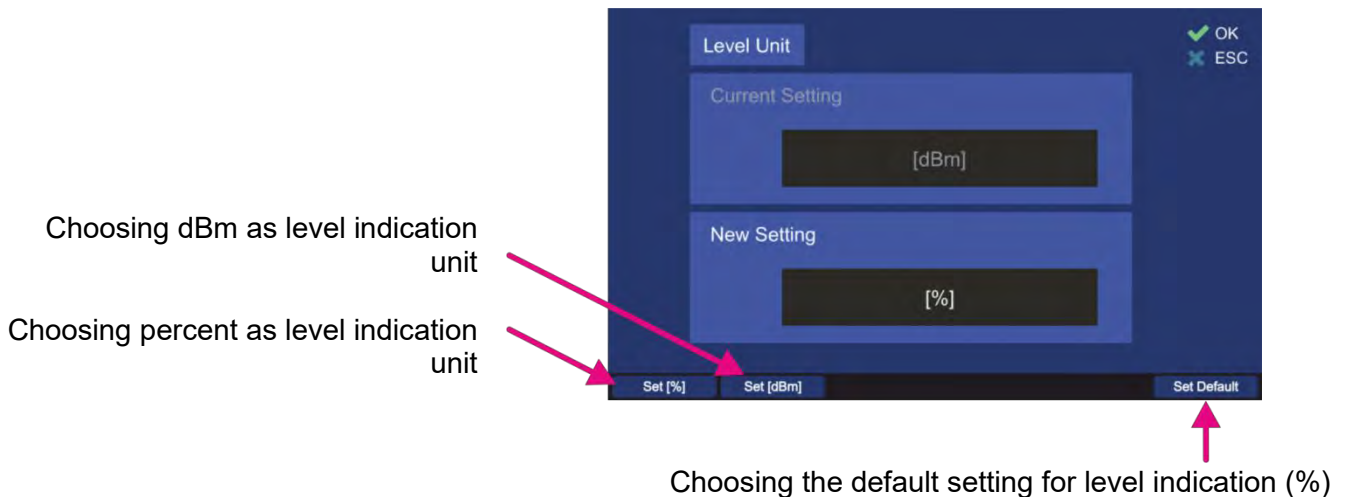
Choosing dBm as level indication unit

Choosing percent as level indication unit

Choosing the default setting for level indication (%)

Figure 82. Changing the level unit

o Press the hotkey "Set [%]" to set the level unit to "[%]" (percent). Each level indication in the DCU application will be indicated in percent.
o Pressing the hotkey "Set [dBm]" will set the level unit to "[dBm]". Each level indication in the application will be indicated in dBm.
o Press the hotkey "Set Default" to set the distance indication to the default value (%).
o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

7.4.2.6 Light Sensor Settings

The light sensor is used in the DCU to adjust the brightness of the display, legends and LEDs automatically according to the ambient light level.
In this menu point, which contains three settings, the characteristics of the light sensor can be defined.
After pressing "OK" or "Edit Value" while the menu point "Light Sensor Settings" is marked, the following dialog will open.

Choosing e.g. "Minimum Range" setting for editing

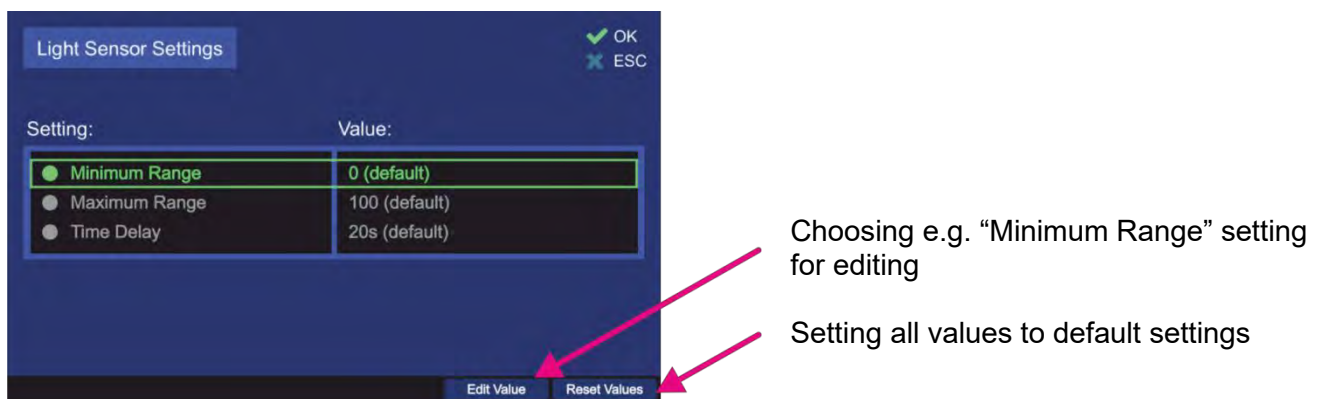Setting all values to default settings

Figure 83. Light sensor settings

With the minimum / maximum range settings one can influence the spacing of changing the brightness of display, legends or LEDs.
o Other than with other dialogs of the "Display" menu, editing of the values is only available over the "Edit Value" hotkey (pressing "OK" is valuated as accepting of the present values and will lead out of the dialog).
o Leaving the top level dialog (s. Figure 83) always press "OK" for the second time (after confirming the actual setting), otherwise, the changed settings will not be adopted.

Minimum Range
The minimal value of the light sensor is "0" (default value).

To change this value, press the hotkey "Edit Value", while "Minimum Range" is marked.
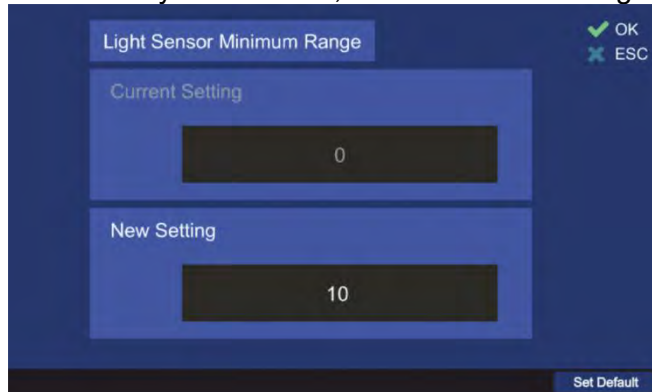

Figure 84. Changing the minimum range value of the light sensor

- o Type the new value for the minimum range of the light sensor in the "New Setting" input field, using the numeric buttons of the DCU keypad.
- o Use the "Set Default" hotkey to reset the value to the default setting.
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

Maximum Range
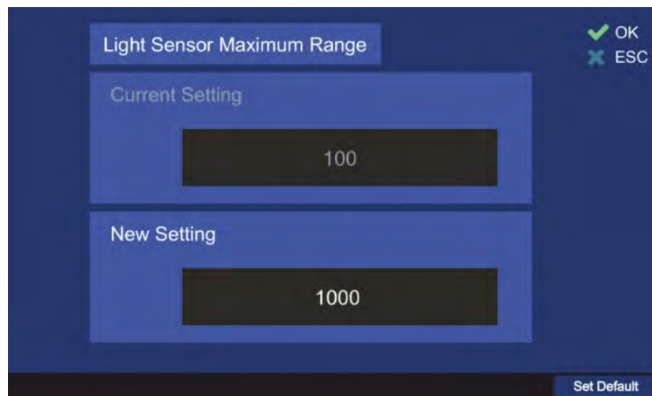The maximal value of the light sensor is "1000".

Figure 85. Changing the maximum range value of the light sensor

- o Type the new value for the maximum range of the light sensor in the "New Setting" input field, using the numeric buttons of the DCU keypad.
- o Use the "Set Default" hotkey to reset the value to the default setting.
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

Time Delay
This setting determines how fast the system brightness reacts to the changing of ambient brightness. The adjustable range is between 0 s and 999 s.
Recommended value is the default value of 20 seconds, which ensures that e.g. the shadow of a person that quickly passes by, influences the brightness of the system.
To change this value, press the hotkey "Edit Value", while "Time Delay" is marked.
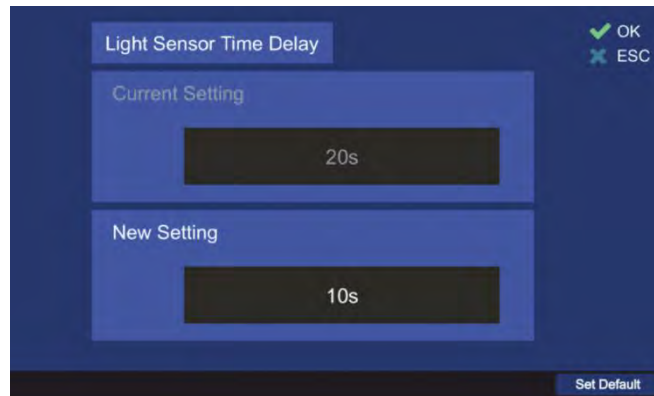
Figure 86. Changing the time delay value for the light sensor

- o Type the new value for the delay value of the light sensor in the "New Setting" input field, using the numeric buttons of the DCU keypad.
- o Use the "Set Default" hotkey to reset the value to the default setting.
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

7.4.2.7 Standby Brightness

Over this setting, the general brightness during the standby mode can be defined.
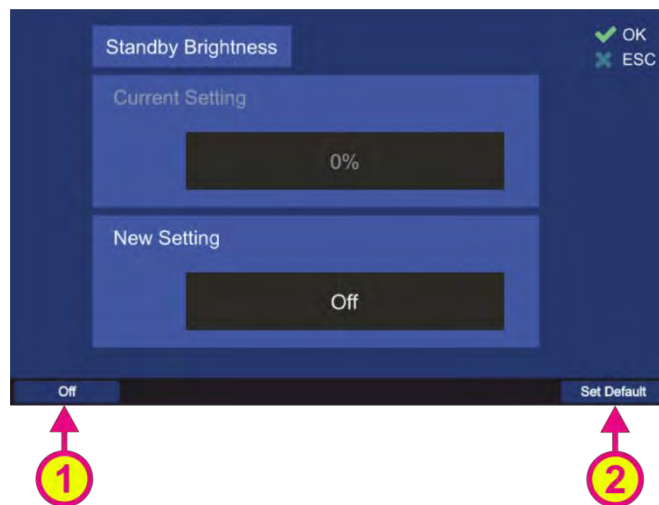To change this value, press the hotkey "Edit Value", while "Standby Brightness" is marked.

Figure 87. Adjusting the standby brightness

- o Type the new value for the standby brightness value in the "New Setting" input field, using the numeric buttons of the DCU keypad or use the hotkey "Off" (s. Figure 87, position 1) in order to set the standby brightness to a "black screen"-value.
  If the setting "Off" is confirmed with "OK", the display will be turned off after the button "Standby" is pressed.
- o Use the "Set Default" hotkey (s. Figure 87, position 2) to reset the value to the default setting (0%).
- o Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the previous setting.

7.4.3 System

The "System" settings page contains a number of the internal system settings, which are only available over the administrator access level.
All settings are organized alphabetically in order to improve the handling of the page.

Caution
Incorrect system settings may lead to malfunctions of the system.

The "System" settings page contains multiple settings that are represented by textual lines.
Keep pressing the "Up" or "Down" arrow buttons of the DCU keypad in order to switch to the next page with the next settings (after the first set of settings of the page is over). There are currently 12 setting-lines on the "Setup" page that where appropriate include the corresponding sub-settings.
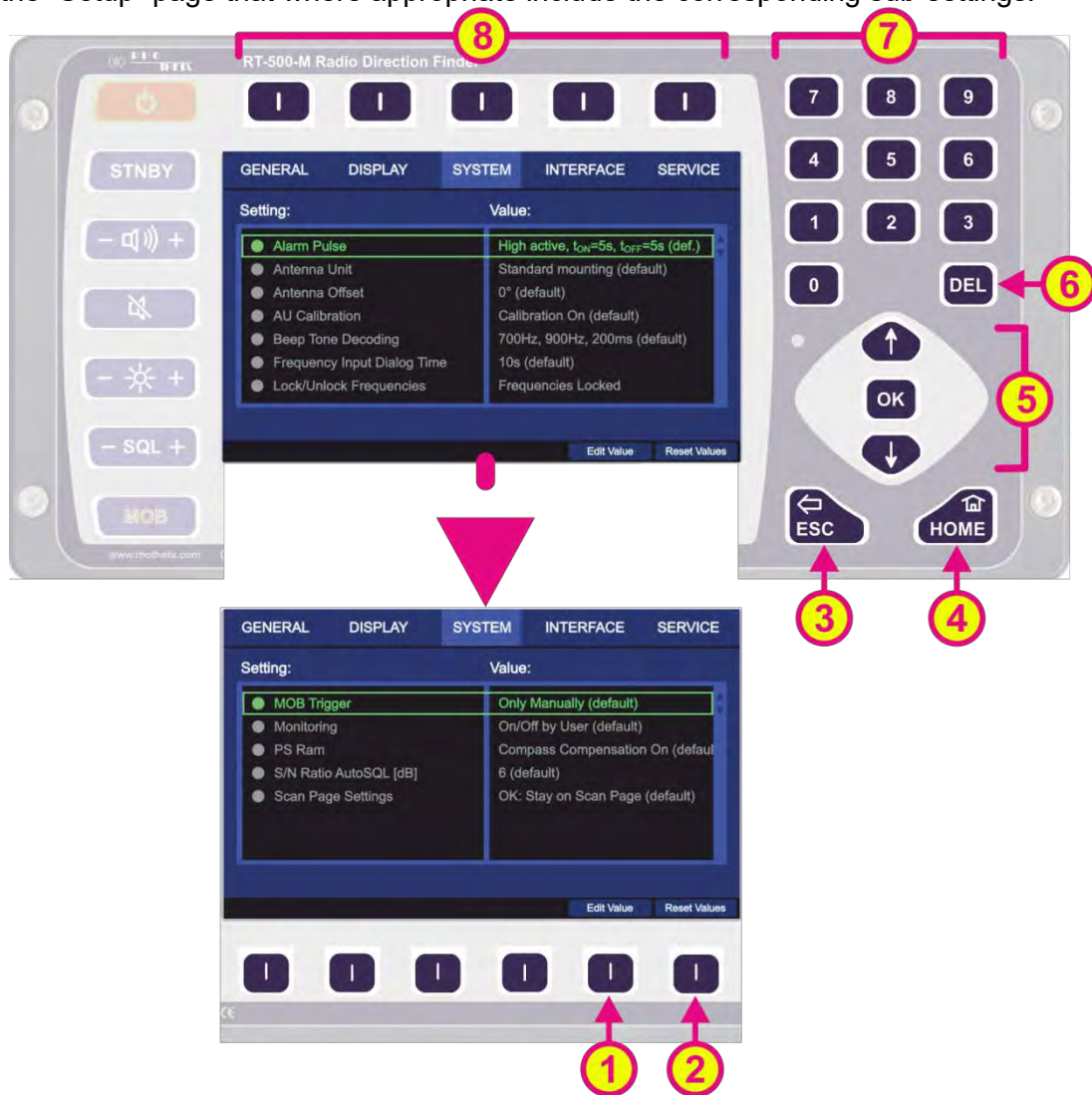

Figure 88. Setup page. System settings.

Indication on Setup Page, Display Settings		
Pos.	**Element**	**Meaning / Description**
1	"Edit Value"	Depending on currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below)

②	"Reset Values"	Resets all values to the default settings. The default setting values cannot be changed by the user.
③	[ESC button]	When there is a dialog opened, pressing this button will close the dialog without adopting new values. When there is no dialog opened, pressing this button will go back to the last activated page. The "Bearing" page is the end point.
④	[HOME button]	Pressing this button always leads to the "Bearing" page. Even an opened dialog will be closed, without adopting the changed values.
⑤	[Arrow/OK buttons]	"Up" and "Down" arrows are used to move between the system settings. "Right and "left" arrows have no function inside the system settings" page. With the "OK" button confirming of values or opening the system settings dialogs is accomplished.
⑥	[DEL button]	Inside the dialogs for the system settings, the "DEL" button is used to clear the whole input at once. On the top level of this page, this button has no function.
⑦	[Numeric keypad]	Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the page they have no function.
⑧	Top line	Navigation line of the screen, which allows switching between setup menus ("General", "Display", "System", "Interface" and "Service").

Table 13. Setup page, system settings. List of elements.

7.4.3.1 Alarm Pulse

With this setting menu, the behavior of the alarm output can be defined.
The alarm output is provided by the DCU POWER+IO Connector and can be used for related alarm functions like activating a siren.
In order to facilitate the alarm function using the DCU (in combination with the alarm system that is used on the vessel), the DCU settings are changeable.
By pressing the "OK button or the hotkey "Edit Value", while the setting "Alarm Pulse" is marked by the green frame, the following dialog is opened.

Note
In this dialog pressing "OK" will be interpreted as confirming of the whole set of settings that are currently displayed, which will lead to closing the dialog confirming changed values.
To change the single settings only the hotkeys for modifying the related values are used (s. Figure 89).
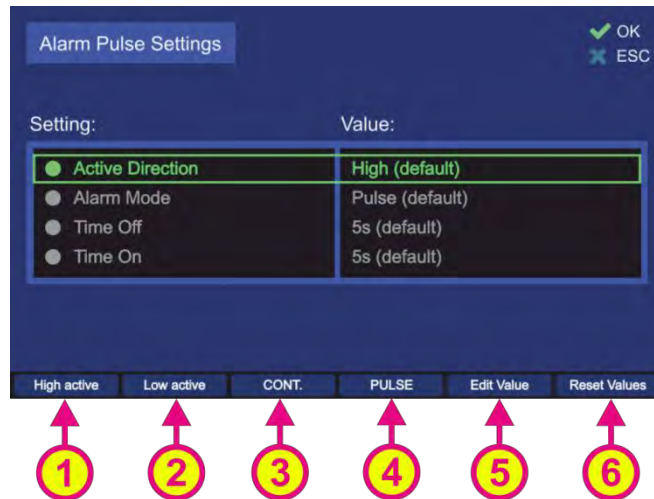
Figure 89. Alarm pulse settings

Active direction setting defines which direction (low or high) will lead to an alarm indication.
This setting is changeable using the hotkeys "High active" / "Low active" or "Edit Value" (s. Figure 89,
numbers ①, ② and ⑤), whereat using the first two hotkeys will change the value without opening
the separate dialog.
  - o By pressing the hotkey "Edit Value", the dialog for changing the active direction of the alarm
    output will be opened. The handling of this dialog is shown in Figure 90.
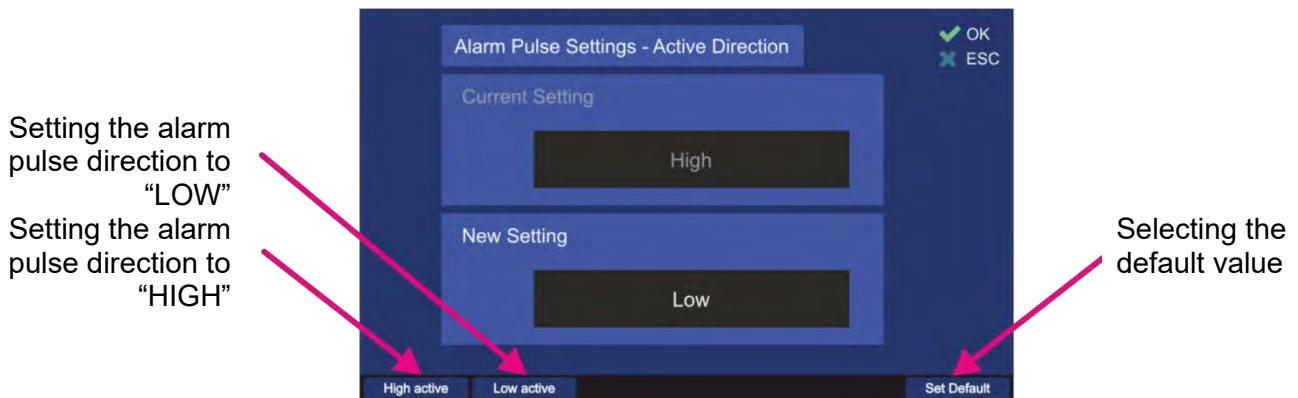

Figure 90. Active direction dialog

  - o Pressing the "High active" hotkey sets the active direction of the alarm pulse to "HIGH". That
    means, the default state of the alarm output is low and an alarm is indicated by the high state.
  - o Pressing the "High active" hotkey sets the active direction of the alarm pulse to "LOW". That
    means, the default state of the alarm output is high and an alarm is indicated by the low state.
  - o Pressing the "Set Default" hotkey sets the alarm output to the default value, which is "HIGH".

Alarm mode setting defines, how the alarm output behaves during the alarm state (alarm mode
continuous or pulsed).
This setting is changeable using the hotkeys "CONT." / "PULSE" or "Edit Value" (s. Figure 89,
numbers ③, ④ and ⑤), whereat using the first two hotkeys will change the value without
opening the separate dialog.
  - o By pressing the hotkey "Edit Value", the dialog for changing the alarm mode of the alarm
    output will be opened. The handling of this dialog is shown in Figure 91.
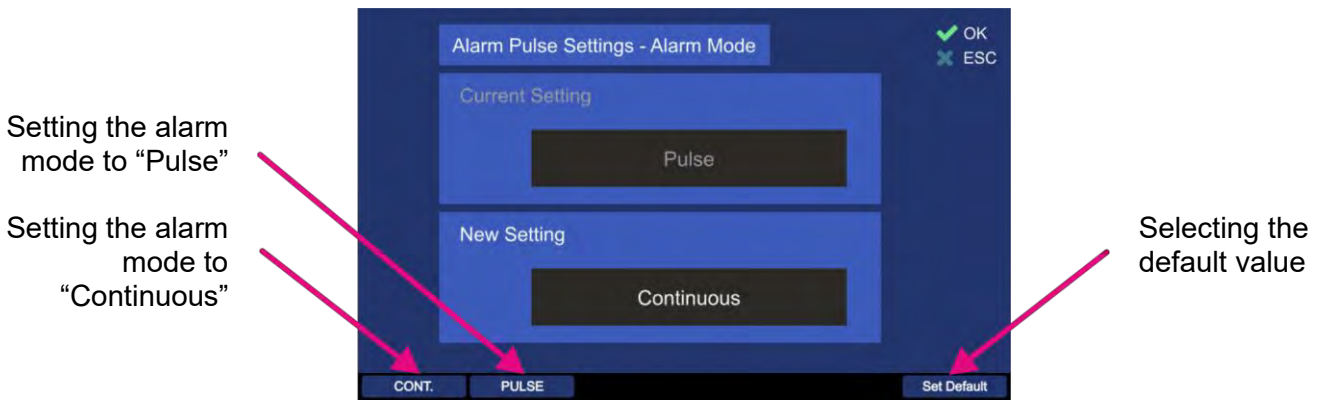
Figure 91. Alarm mode dialog

Setting the alarm mode to "Pulse"

Setting the alarm mode to "Continuous"

Selecting the default value

- o Pressing the " CONT." hotkey sets the alarm mode of the alarm pulse to "Continuous". That means the output is high or low as long as the alarm condition exists.
- o Pressing the "PULSE" hotkey sets the alarm mode to "Pulse", which means that the output is pulsed as long as the alarm condition exists. The pulsed signal is defined by the settings "Active Direction", "Time Off" and "Time On".
- o Pressing the "Set Default" hotkey sets the alarm output to the default value, which is "Pulse"

Time Off

This setting defines the time of the absence of the alarm indication (the duration of the alarm absence), e.g. using the default value of 5 seconds will stop the alarm indication for 5 seconds after period of the alarm-on time, which is adjusted in the "Time On" setting ".

- o To change the "Time Off"- time, press the hotkey "Edit Value" (s. Figure 89, ⑤). The related dialog will open (s. Figure 92).
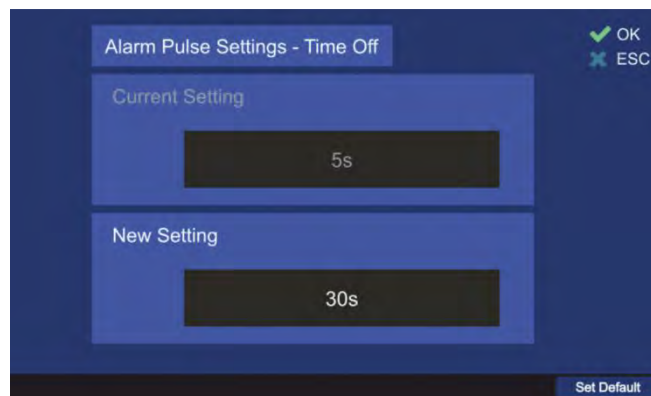

Figure 92. Time off Dialog

- o Use the number keys of the DCU keypad to enter the new value for the "Time Off" setting.
- o Press the hotkey "Set Default" to use the default value of 5 s.
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Time On

This setting defines the time of the alarm indication (the duration of the alarm pulse), e.g. using the default value of 5 seconds will lead to an alarm indication for 5 seconds after the "Time on" was triggered.

- o To change the "Time On"- time, press the hotkey "Edit Value". The related dialog will open (s. Figure 93).
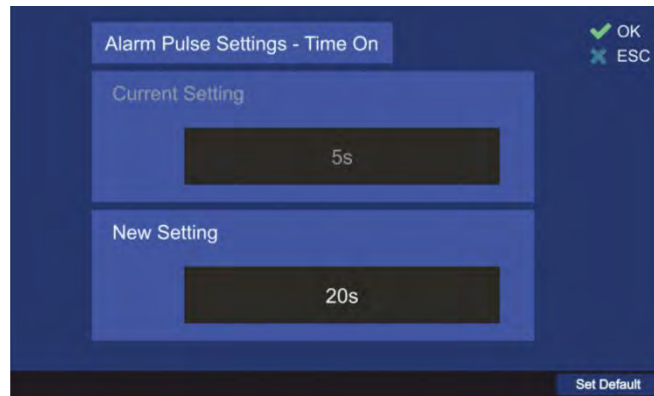
Figure 93. Time on Dialog

- o Use the number keys of the DCU keypad to enter the new value for the "Time On" setting.
- o Press the hotkey "Set Default" to use the default value of 5 s.
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.2 Antenna Unit

The RT-500-M dipole antenna unit can only be mounted in the vertical position.
For standard mounting (which is the default setting), the mounting flange points to the bottom of the vessel.
This setting must be changed to "Upside Down", if the antenna is mounted hanging upside down (flange on the top), in order to get the correct signal processing.

- o By pressing the "OK button or the hotkey "Edit Value", while the setting "Antenna Unit" is marked by the green frame, the following dialog is opened.

Choosing the "Upside Down" mounting position

Choosing the "Standard" mounting position

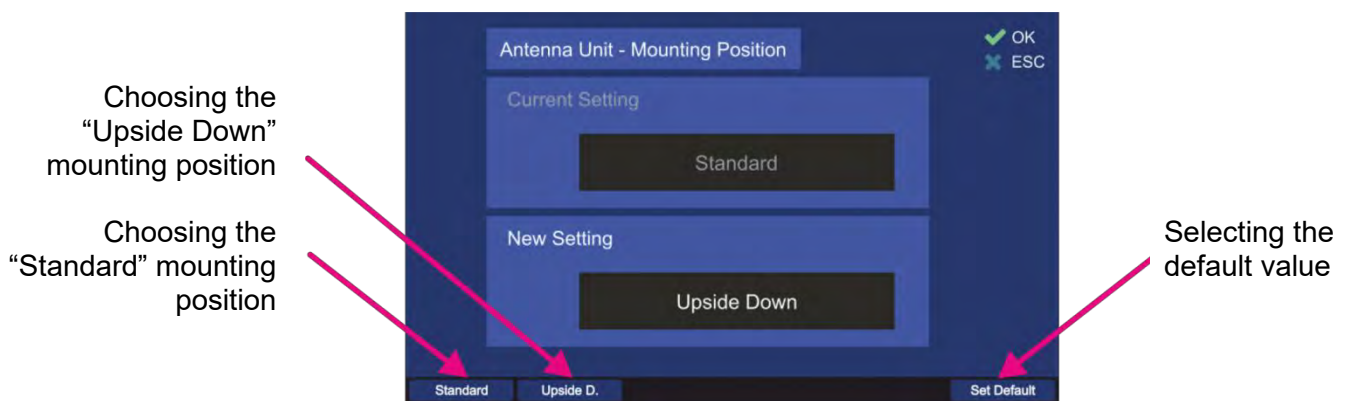Selecting the default value

Figure 94. Antenna unit (mounting position) dialog

- o Pressing the "Standard" hotkey sets the value for the mounting position to "Standard".
- o Pressing the "Upside D." hotkey sets the value for the mounting position to "Upside Down".
- o Pressing the "Set Default" hotkey sets the antenna unit mounting position to the default value, which is "Standard"
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.3 Antenna Offset

The antenna is to be mounted facing "North" or "0°" direction. There is a "North" respectively "0°" marker on the antenna unit, which has to point to the vessel's bow, parallel to the vessel's longitudinal axis.

If for some reason the antenna cannot be mounted pointing exactly to the bow, the deviation correction should be put in, using this setting, in order to calculate bearing values correctly.

The offset is adjustable from 0° to 359° (e.g. -15° = 345°).

- o By pressing the "OK button or the hotkey "Edit Value", while the setting "Antenna Offset" is marked by the green frame, the following dialog is opened.
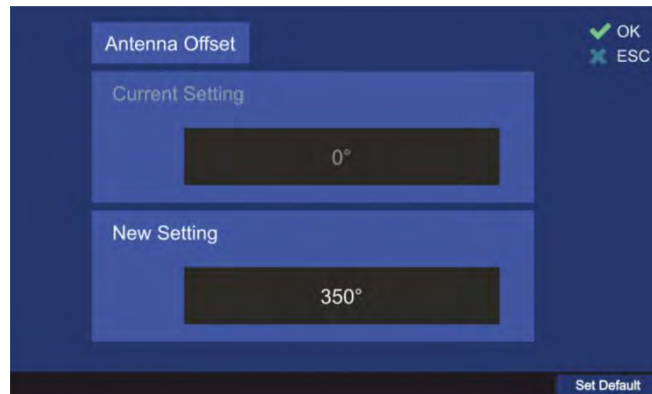

Figure 95. Antenna offset dialog

- o Use the number keys of the DCU keypad to enter the new value for the "Antenna Offset".
- o Press the hotkey "Set Default" to use the default value of 0°.
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.4 AU Calibration

This setting determines whether calibration values are used for the bearing calculation or not. In the default case, the internal calibration values of the AU are used, which can be disabled using this setting.

- o By pressing the "OK button or hotkey "Edit Value", while the setting "AU Calibration" is marked by the green frame, the following dialog is opened.
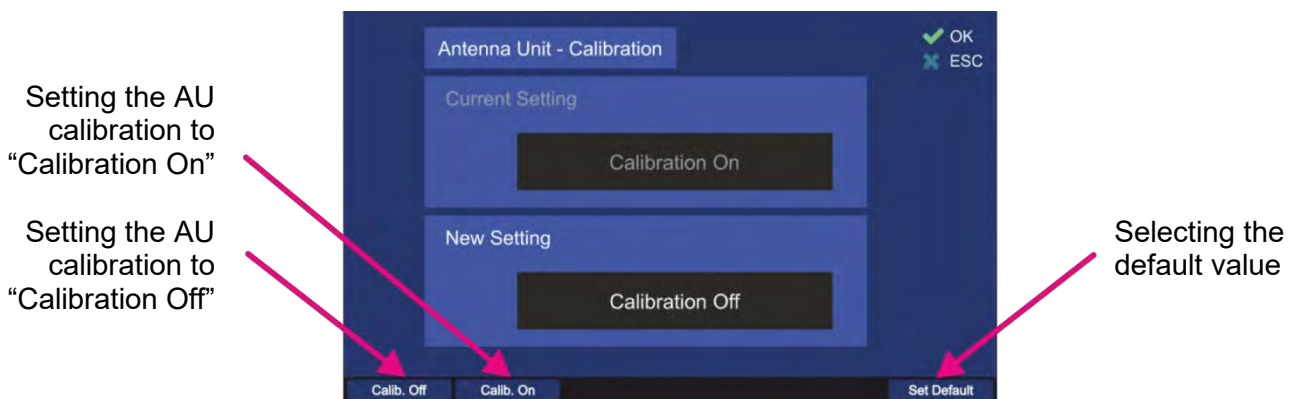
Figure 96. AU calibration on/off dialog

- o Including the AU calibration values into the bearing calculation is done by pressing the hotkey "Calib. On".
- o To disable using the internal calibration values of the AU choose the hotkey "Calib. Off" (only in special cases).
- o Press the hotkey "Set Default" to use the default value (calibration on).
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.5 Beep Tone Decoding

Parameters of the menu "Beep Tone Decoding" control the behavior of the function "Fast Channel Scan", for the case that an alarm should be triggered only if an audio signal ("BeepTone") has been decoded.
This setting is only usable, if option "Fast Channel Scan" is unlocked (for further information please see 7.2.3.2).

The user can define characteristics of beep tone decoding by pressing "OK" or the hotkey "Edit Value", while the setting "Beep Tone Decoding" is marked by the green frame. The following dialog opens (s. Figure 97).

Figure 97. Beep tone decoding settings

All values can be set to the default values, using the hotkey "Reset Values" (s. Figure 98, position 5).

Frequency High defines the upper frequency for the beep tone decoding. The default value for this setting is 900 Hz. There are two ways to change this setting: either using the "Freq. High" or the "Edit Value" hotkey (s. Figure 98, positions 1 and 4), both of these hotkeys will open the same dialog.
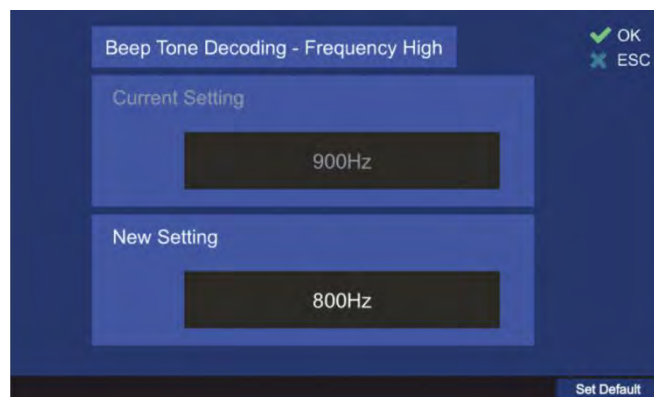

Figure 98. Dialog for the upper frequency (Beep Tone Decoding)

- o Type the new value for the upper frequency into the "New Setting" field, using the DCU number keys.
- o Press the hotkey "Set Default" to use the default value (900 Hz).
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Frequency Low defines the upper frequency for the beep tone decoding. The default value for this setting is 700 Hz. There are two ways to change this setting: either using the "Freq. Low" or the "Edit Value" hotkey (s. Figure 98, positions 2 and 4), both of these hotkeys will open the same dialog.
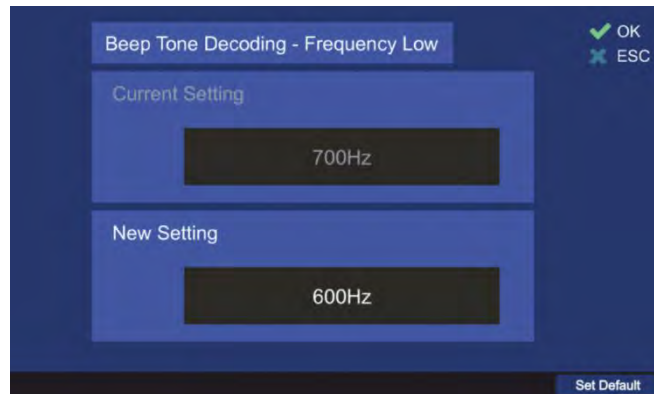

Figure 99. Dialog for the lower frequency (Beep Tone Decoding)

- o Type the new value for the lower frequency into the "New Setting" field, using the DCU number keys.
- o Press the hotkey "Set Default" to use the default value (700 Hz).
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Decoding Time defines the decoding time for the beep tone decoding (minimum required duration of the signal).
The default value for this setting is 200 ms. There are two ways to change this setting: either using the "Dec. Time" or the "Edit Value" hotkey(s. Figure 98, positions 3 and 4), both of these hotkeys will open the same dialog.
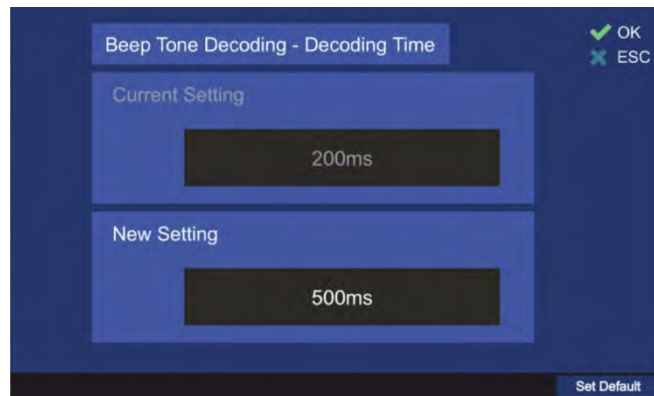

Figure 100. Decoding time dialog

- o Type the new value for the decoding time into the "New Setting" field, using the DCU number keys.
- o Press the hotkey "Set Default" to use the default value (200 ms).
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.6 Frequency Input Dialog Time

This setting defines the duration until the dialog for frequency input (s. 7.1.2.2) closes automatically if no interaction of the user happens.

- o By pressing the "OK button or hotkey "Edit Value", while the setting "Frequency Input Dialog Time" is marked by the green frame, the following dialog is opened.
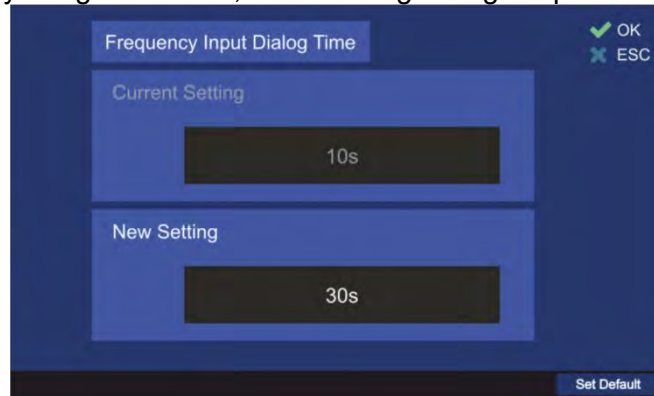

Figure 101. Frequency input hold time dialog

- o Type the new value for the frequency input hold time into the "New Setting" field, using the DCU number keys.
- o Press the hotkey "Set Default" to use the default value (10 s).
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.7 Lock/Unlock Frequencies

It is possible to lock or unlock some particular frequencies as well as entire frequency bands from the licensed frequency ranges. After a frequency has been locked, it will not be possible to set this frequency for the bearing operation on the "Bearing" page.
Locking/unlocking of frequencies is the responsibility of the administrator. The operator can only view the frequencies, which have been locked by the administrator in the dialog "Frequency Information Dialog" (s. 7.4.1.8).

- o By pressing the "OK button or hotkey "Edit Value", while the setting "Lock/Unlock Frequencies" is marked by the green frame, the following dialog is opened (s. Figure 102).
  This view will contain only one hotkey "Add Freq." if entered for the first time, when no frequency is locked yet.
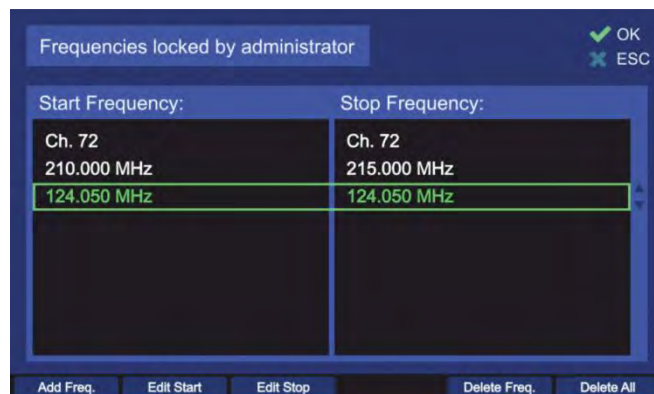

Figure 102. Locked frequencies list. Administrator view

- o The use of this dialog is described in chapter 7.4.1.8, please refer to it for more information.

7.4.3.8 MOB Trigger

This setting defines the event for starting the MOB mode.

Basically, the MOB mode can be triggered by three situations:

1. The vessel's crew witnesses a person falling over board. The MOB mode can be activated manually by pressing the MOB button (s. Figure 6, position 7) of the DCU keypad.
2. The person, who falls over board, is wearing an ELT (emergency locator transmitter) that produces a typical modulated emergency signal. The emergency signals are recognized by RT-500-M and can activate the MOB function if the corresponding setting is activated.
3. The person, who falls over board, is wearing a personal transmitter beacon that produces an audio emergency signal ("beep tone" with distinct acoustic frequency). The emergency signals are recognized by RT-500-M and can activate the MOB function if the corresponding setting is activated.

To adjust the trigger event for starting the MOB mode, press the "OK" button or hotkey "Edit Value", while the setting "MOB Trigger" is marked. The following dialog will open (s. Figure 103).
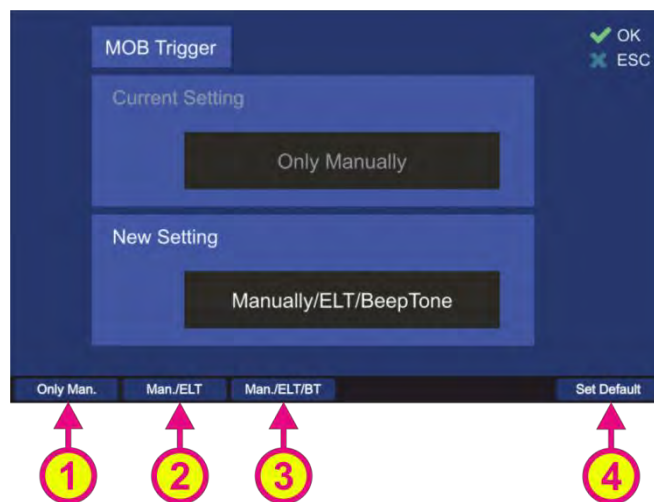

Figure 103. MOB trigger dialog

o Choose the new setting using one of three hotkeys (s. Figure 103, positions 1, 2 and 3), which will then appear in the "New Setting" field.

"Only Man." The MOB mode will be started by pressing the MOB button only.
"Man./ELT" The MOB mode will either be started by pressing the MOB button or by an ELT alarm.
"Man./ELT/BT" The MOB mode will be started by the following events:
- User presses the MOB button
- ELT alarm occurred
- Beep Tone detected

Note
"BT" (beep tone) is active only in "Fast Channel Scan".

o Press the hotkey "Set Default" (s. Figure 103, position 4), to use the default value ("Only Manually").
o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.9 Monitoring

This setting determines how the "Monitoring" function will be handled.

There are two possible settings in this menu (s. Figure 104).

- o To open the dialog for the "Monitoring" handling, press button "OK" or hotkey "Edit Value", while the line "Monitoring" is marked.

Choosing the "Stays On" setting

Choosing the "On/Off (User)" setting
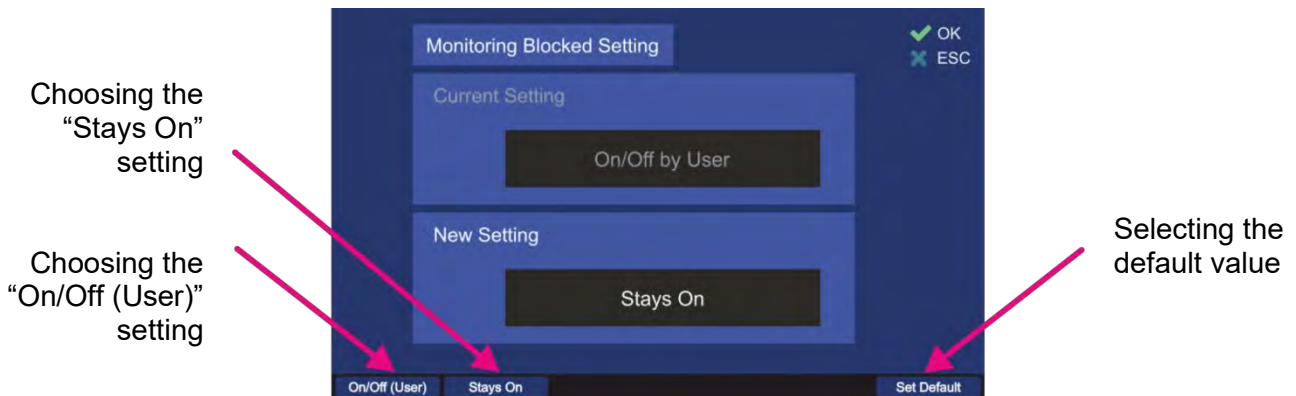
Selecting the default value

Figure 104. Monitoring handling settings

- o Choose the new setting using one of the hotkeys (s. Figure 104), which will then appear in the "New Setting" field.
  "On/Off (User)" The user can start and terminate the monitoring mode.
  "Stays On" The monitoring mode starts immediately after adopting this setting and the user cannot terminate this mode. To terminate the monitoring mode or change this setting the "Administrator" access is needed.

- o Press the hotkey "Set Default" to use the default value ("On/Off by User").

- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.10 PS Ram

This setting defines if compass data should be used to compensate the "Contouring Error" inside the AU.

Fast changes of the ship's course can lead to a "Contouring Error" of the bearing indication, when the direction, shown on the bearing page, changes slowly compared to the vessel's direction change. The reason is the averaging procedure of the phase summator inside the antenna unit.

If an external compass is connected, the bearing value determination can be done by a special, improved compensating procedure (the "PS Ram compensation"), which eliminates the contouring error. For a compass of minor quality (e.g. heavy and quick variations) it may be necessary, to switch off the "PS Ram compensation".

- o To open the dialog for the "PS Ram" handling, press button "OK" or hotkey "Edit Value", while the line "PS Ram" is marked.

Setting the PS Ram compensation to "Comp. Off"

Setting the PS Ram compensation to "Comp. On"
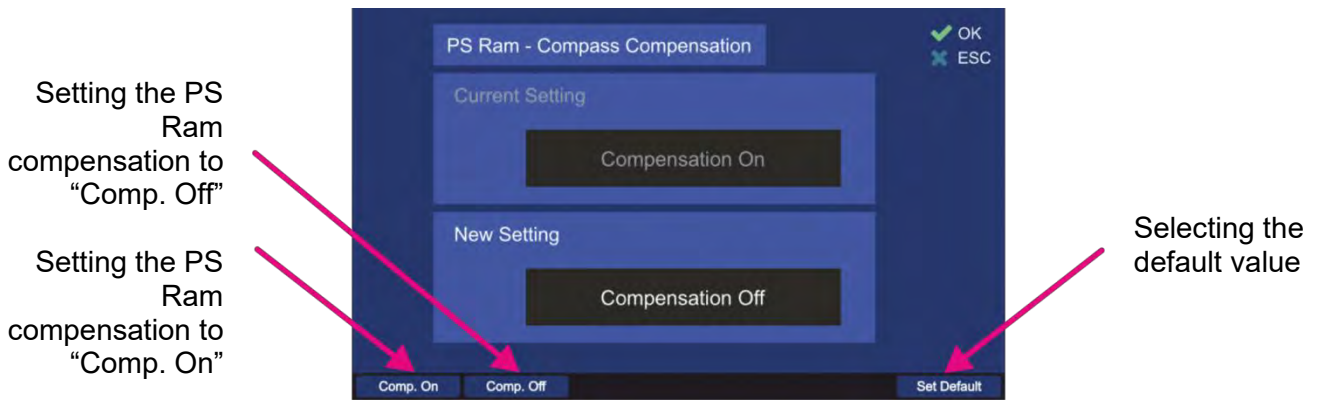
Selecting the default value

Figure 105. PS Ram compensation dialog

o   Choose the new setting using one of the hotkeys (s. Figure 105), which will then appear in the "New Setting" field.
"Comp. On": The AU will use compass values to compensate the contouring error.
"Comp. Off": The AU will not use compass values to compensate the contouring error.

o   Press the hotkey "Set Default" to use the default value ("Comp. On").

o   Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.11 S/N Ratio AutoSQL [dB]

This value defines the "Signal to Noise Ratio" for the automatic squelch control inside the AU.
S/N Ratio determines how many level-points the squelch marker is set above the noise level. If e.g. the value is 6, the squelch marker is always adjusted 6 level-points above the noise level, when the "AutoSQL" function is used.

o   By pressing the "OK button or hotkey "Edit Value", while the setting "S/N Ratio AutoSQL [dB]" is marked, the following dialog is opened (s. Figure 106).
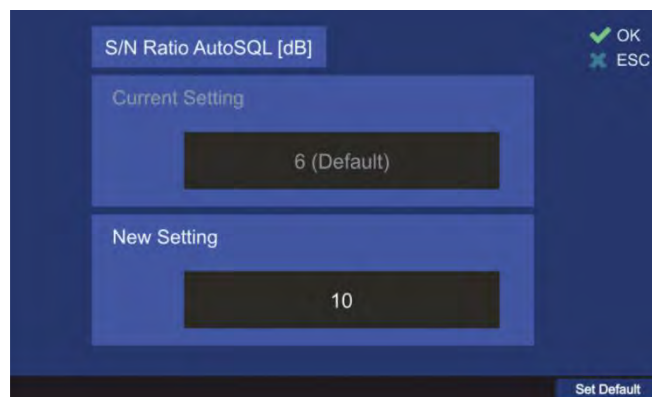
Figure 106. S/N Ratio for auto squelch function

o   Use the number keys of the DCU keypad to enter the new value for the "S/N Ratio".
o   Press the hotkey "Set Default" to use the default value of "6".
o   Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.12 Scan Page Settings

This value defines the effect of pressing "OK" on the "Scan" page.
In every case, pressing "OK" will start a scan algorithm, if it was in a deactivated state, but with one setting the "Scan" page will stay open, and in the other case the "Bearing" page will be opened.

- o By pressing the "OK button or hotkey "Edit Value", while the setting "Scan Page Settings" is marked, the following dialog is opened (s. Figure 107).

Setting the "Go to Bearing Page" behavior

Setting the "Stay on Scan Page" behavior
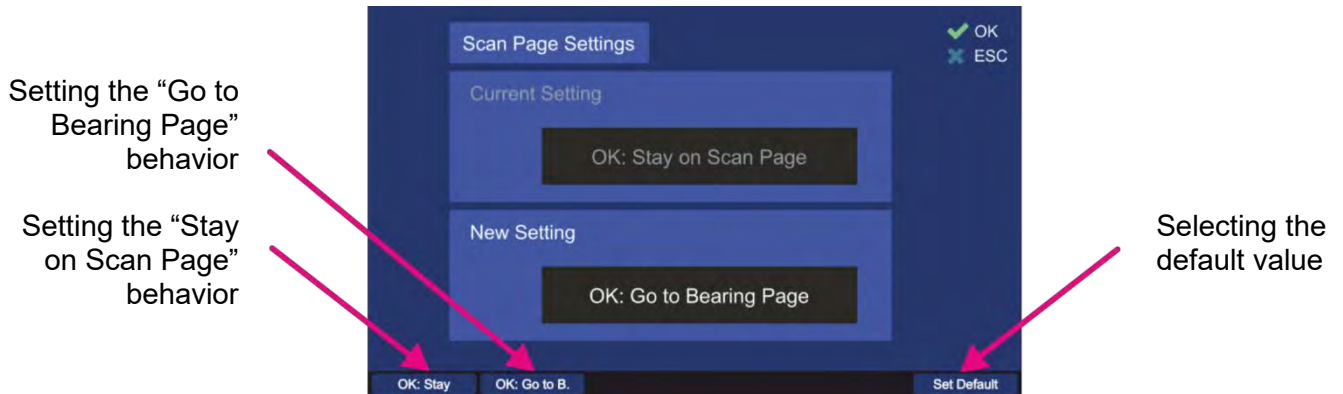
Selecting the default value

Figure 107. Scan page settings dialog

- o Choose the new setting using one of the hotkeys (s. Figure 107), which will then appear in the "New Setting" field.
  "OK: Stay": Pressing this hotkey defines that the "Scan" page should stay opened after starting a scan algorithm by pressing "OK" (on the "Scan" page).
  "OK: Go to B.": Pressing this hotkey defines that the "Bearing" page should be opened after starting a scan algorithm by pressing "OK" (on the "Scan" page).

- o Press the hotkey "Set Default" to use the default value ("OK: Stay on Scan Page").

- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.4 Interface

The setup menu "Interface" contains critical settings that influence important system parameters, therefore it is password protected and can be used by the administrator only.

This page enables the user to configure the interfaces to external devices.
It is possible to configure programmable IOs, LAN interface, interfaces to external compass and GPS.
Furthermore, the user is able to configure the characteristics for remote control via NMEA commands.
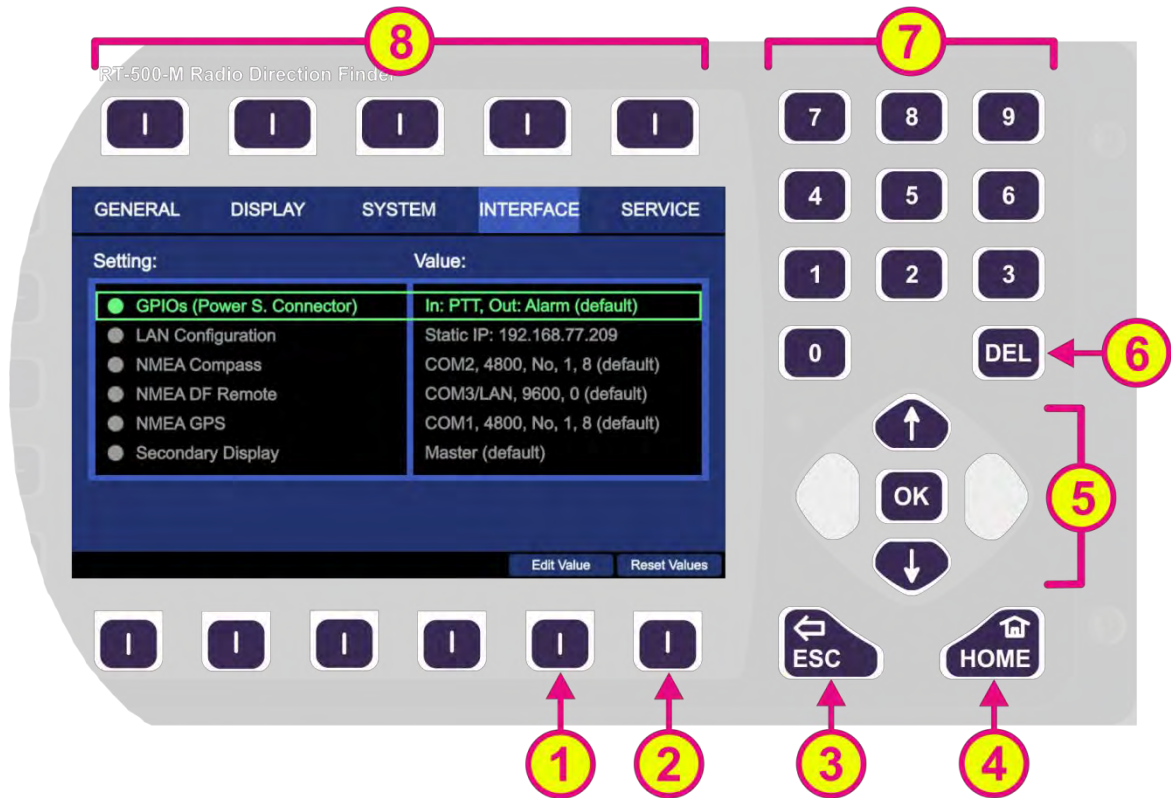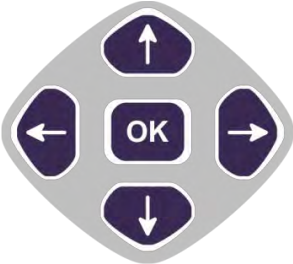
Figure 108. Setup page. Interface settings

Indication on Setup Page, Interface Settings		
Pos.	**Element**	**Meaning / Description**
①	"Edit Value"	Depending on currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below)
②	"Reset Values"	Resets all values to the default settings. The default setting values cannot be changed by the user.
③	⬅ ESC	When there is a dialog opened, pressing this button will close the dialog without adopting new values. When there is no dialog opened, pressing this button will go back to the last activated page. The "Bearing" page is the end point.
④	🏠 HOME	Pressing this button always leads to the Bearing Page. Even an opened dialog will be closed, without adopting the changed values.
⑤	↑ ← OK → ↓	"Up" and "Down" arrows are used to move between the display settings. "Right and "left" arrows have no function inside the interface settings" page. With the "OK" button confirming of values or opening the interface settings dialogs is accomplished.
⑥	DEL	Inside the interface settings dialogs the "DEL" button is used to clear the whole input at once. On the top level of this page this button has no function.

⑦	[7] [8] [9] [4] [5] [6] [1] [2] [3] [0] [DEL]	Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the page they have no function.
⑧	Top line	Navigation line of the screen, which allows switching between setup menus ("General", "Display", "System", "Interface" and "Service").

Table 14. Setup page, interface settings. List of elements.

7.4.4.1 NMEA DF Remote

It is possible to operate the RT-500-M direction finder remotely using the NMEA communication protocol.
For this purpose, the control unit (e.g. ECDIS) can be connected to the NMEA interface of the DCU.

o   Additionally, by choosing the combination "COMx[1] / LAN", the NMEA sentences will be also sent via the LAN connection (s. Figure 109, position 3).

Note
If communication ports other than the default port (COM3) are not used, they will appear as hotkeys in the dialogs (as possible ports to use for the NMEA remote communication). And vice versa, when they are occupied, the corresponding hotkeys are not displayed.

Note
By default, the "Autotalk" mode is activated, which means that NMEA sentences of the direction finder are sent out cyclically with a fixed time period of 250 ms. The "Autotalk" mode can also be deactivated per corresponding NMEA command (s. NMEA-Protocol Description (RT-500-M & RT-800))

Configure the interface settings for remote control of the direction finder in this menu item.

o   Press the button "OK" or hotkey "Edit Value", while the setting "NMEA DF Remote" is marked (s. Figure 108).
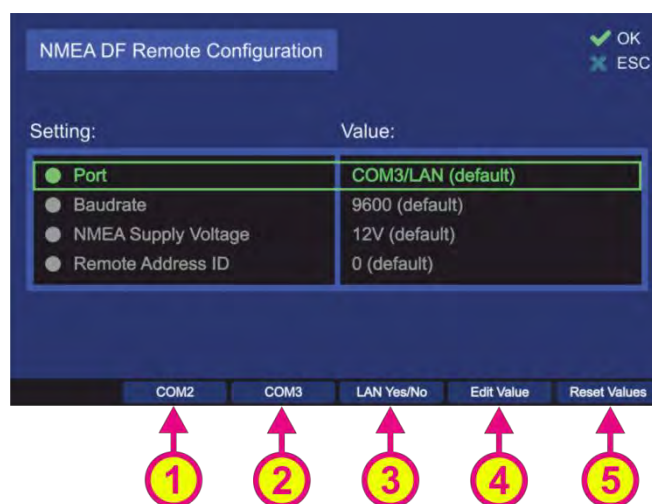   Following sub-menu will appear (s. Figure 109).

Figure 109. NMEA DF remote control configuration

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[1] "x" stands for the number of the interface

The NMEA DF remote configuration is accomplished by the following settings:
- Port
- Baudrate
- Remote Address ID

NMEA supply voltage (12 V) is not configurable, but it is displayed there as information.
Pressing the hotkey "Reset Values" (s. Figure 109, position 5) will set all menu items to default values.
To exit the dialog confirming all changes that have been made within the sub-dialogs for single settings, press "OK".

Note
Pressing "ESC" instead of "OK" when leaving the "NMEA DF Remote Configuration" dialog will discard all entered settings.

Port

This setting defines, which communication port is connected to the remote control PC.
o   For changing the communication port, press either the hotkey "COMx" (s. Figure 109, positions 1 and 2) or the hotkey "Edit Value" while the menu item "Port" is marked (s. Figure 109, position 4).

   Note
   that also the hotkey for COM1 can be displayed there if it is not used for other NMEA devices like e.g. compass.

o   Using the hotkey for "COMx" in the top level dialog "NMEA DF Remote Configuration", changes the value of the "Port" setting without opening the corresponding dialog.

o   Pressing the hotkey "LAN Yes/No" (s. Figure 109, position 3) will turn on the additional communication over LAN (pressing this hotkey again will turn the LAN communication off, see also 7.4.4.2).
   If COMx and LAN are set for remote control, the priority between both is time-based.

   Example:
      ➔ Commando for squelch comes via LAN.
      ➔ Commando for squelch comes via COM.
      ⬅ First, the squelch level gets adjusted on the LAN command. During this time the message from the COM port is buffered.
      ⬅ After that, the squelch level gets adjusted on the command from COM port.

o   Pressing the hotkey "Edit Value" while "Baudrate" is marked, opens the following sub-dialog (s. Figure 110).
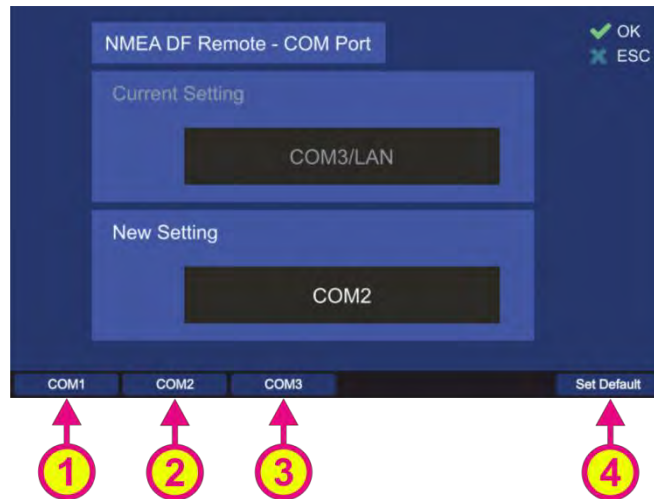
Figure 110. Remote communication port configuration

- o Selecting "COMx" (s. Figure 110, positions 1, 2 and 3) configures the corresponding NMEA interface as the remote communication port. Choose the new setting using one of the hotkeys, which will then appear in the "New Setting" field.

    Note
    This setting will only set the corresponding communication port. Additional transmitting the NMEA sentences over LAN should be set in the top level menu (s. Figure 109, position 3).

- o Press the hotkey "Set Default" to use the default value.
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Baudrate
Defines the speed of NMEA interface data transfer.
The default value for the baud rate of the NMEA remote control is 9600. The baud rate can be changed using this menu item.
For further information please see the document "NMEA-Protocol Description (RT-500-M & RT-800)".

- o To change the baud rate, press the hotkey "Edit Value" while the menu item "Baudrate" is marked (s. Figure 109). The corresponding sub-dialog will be opened (s. Figure 111).
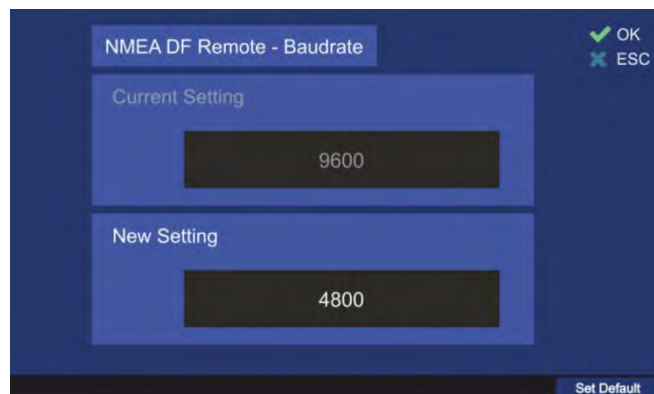

Figure 111. Remote control baud rate configuration

- o Use the number keys of the DCU keypad to enter the new value for the "Baudrate".
- o Press the hotkey "Set Default" to use the default value of "9600".
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

NMEA supply voltage
Is not configurable (12 V, default), but it is displayed under the NMEA settings as information.

Remote Address ID
Is a setting, which is used to give the direction finder an address ID for the NMEA communication.
The DF only reacts to the NMEA request sentences, if the address ID in the sentence is equal to the address, which is selected via this setting (or has the value 255, if the ID was not set).

Note
When using address ID = 255, then all connected DF systems are addressed, independent of their internal IDs.

For further explanation please refer to the document "NMEA-Protocol Description (RT-500-M & RT-800)".
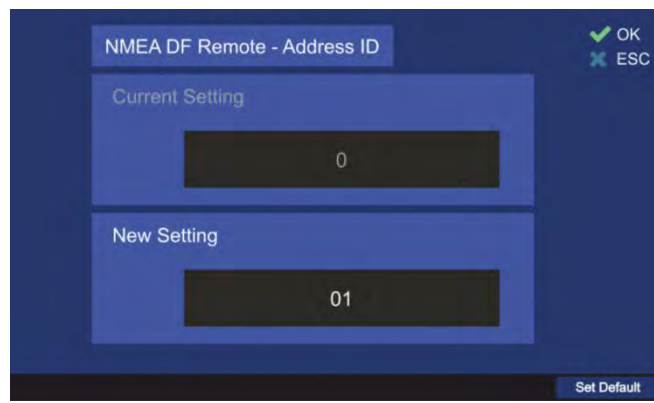The address ID can take values between 0 and 99.

Figure 112. Remote control address ID configuration

- o   Use the number keys of the DCU keypad to enter the new value for the "Address ID".
- o   Press the hotkey "Set Default" to use the default value of "0".
- o   Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.4.2 LAN Configuration

The RT-500-M DCU can be connected to the Local Area Network of the vessel.
To configure the LAN interface of the DCU use the menu item "LAN Configuration".

- o Press the button "OK" or hotkey "Edit Value", while the setting "LAN Configuration" is marked (s. Figure 108).
  Following sub-menu will appear (s. Figure 113).

Figure 113. LAN configuration menu

There are two settings necessary to configure the DCU for LAN communication:
- Mode of the IP address assignment
- The IP address

Pressing the hotkey "Reset Values" (s. Figure 113, position 4) will set all menu items to the default values.

The <u>default setting</u> after the first booting of the system is:
Mode: **Static IP**
IP Address: **192.168.77.208**
TCP Port for remote control: **9999**

<u>Mode</u>
The mode of the IP address assignment can be static or dynamic.
If the mode is changed to "**dynamic**", then the IP address is assigned dynamically by the DHCP server, which means that the DCU gets a random IP address that is currently free. It also means that the IP address can change at any time.
The hotkey "Edit Value" disappears, if the setting "IP Address" is marked and "Mode" is currently set to dynamic.
The presently assigned IP address can be viewed via the "IP Address" setting.

If the mode is set to "**static**", the IP address of the DCU must be set to a valid fixed value that is not occupied by any other user of the vessel's LAN. Once assigned, the static IP address does not change anymore.

- o IP address assignment can be changed directly using the hotkeys "Static IP" and "Dynamic IP" (positions 1 and 2, s. Figure 113), so that the value of this setting is changed without opening the dialog, or it can be set over the corresponding dialog after pressing the hotkey "Edit Value" (s. Figure 113, position 3) while this menu point is marked, the following dialog opens (s. Figure 114).
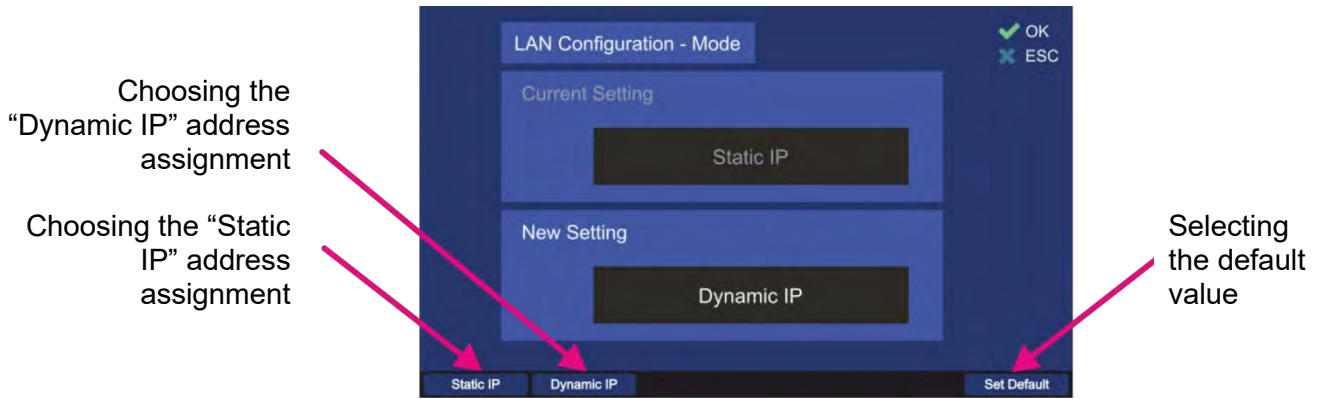
Choosing the "Dynamic IP" address assignment

Choosing the "Static IP" address assignment

Selecting the default value

Figure 114. Changing the mode of the IP address assignment

- o Choose the new setting using one of the hotkeys (s. Figure 114), which will then appear in the "New Setting" field.
- o Press the hotkey "Set Default" to use the default value ("Static IP").
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

<u>**IP Address**</u>

The IP address can be changed only if "Mode" is set to "Static IP" (dynamic IP address is assigned by the DHCP server).

- o For changing the IP address press the hotkey "Edit Value" while this menu point is marked (s. Figure 113, position 3).
  Following dialog opens (s. Figure 115).

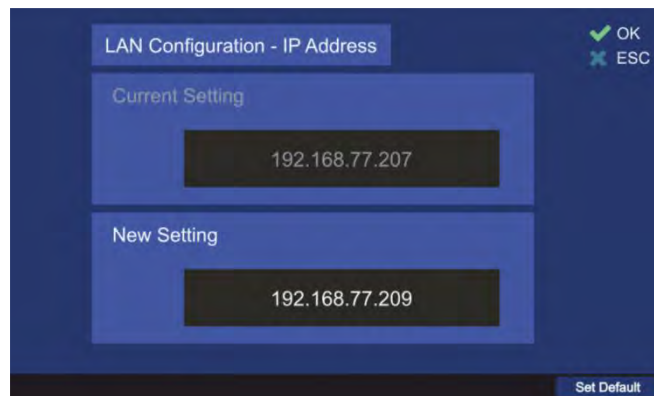**Figure 115. Setting the new IP address**

- o Use the number keys of the DCU keypad to enter the new value for the "IP Address" setting.
- o Press the hotkey "Set Default" to use the default value "192.168.77.208".
- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Caution
Always reboot the DCU after changing the mode or IP address settings!

7.4.4.3 NMEA Compass

An external compass can be connected to the NMEA interface of the DCU.

Configure the interface settings for external compass in this menu item.

- o Press the button "OK" or hotkey "Edit Value", while the setting "NMEA Compass" is marked. Following sub-menu will appear (s. Figure 116).
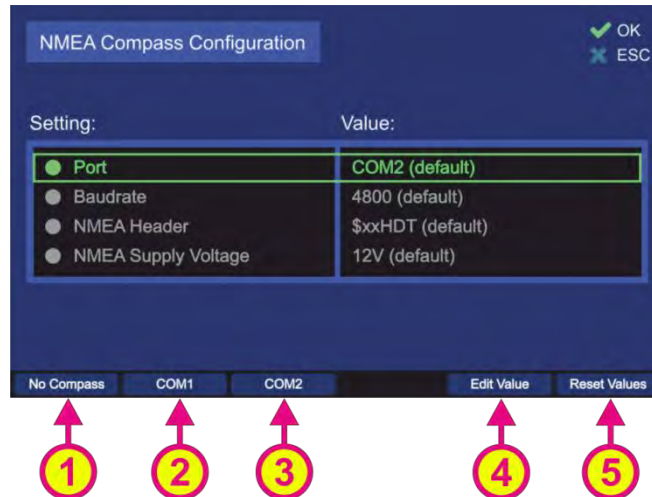

Figure 116. Compass configuration settings

There are three settings necessary to configure the NMEA compass connection:
- Port
- Baudrate
- NMEA header

NMEA supply voltage (12 V) is not configurable, but it is displayed there as information.
Pressing the hotkey "Reset Values" (s. Figure 116, position 5) will set all menu items to default values.
To go out of dialog confirming all changes, which have been made within the sub-dialogs for the single settings, press "OK".

Note
Pressing "ESC" instead of "OK" leaving the "NMEA Compass" dialog, all previously configured changes of single settings will not be adopted.

Port
This setting defines, which communication port is connected to the external compass.
- o The communication port can be changed by pressing one of the three hotkeys "No Compass", "COM1" or "COM2" (s. Figure 116, positions 1, 2 or 3) or the hotkey "Edit Value" while menu item "Port" is marked (s. Figure 116, position 4).
  Using the hotkeys 1, 2 or 3 on the top level dialog "NMEA Compass Configuration" (s. Figure 116), the value of the "Port" setting can be changed without opening the corresponding dialog.

- o Pressing the hotkey "Edit Value" the following sub-dialog will be opened (s. Figure 117).

Figure 117. Compass connector setting

- Choose the new setting using one of the hotkeys (s. Figure 117), which will then appear in the "New Setting" field.
  Selecting "<u>COM1</u>" or "<u>COM2</u>" (s. Figure 117, positions 2 and 3) configures the corresponding communication port as the input port for the external compass data. By choosing "<u>No compass</u>" setting (s. Figure 117, position 1), the external compass data will be ignored. "No compass" has to be selected, if no external compass is connected, in order to avoid displaying the corresponding warning on the "Bearing" page ("No Compass" warning).

- Press the hotkey "Set Default" to use the default value ("COM2").

- Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

<u>Baudrate</u>
Defines the speed of NMEA interface data transmission.
The default value for baud rate of the NMEA interface is 4800, in compliance with the standard for NMEA 0183, version 3.01. The baud rate can be changed using this menu item.
For further information please see the document "NMEA-Protocol Description (RT-500-M & RT-800)".

- To change the baud rate, press the hotkey "Edit Value" while the menu item "Baudrate" is marked (s. Figure 116). The corresponding sub-dialog will be opened (s. Figure 118).
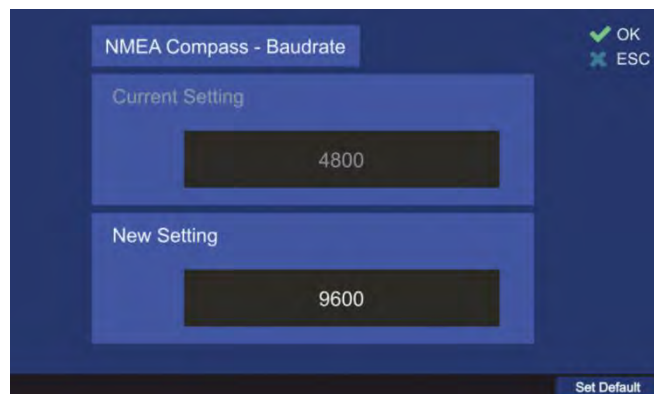

Figure 118. Compass baud rate setting

- Use the number keys of the DCU keypad to enter the new value for the "Baudrate".

o   Press the hotkey "Set Default" to use the default value of "4800".

o   Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

NMEA Header
Defines the appropriate compass NMEA sentence provided by vessels compass. Please see the compass documentation of the vessel.

The default setting for the NMEA header is "$xxHDT" and can be changed within this menu item.

o   In order to change the NMEA header setting, press the hotkey "Edit Value" while the menu item "NMEA Header" is marked (s. Figure 116). The corresponding sub-dialog will be opened (s. Figure 119).
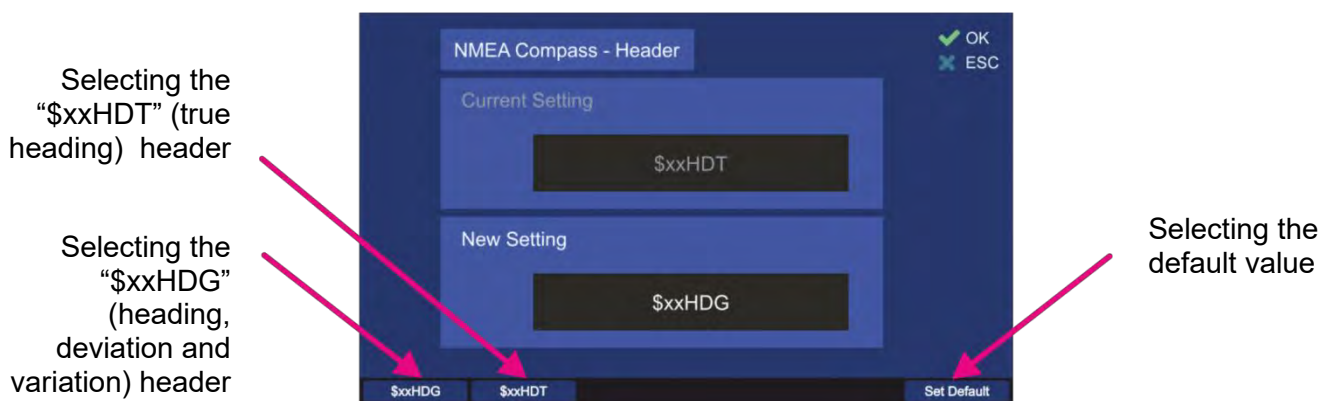
Figure 119. Compass header setting

o   Choose the new setting using one of the hotkeys (s. Figure 119), which will then appear in the "New Setting" field.

o   Press the hotkey "Set Default" to use the default value ("$xxHDT").

o   Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

NMEA supply voltage (12 V, default) is not configurable, but it is displayed under the NMEA settings as information.

7.4.4.4 NMEA GPS

The RT-500-M DCU is able to read external GPS data via a defined NMEA protocol.
Connect the external GPS device to one of the NMEA interfaces of the DCU.
The GPS data format can be configured in this menu.

- o Press the button "OK" or hotkey "Edit Value", while the setting "NMEA GPS" is marked (s. Figure 108).
  Following sub-menu will appear (s. Figure 120).
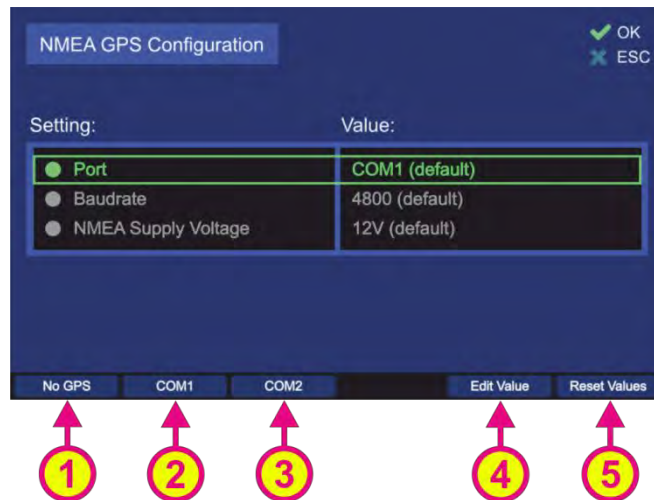
Figure 120. NMEA GPS configuration settings

The NMEA GPS configuration is accomplished by the following settings:
- Port
- Baudrate

NMEA supply voltage (12 V) is not configurable, but it is displayed there as information.

- o Pressing the hotkey "Reset Values" (s. Figure 120, position 5) will set all menu items to default values.

- o To exit the dialog confirming all changes that have been made within the sub-dialogs for single settings, press "OK".

  Note
  Pressing "ESC" instead of "OK" when leaving the "NMEA GPS Configuration" dialog, all previously configured changes of single settings will be discarding.

Port

This setting defines, which communication port is connected to the external GPS device.

Figure 121. NMEA GPS communication port settings

- o By selecting "No GPS" (s. Figure 121, position 1) the external GPS data will be ignored.

- o Selecting "COMx [1]" (s. Figure 121, positions 2 and 3) configures the corresponding NMEA interface as the GPS communication port. Choose the new setting using one of the hotkeys, which will then appear in the "New Setting" field.

- o Press the hotkey "Set Default" (s. Figure 121, position 4) to use the default value.

- o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Baudrate

Defines the speed of NMEA GPS interface data transfer.
The default value for the baud rate of the NMEA GPS communication is 4800. The baud rate can be changed using this menu item.
For further information please see the document "NMEA-Protocol Description (RT-500-M & RT-800)".

- o To change the baud rate, press the hotkey "Edit Value" while the menu item "Baudrate" is marked (s. Figure 120). The corresponding sub-dialog will be opened (s. Figure 122).
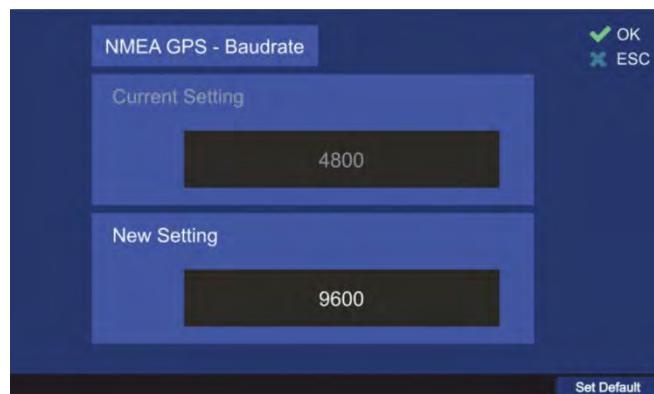

Figure 122. Changing the NMEA GPS baud rate setting

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[1] "x" stands for the number of the interface

o Use the number keys of the DCU keypad to enter the new value for the "Baudrate".

o Press the hotkey "Set Default" to use the default value of "4800".
o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

NMEA supply voltage
Is not configurable (12 V, default), but it is displayed under the NMEA settings as information.

7.4.4.5 GPIOs (Power S. Connector)

With this setting, the behavior of the two programmable GPIOs can be defined.
The power supply connector (POWER + IO, s. chapter 8.1) provides the "programmable IN" and the "programmable OUT" lines, where different signals can be provided.

o In order to define, which signals are to be allocated to the IOs, select the setting "GPIOs (Power S. Connector)" (s. Figure 108) and press "OK" or the hotkey "Edit Value". The following dialog appears (s. Figure 123. Dialog for setting the GPIOs).
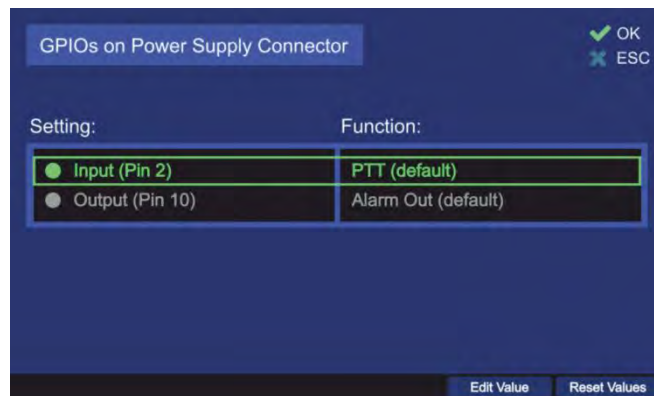

Figure 123. Dialog for setting the GPIOs

Input (Pin 2)

A signal can be allocated to the "programmable IN" pin (s. chapter 8.1, POWER + IO).
There are two setting possibilities for this pin:
1. PTT: This setting defines "Pin 2" as a source for the PTT signal. The software will look for PTT signal at this pin as well as at the actual PTT input pin (s. chapter 8.1, POWER + IO). Both sources are valid as PTT source.
2. No Function: This setting means that the pin will not be related to any function.

o To configure the programmable input pin, press the hotkey "Edit Value", while the setting "Input (Pin 2)" is marked.

Assigning the "PTT" signal to the input pin

Assigning "No Function" signal to the input pin

Selecting the default value

Figure 124. Assigning a function to the input pin

o Choose the new setting using one of the hotkeys (s. Figure 124), which will then appear in the "New Setting" field.

o Press the hotkey "Set Default" to use the default value ("PTT").

o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

Output (Pin 10)

A signal can be allocated to the "programmable pin OUT" (s. chapter 8.1, POWER + IO).
There are four setting possibilities for this pin:
1. Alarm Out: Choosing this setting connects the programmable output pin with the pin for the alarm relay (s. Figure 125, position 2).
2. Squelch Out: Choosing this setting (s. Figure 125, position 3) connects the programmable output pin with the "Squelch Out" pin of the "POWER + IO" connector (s. chapter 8.1).
3. Status Out: Choosing this setting connects the programmable output pin with the internal error status output of the device (s. Figure 125, position 4).
   That means, if there are no errors, the output will be active (open collector). If there is an error, the output will be not active (open collector).
4. No Function: Choosing this setting allocates the state "No Function" to the programmable pin, which means that the pin is not related to any function (s. Figure 125, position 1).

o To configure the programmable output pin, press the hotkey "Edit Value", while the setting "Input (Pin 2)" is marked.

Figure 125. Assigning a function to the output pin

o Choose the new setting using one of the hotkeys (s. Figure 125), which will then appear in the "New Setting" field.

o Press the hotkey "Set Default" (s. Figure 125, position 5) to use the default value ("Alarm Out").

o Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.5 Service

The "Service" menu allows the performing of the service-related functions, like e. g. updating of the DCU software, inputting the new license code if new options have been purchased, etc.

Note

The setup menu "Service" contains critical settings that influence important system parameters, therefore it is password protected and can be used only with the administrator access level.
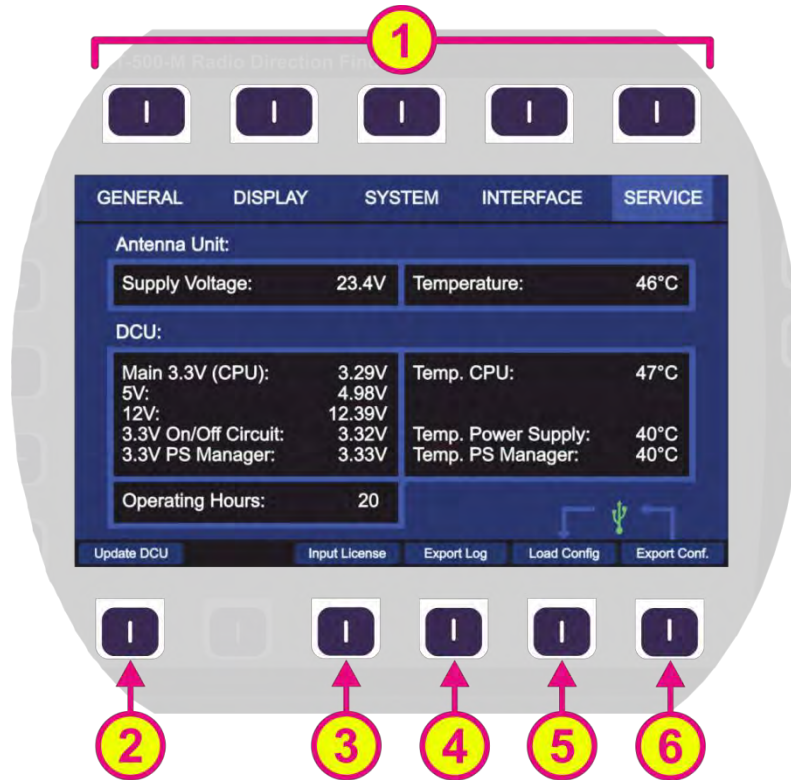

Figure 126. Setup page. Service menu

Indication on Setup Page, Service Menu		
Pos.	**Element**	**Meaning / Description**
①	Top line	Navigation line of the screen, which allows switching between setup menus ("General", "Display", "System", "Interface" and "Service").
②	"Update DCU"	Opens a dialog to start a software update for the DCU (s. 7.4.5.1).
③	"Input License"	Opens a dialog to input a new license code (s.7.4.5.2).
④	"Export Log"	Opens a dialog to export log files to USB (s. 7.4.5.3).
⑤	"Load Config"	Opens a dialog to import configuration files from USB (s. 7.4.5.4).
⑥	"Export Conf."	Opens a dialog to export configuration files to USB (s. 7.4.5.5).

Table 15. Service menu. List of elements.

After opening the "Service" menu by pressing the corresponding hotkey, while on the "Setup" page, an information view of the current system parameters opens.
Those are the most important working parameters of the AU and DCU, such as temperature or voltage of different functional blocks.

7.4.5.1 Update DCU

The "Update DCU" dialog is opened by pressing the corresponding hotkey when the service menu is opened (s. Figure 126, position 2). To load new software use the USB interface (s. chapter 6.2, Figure 7, position 11).

The function of this dialog is the updating of the DCU software, if a new version is available. In such a case the dialog has the following appearance (s. Figure 127).

Note

In the case of unavailability of the new software version, the dialog will merely show the current version without the possibility to take any action inside the dialog.

The hotkey "Start Update" appears, if a flash drive with a valid software version has been detected. The new software version is then displayed in the dialog under the label "New Version".
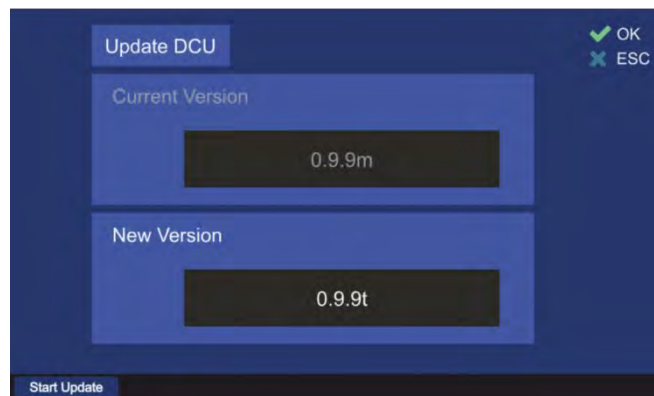

Figure 127. Update DCU dialog, new version available

o   Pressing the hotkey "Start Update" will start the update from USB.
    During the update, the text of the hotkey changes to "Update…" (s. Figure 128) and the warning at the top of the display appears.

Figure 128. Update DCU in progress

After a successful update the button name turns back to "Start Update".

Figure 129. Update of the DCU software finished

    o   Confirm the new software version with „OK" to leave the dialog.

Caution

Please always restart the device after the new software version was uploaded!

After the restart of the DCU, the indication of the new software version under the menu "General" (s. Figure 130) can be checked.

Figure 130. Update DCU control on the "General" page

7.4.5.2 Input License

If a new license code has been provided to you by RHOTHETA, you can input it using this dialog. The "Input License" dialog is opened by pressing the corresponding hotkey when the service menu is opened (s. Figure 126, position 3).

    o   You can input the new license either manually or load it from the USB flash drive.

    o   Use arrow buttons of the keypad to navigate between letters of the virtual keyboard in the license input dialog (s. also description of using the virtual keyboard in 7.4.1.5).

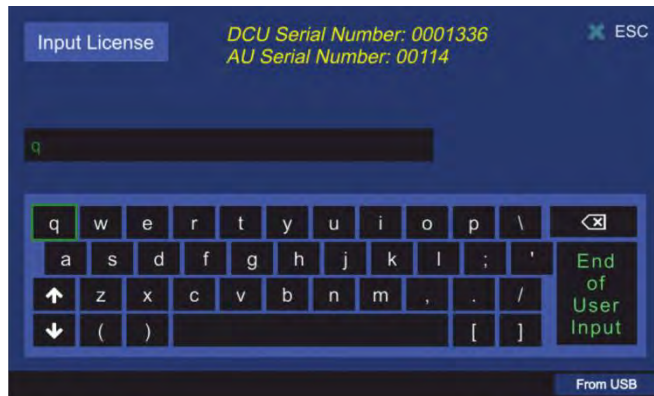   o   Use the number keys of the DCU keyboard for input of the numbers.

Figure 131. Input license dialog

o   In order to load the license file from USB, after connecting the flash drive at the USB port (refer to chapter 6.2), press the hotkey "From USB". The software will search for a valid license code on the flash drive. If a valid license has been found, the license text will be displayed in the license input field.

o   After a valid license code was inputted, the device will show the message "Valid License!" and ask for confirming the action of adopting the new license (s. Figure 132).
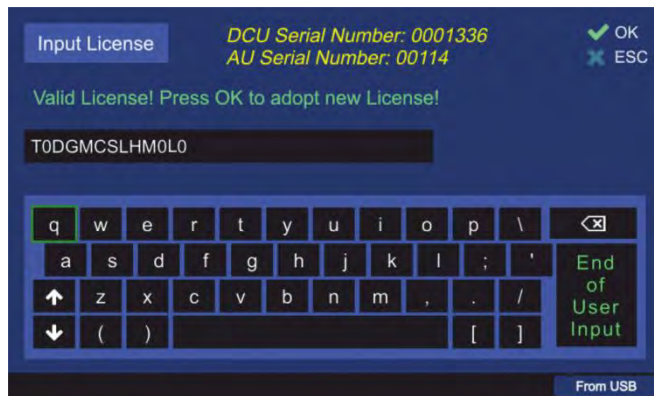

Figure 132. Input of a new license from USB

o   After confirming the new valid license with "OK", a dialog will be opened, which shows the licensed frequency bands (s. Figure 133).
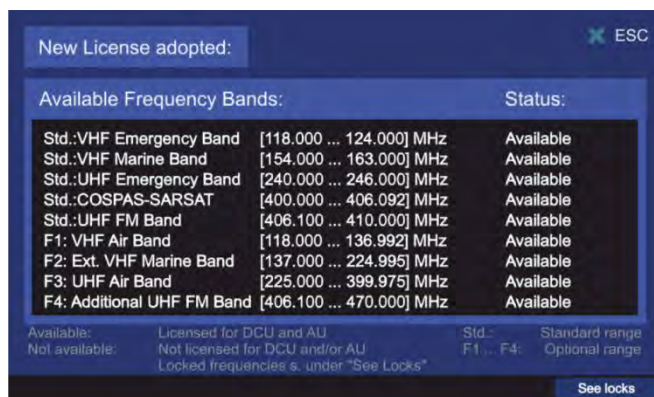

Figure 133. New license adopted

7.4.5.3 Export Log Files

This dialog allows the export of the log files via USB (refer to chapter 6.2). Each log file has a header with the following information:

- Serial number of DCU
- Serial number of AU
- Software version of DCU
- Software version of AU
- Operating hours of DCU

The "Export Log" dialog is opened by pressing the corresponding hotkey when the service menu is opened (s. Figure 126, position 4).
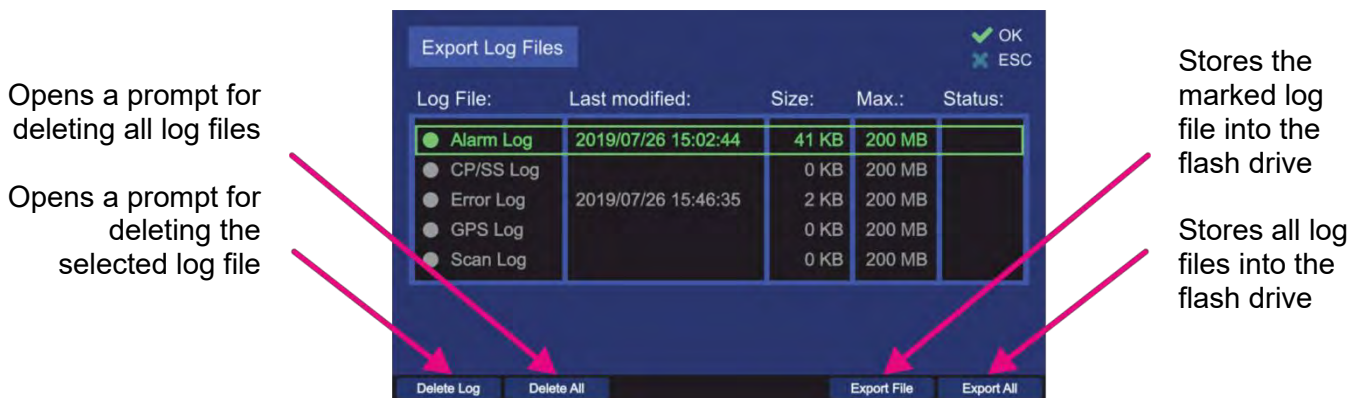
Opens a prompt for deleting all log files

Opens a prompt for deleting the selected log file

Stores the marked log file into the flash drive

Stores all log files into the flash drive

Figure 134. Export Log dialog

o Pressing the hotkey "Delete Log" will open the following window (s. Figure 135). Pressing "OK" will delete the currently marked file. Pressing "ESC" will close the dialog without deleting the log file.
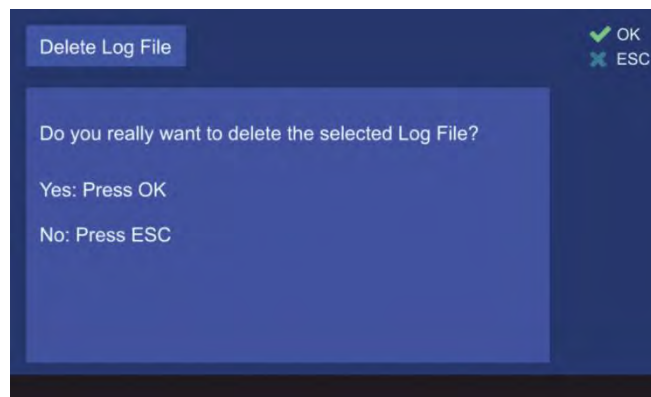
Figure 135. Confirming the deleting of the log file

o Pressing the hotkey "Delete All" will open the prompt dialog for deleting of all log files (s. Figure 136). Pressing "OK" will delete all log files. Pressing "ESC" will close the dialog without deleting the log files.
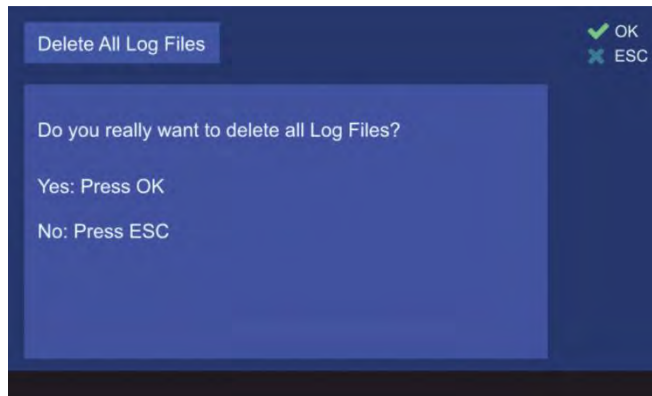
Figure 136. Confirming of deleting of all log files

o   The hotkey "Export File" is only visible, if a valid log file is marked and the USB flash drive was detected. By pressing this hotkey, the log file will be stored in the flash drive.
After a successful export of the log file, the hotkey name becomes gray. It is also gray, if a log file is marked, that has been already exported. The same export cannot be repeated without re-opening the dialog.
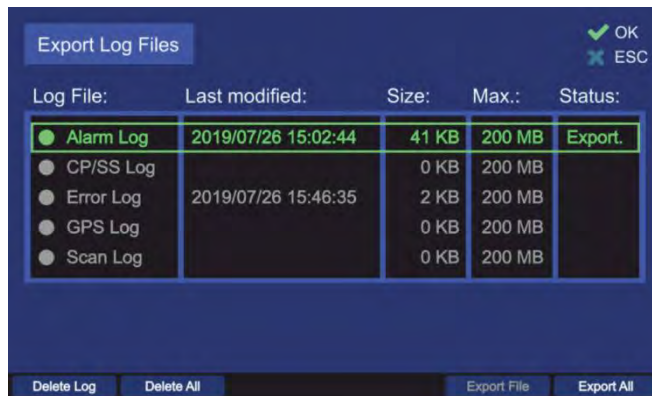
Figure 137. Exporting a log file finished

o   The hotkey "Export All" is only visible, if there is at least one valid log file and the USB flash drive was detected. By pressing this hotkey, all available log files will be stored into the flash drive.
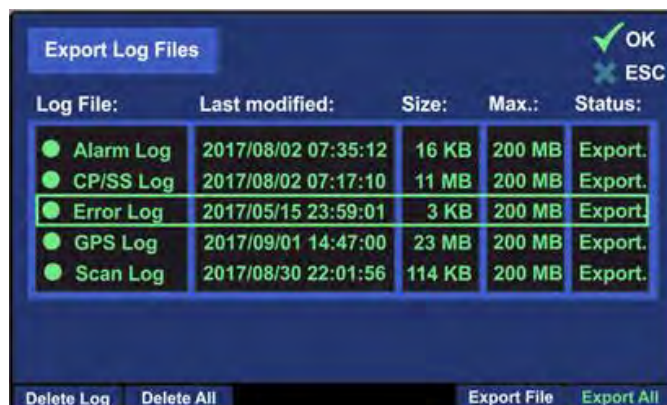

Figure 138. Exporting of all log files is in progress

After a successful export of log files, the hotkey name becomes gray. The same export cannot be repeated without re-opening the dialog.

7.4.5.4 Load Configuration Files

This dialog allows the import of the configuration files into the RT-500-M DCU.
The hotkey "Load Config" (s. Figure 126, position 5) is activated only if the USB flash drive was detected. Pressing this hotkey will open the following sub dialog (s. Figure 139).
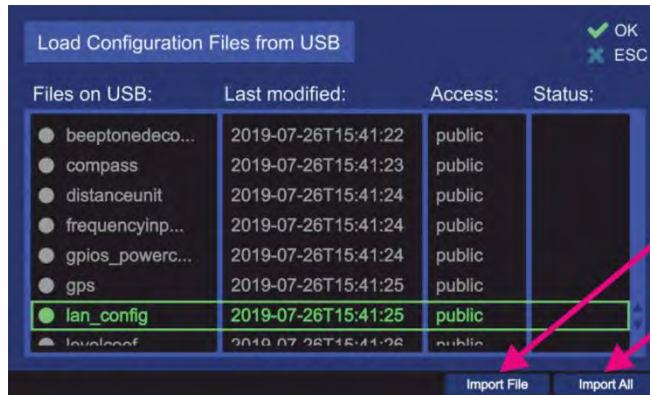
Starts importing of the marked configuration file into the DCU

Starts importing of all available configuration files

Figure 139. Importing a log file

o The hotkey "Import File" is only visible, if a valid configuration file is marked. Pressing this hotkey will start importing the marked configuration file from the USB flash drive. After successful import of the file, the hotkey name becomes gray (s. Figure 140).
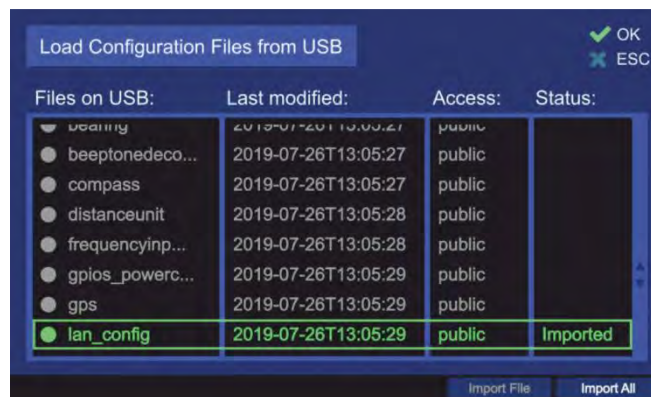

Figure 140. File imported

The import of the same configuration file cannot be repeated without re-opening the dialog.

o The hotkey "Import All" is only visible, if there is at least one valid configuration file on the connected USB flash drive. Pressing this hotkey will start importing all valid configuration files from the flash drive. After the successful import of the files, the hotkey name becomes gray.
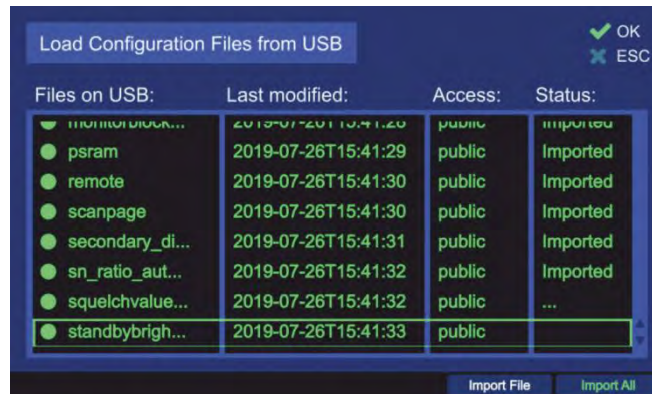
Figure 141. Importing of all files

The same import cannot be repeated without re-opening the dialog.

7.4.5.5 Export Configuration Files

This dialog is used to select configuration files from the internal memory for exporting them to a USB flash drive (refer to chapter 6.2). The hotkey "Export Conf." (s. Figure 126, position 6) is activated only if the USB flash drive was detected. Pressing this hotkey will open the following sub dialog (s. Figure 142).

Starts exporting of the currently marked configuration file

Starts exporting of all available configuration files
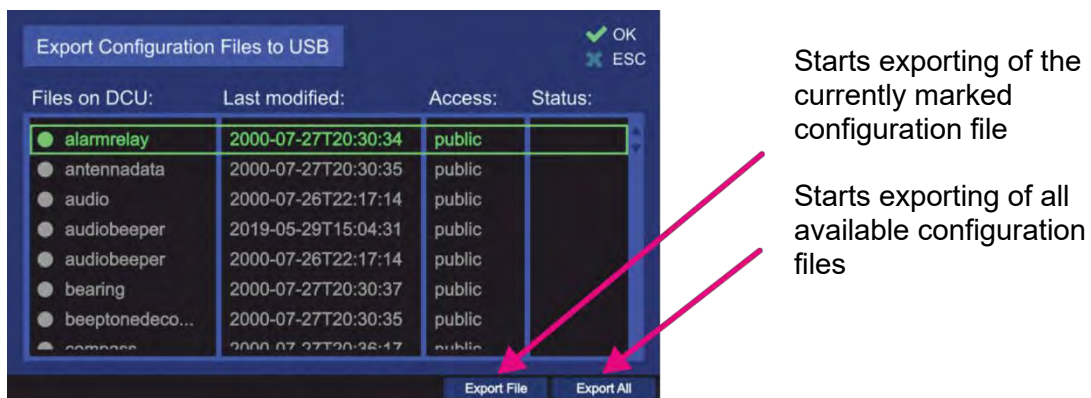
Figure 142. Export configurations dialog

o The hotkey "Export File" is only visible, if the currently marked configuration file is labeled with "Public". Pressing this hotkey starts exporting the configuration file to the USB flash drive.
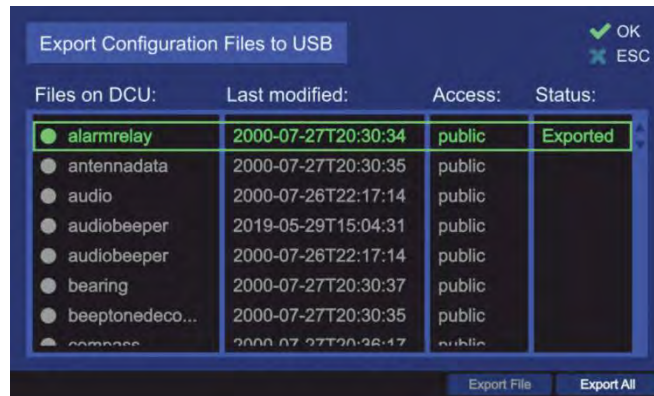
Figure 143. Export of a single file

After a successful export of the file, the name of the hotkey becomes gray. The same export cannot be repeated without re-opening the dialog.

o Pressing the hotkey "Export All" will start importing all valid ("public") configuration files to the flash drive.
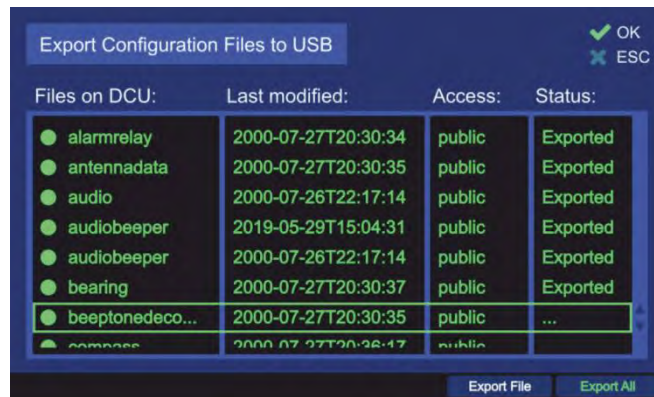
Figure 144. Export of all configuration files

After the successful import of the files, the hotkey name becomes gray. The same export cannot be repeated without re-opening the dialog.

7.5 Other Operational Functions

7.5.1   Adjusting the Volume

The volume adjustment button [− 🔊 +] (s. Figure 6, position 3) contains two keys: "+" and "-" (twin function key).

Pressing any of the two keys opens the dialog for adjustment of internal and external speaker.
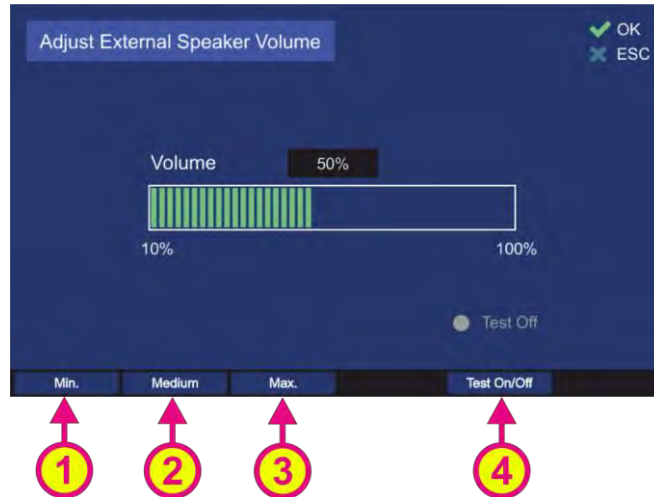
Figure 145 "Adjust External Speaker Volume Dialog"

Use hotkey "Min." (s. Figure 145, position 1), "Medium" (Figure 145, position 2) and "Max." (Figure 145, position 3) in order to set an appropriate volume.

Use hotkey "Test On/Off" (Figure 145, position 4) in order to test volume.

To switch the volume on/off quickly, use the mute-button [🔇] (s. Figure 6, position 4).

7.5.2 Adjusting of the Squelch

The correct adjustment of the squelch is crucial for attaining the optimal sensitivity of the signal reception. The more sensitively the system works, the greater signal range (operating distance) can be achieved. Especially weak signals are often located on the edge to the noise level or even inside the noise level.

Therefore, it is very important to continuously check the squelch level setting and adjust it to the given signal strength and environmental situation in order to use the direction finder system to the full capacity of performance.

- o Pushing the button **─ SQL +** "+" or "-" (twin function key, s. Figure 6, position 6): opens the following dialog:
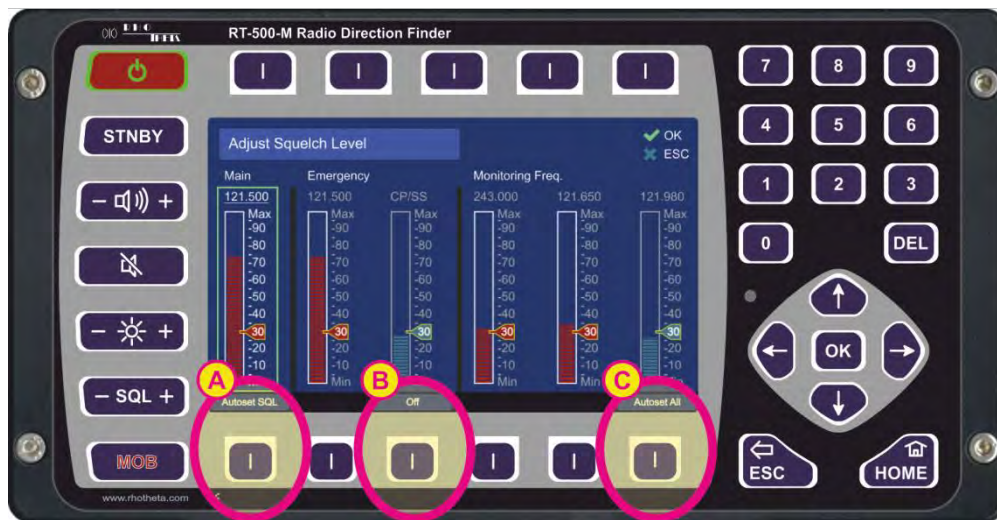
Figure 146. Squelch Dialog

- o Pushing the arrow keys ← → allows switching between the frequencies (green frame indicates the currently chosen frequency).

  With the arrow keys ↑ ↓ the squelch can be adjusted manually to the desired level in one-percent-steps.

  It is also possible to set the squelch level for the main frequency automatically, according to the received signal level. To use this function, push the hotkey "Autoset SQL" (s. field "A"). The squelch can also be turned to the zero level, e.g. for the purpose of receiving very weak signals, which are "hidden" in the noise. The turning off of the squelch is accomplished by pressing the "Off"-hotkey (s. field "B").

  To apply the function of the automatic squelch adjusting to all the stored frequencies press the hotkey "Autoset All" (s. field "C").

7.5.3 Dimming

The brightness of the display and key illumination can be adapted to surrounding lighting conditions.

The button [– ☼ +] (twin function key, s. Figure 6, position 5) has two keys ("-", "+") to adjust the brightness of:

- Backlight of the display
- Backlight of the keypad legends
- LEDs

Pressing one of these keys will open a dialog with a brightness indication and already decrease or increase the brightness.

The brightness can be adjusted in the manual mode as well as in the automatic dimming mode, which is coupled with the light sensor. Further, the dialog shows the current level of the light sensor.
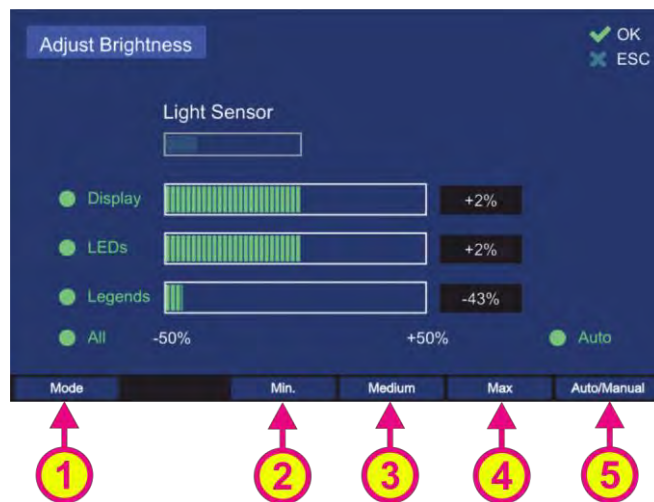
Figure 147 "Adjust Brightness Dialog"

o Use hotkey "Mode" (s. Figure 147, number 1) to select between:
  ▪ Display
  ▪ LEDs
  ▪ Legends and
  ▪ All

o Use the hotkey "Min." (s. Figure 147, position 2), "Medium" (s. Figure 147, position 3) and "Max." (s. Figure 147, position 4) in order to set the appropriate luminosity.

o Use the hotkey "Auto/Manual" (s. Figure 147, position 5) in order to set auto or manual luminosity adjustment mode.
  In the auto mode the luminosity of items will be adjusted automatically based on the light-sensor value.
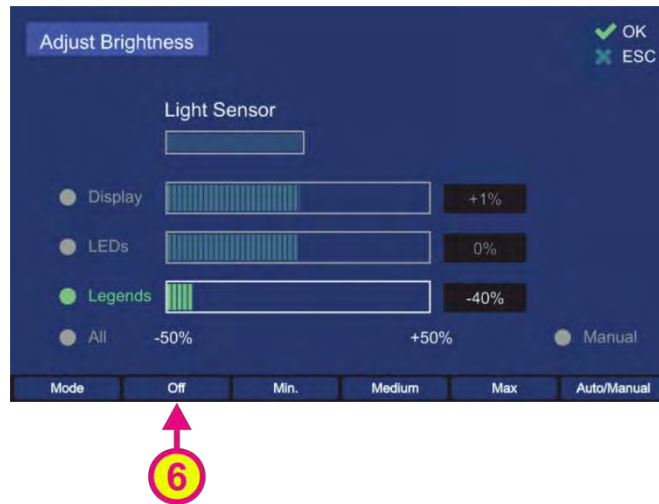
Figure 148. Deactivation of the illumination of legends

o   The hotkey "Off" (s. Figure 148, number 6) is only available if the "Mode" is set to "Legends". Pressing this hotkey deactivates the illumination of the legends.

7.5.4 MOB (Man Over Board) Operation

The MOB function is useful to save the current GPS position when a person goes overboard. This possibility helps to rescue a person in the water, even if the person does not have a personal locator beacon by just pressing the "MOB" button (s. Figure 6, position 7) on the keypad at the right time.

The following figure demonstrates the functionality in case of the person in the water, who has an emergency beacon operating on 121.500 MHz (121.650 as training frequency) and the MOB function has been triggered.

Figure 149 "The MOB direction overlays the bearing"

The magenta arrow (slim), which overlays the bearing arrow (the bigger red arrow) shows the direction to the GPS position which has been saved by the MOB function. Simultaneously the RT-500-M displays the Doppler based bearing of the radio signal which comes from the PLB (Personal Locator Beacon). The distance (here Dis: 0.24 km) between the saved GPS position and the current GPS position is numerically indicated in the central digital display.

The MOB function can be triggered manually or by the ELT/PLB or beep tone detection. If the MOB mode is started manually (by pressing the MOB button) the corresponding MOB dialog will be opened. If the MOB mode is started automatically (ELT/PLB or beep tone detection), the MOB dialog will not be opened, but the MOB position will be automatically adopted. All corresponding settings regarding triggering the MOB function can be found in the setup menu (see chapter 7.4.3.8).

Note
The basic requirement for opening "MOB" dialog is that the GPS data from an external GPS device is available.

The following figure shows the "Man Over Board" dialog.
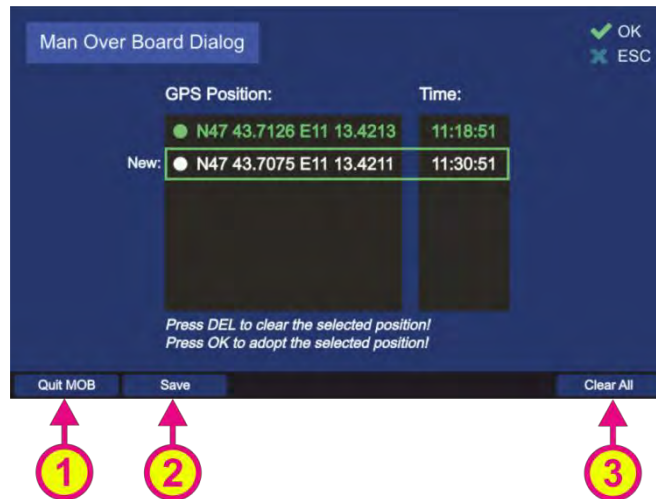
Figure 150. "Man Over Board" dialog

o   Press "Quit MOB" (s. Figure 150, position 1) to quit the dialog.
    This hotkey is used to quit the MOB mode. By pressing this hotkey an extra dialog will appear
    for additional confirmation.

o   Press "Save" (s. Figure 150, position 2) to save the current GPS position.
    Pressing this hotkey will save the new GPS position and move the line with the new position
    above the current position. Furthermore, the new position will be shown gray as it has not been
    adopted for MOB mode.

o   Select the line with the appropriate saved GPS Position and press OK to display the
    corresponding GPS based calculations (distance and true bearing) on the bearing display.

o   Press "Clear All" (s. s. Figure 150, position 3) to delete all saved positions.

8 Interfaces and Installation

8.1 Power & I/O
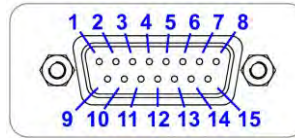
Contact / Pin	Signal	
15	**+12 V to +30 VDC**	Input power supply
8	**GND (Ground)**	**Note** Ground of power supply is connected to housing with an anti-interference device.
7	**Permanent Operation**	Optional input: External power on When applying a voltage > approx. 2 V_{DC} the device will be put into permanent operation independent of key On/Off. (Most simple activation: Connection / bridge Pin 7 ⇔ Pin 15)
14	**PTT / SBS**	Optional input in order to suppress self-bearing. When connecting input PTT/SBS (Self Bearing Suppression) to Ground, self-bearing is suppressed.
6	**GND**	
12	**Squelch Out**	When receiving a signal this pin is connected to ground (active) by the means of an open collector output. Max. current 200 mA.
4	**Alarm Relay**	Optional alarm contact (mechanical relay as NOC, Normal opening contact) max. 1 A at 30 VDC resp. max. 0.3 A at 125 VAC Pin 1 = COM; Pin 4 = NC; Pin 9 = NO
1		
9		
3	**Speaker +**	Optional connection of external speaker. Impedance of speaker: 4...600 Ω, U_{Max}: 8 V_{SS}, Power: 1.5 W_{Max}
11	**Speaker -**	**Note** The audio exit is a symmetric push-pull amplifier. This inhibits, that none of the speaker signals are to be connected to the ground.
13	**Audio Line Out**	Symmetric Audio exit (adjustable in menu, from 200 mV_{SS} at 10% to max. 2 V_{SS} at 99%, 600 Ohm)
5	**Audio Line Out**	
2	**Programmable IN** (*Electrical identical to PTT*)	Optional programmable input: - PTT - No function To activate connect to GND.
10	**Programmable OUT** (*Electrical identical to Squelch Out*)	Optional programmable exit (open collector): - Alarm - Status (see DCU) - No function Max. current 200 mA.

<div align="center">**Table 16. "Power & I/O Connector"**</div>

8.2 Antenna Unit (Connecting Cable DCU ⇔ AU)

8.2.1 Pinning Antenna Unit Connector
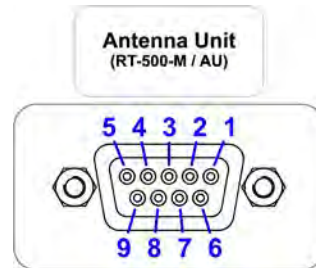
Contact / Pin	Signal	
3	**+12 to +30 V** $_{DC}$	Output - Power supply Antenna Unit
8		
5	**GND**	
9		
1	**RS485 A**	Serial data connection DCU ⇔ AU (9600 Baud / semi-duplex / receive and transmit)
6	**RS485 B**	
2	**NF**	Input audio signal resp. analog Test/Service (symmetric optional)
7	**GND**	Input audio symmetric (OPTIONAL)

<div align="center">**Table 17. "Pinning of the AU Connector"**</div>

8.2.2 Connecting Cable DCU ⇔ AU
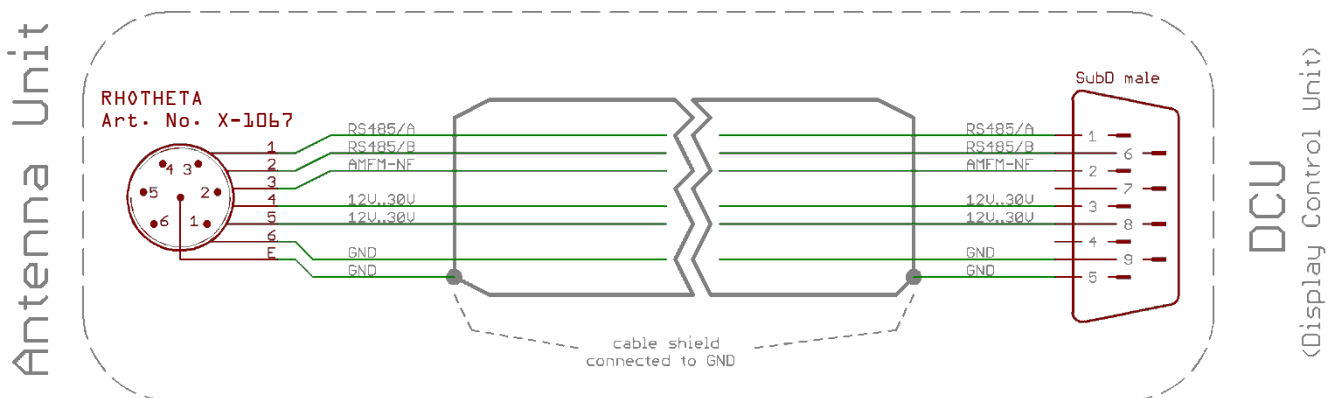
Connection Antenna Unit	connecting cable 6-poled with shield	Connection Display Control Unit
Connector type: RHOTHETA Article Number X-1067	length 1 to100 m: cross -section of conductor min. 6 x 0.50 mm^2	Connector type: SubD 9-poled male

8.3 NMEA COM-Interfaces

All 3 COM-Interfaces COM1, COM2, and COM3 have the same pinning.

These interfaces should be used for connection of
- COMPASS of the vessel
- GPS Receiver
- ECDIS (Remote Control)

Note
When connecting to input use either RS232 Rx or RS422 Rx (not both)!
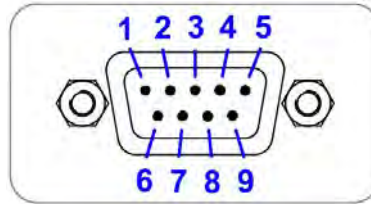
Contact / Pin	Signal	
2	**RS232 Tx**	Output of serial data with RS232 level
3	**RS232 Rx**	Input of serial data with RS232 level
5	**GND**	GND level for RS232 connection
6	**RS422 Tx / A**	Output of serial data with RS422 level
1	**RS422 Tx / B**	NMEA 0183 TX
7	**RS422 Rx / A**	Input of serial data with RS422 level (isolated)
8	**RS422 Rx / B**	NMEA 0183 RX
4	**NC**	Not connected
9	**Power**	Output - Power supply for GPS / Compass (12V)

Table 18. "Pinning of NMEA Connectors"

Note
Per default the "Autotalk" mode is activated, which means that NMEA sentences of the direction finder are sent out cyclically with a fixed time period of 250 ms. The "Autotalk" mode can also be deactivated per corresponding NMEA command (s. NMEA-Protocol Description (RT-500-M & RT-800)).

8.4 LAN Interface

The LAN interface can be used for connection of ECDIS or other Remote and Control Devices.
The RT-500-M can be controlled via the same NMEA sentences which are available on COM Port in DF remote control configuration.

Note
Per default the "Autotalk" mode is activated, which means that NMEA sentences of the direction finder are sent out cyclically with a fixed time period of 250 ms. The "Autotalk" mode can also be deactivated per corresponding NMEA command (s. NMEA-Protocol Description (RT-500-M & RT-800)).

1 2 3 4 5 6 7 8
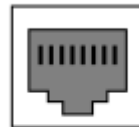
RJ-45
Female

Contact / Pin	Signal	
1	**TX+_D1**	Transmit Data+ (10/100BaseT)
2	**TX-_D1**	Transmit Data- (10/100BaseT)
3	**RX+_D2**	Receive Data+ (10/100BaseT)
4	**BI+_D3**	Bi-directional+ (not used)
5	**BI-_D3**	Bi-directional- (not used)
6	**RX-_D2**	Receive Data- (10/100BaseT)
7	**BI+_D4**	Bi-directional+ (not used)
8	**BI-_D4**	Bi-directional- (not used)

Table 19. "Pinning LAN Connector"

8.5 USB Service Interface

The USB 2.0 connector is used only for service purposes.

Micro-AB
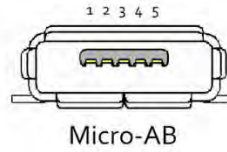
Contact / Pin	Signal	
1	VBUS	+5V
2	USB D-	USB 2.0 Diferental pair
3	USB D+	USB 2.0 Diferental pair
4	NC	Not connected
5	GND	Ground

Figure 151. Pinning USB

8.6 Ground Connector

The ground connector (s. Figure 7, position 8) is used to connect the DCU to ground of the ship. For the connection a screw M5 is required and a cable to ground with a cross-section of 4 mm² is recommended.

8.7 Guideline for Optimal DF Antenna Position

The quality of the bearing results depends largely on the antenna´s location. So, an antenna location has to be found where the transmitter´s wavefield can reach the bearing antenna as undisturbed as possible.
If high bearing accuracy is demanded, no metallic resp. RF-conducting obstacles may be around the antenna unit (in an angle of ± 45° towards the horizontal).

Objects being in the "restricted area" will disturb the arriving wave field. Reflections will arise which might disturb bearing accuracy and so on decrease the bearing accuracy. This physical effect generally is valid for all bearing systems. In practice, often a compromise has to be found between bearing and other interests.
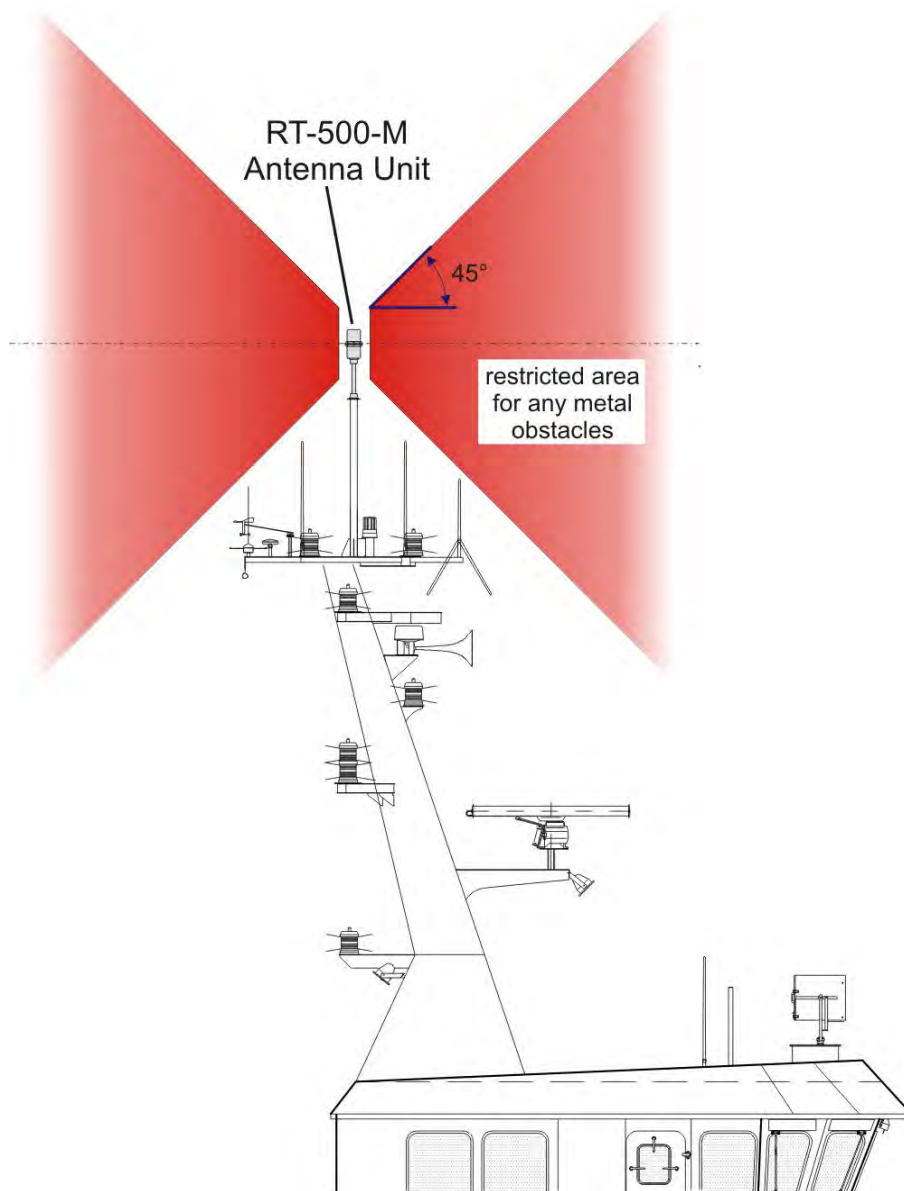
Figure 152. "Example of Optimal DF Antenna Position"

9 Technical Data

9.1 Electrical Characteristics

System Characteristics		
Parameter	**Condition**	**Data**
Method of Bearing		Doppler (3 kHz rotation frequency)
Bearing Accuracy		≤ 5° RMS[1]
Display Resolution		1°
Minimum Signal Duration		≤ 100 ms
Frequency Range	VHF Air Band	118.000 – 124.000 MHz 118.000 – 136.992 MHz (Option F1)
	VHF Marine Band	154.000 – 163.000 MHz 137.000 – 224.995 MHz (Option F2)
	UHF Air Band	240.000 – 246.000 MHz 225.000 – 399.975 MHz (Option F3)
	COSPAS-SARSAT	400.000 – 406.092 MHz
	UHF FM-Band	406.100 – 410.000 MHz 406.100 – 470.000 MHz (Option F4)
Receive Frequency Tuning Steps	VHF Air Band	8.33 kHz
	Marine Band	5 kHz
	UHF Air Band	25 kHz
	COSPAS-SARSAT	8.33 kHz
	UHF FM-Band	5 kHz
Bearing Sensitivity Continuous Signal (±5° bearing fluctuation)	VHF Air Band	≤ 4 µV/m / 2.5 µV/m typical
	Marine Band	≤ 3 µV/m / 2 µV/m typical
	Extended Marine Band above 174 MHz	≤ 5 µV/m / 3 µV/m typical
	UHF Air Band	≤ 6 µV/m / 4 µV/m typical
	COSPAS-SARSAT	≤ 6 µV/m / 4 µV/m typical
	UHF FM-Band	≤ 6 µV/m / 4 µV/m typical

System Characteristics		
Parameter	**Condition**	**Data**
Bearable Types of Modulation		A3E, F3E, A3X (distress signal modulation)
Polarization		Vertical
Scanning		Multiple scanning and monitoring functions available
COSPAS-SARSAT Functionality		Decoding of COSPAS-SARSAT Message: shows beacon ID, GPS position and whole message string (short and long). Displays direction and distance to beacon [2].
TFT Graphic Display		5" (127 mm), 24 bit RGB 800 x480 x 3 dots Max. brightness 700 cd/m² Dimming: manual and automatic
Audio	Internal Speaker	1 W, 4 Ohm
	External Speaker	1 W, 4 Ohm
	Line out	Adjustable from 200 mV$_{pp}$ to 2 V$_{pp}$
Operating Voltage		12 V to 30 V DC
Power Consumption		Max.: 15 W Typical: 8 W Stand-by: 7 W
Current Consumption		Max. 1.5 A
Interfaces		3x NMEA 0183 (RS422) | 3x RS232 Ethernet LAN (NMEA over LAN) Test port (RS-232) Alarm Relay Output (2A, 30 V DC / 0,3 A, 125 V AC) PTT input for self-bearing suppression Squelch output for external audio controlling 2 x programmable I/O Ports USB 2.0 for service purposes

Table 20. Electrical Characteristics

[1] Measured with un-modulated, undisturbed wave field at field strength ≥ 20 dB above sensitivity level by changing the angle of incidence with the antenna rotating on a revolving table in order to eliminate environmental influences on the results.

[2] If GPS data is available.at NMEA interface

9.2 Mechanical Characteristics

9.2.1 Mechanical Data
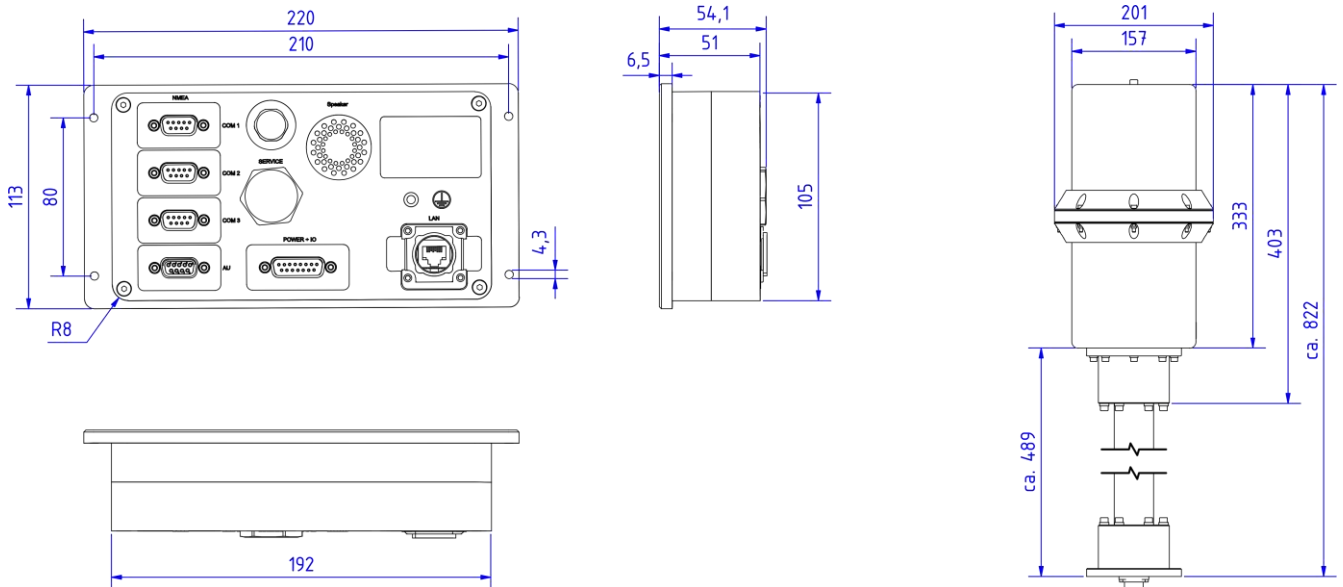
Figure 153. DCU and AU mechanical dimensions

Measuring units: millimetres [mm]

Mechanical Characteristics		
Parameter	**DCU**	**AU**
Weight	1500 g (3.3 lbs)	5200 g (11.5 lbs)
Operating Temperature	-20 °C to +60 °C (-4 °F to +140 °F)	-40 °C to +60 °C (-4 °F to +140 °F)
Storage Temperature	-55 °C to +80 °C (-67 °F to +176 °F)	-55 °C to +80 °C (-67 °F to +176 °F)
Ingress Protection	IP67	IP67
Max. Wind Speed	-	270 km/h

Table 21. Mechanical Characteristics

9.2.2 DCU Mounting Cutout
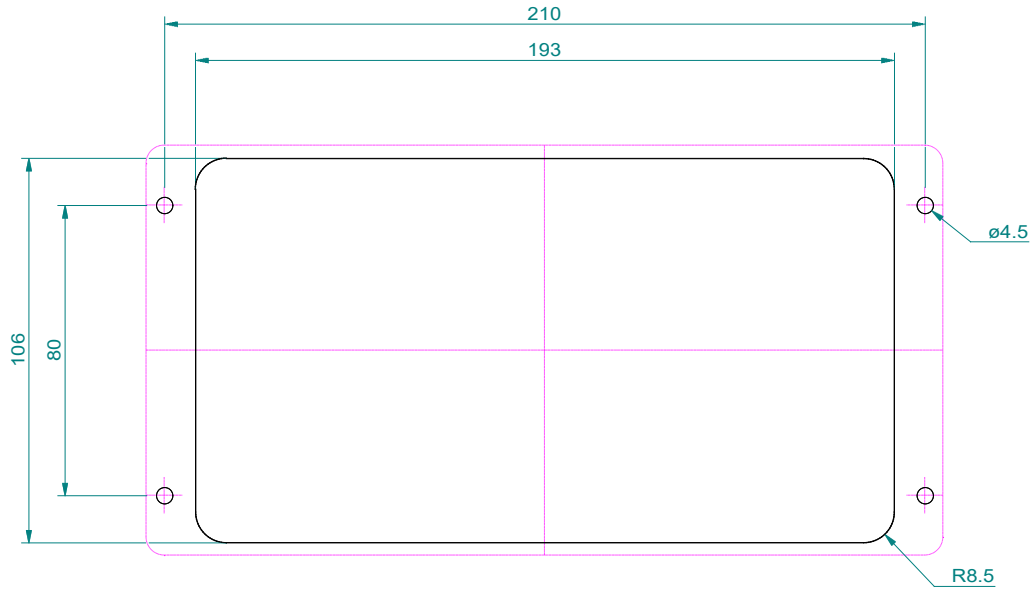
Figure 154. DCU mounting cutout

Measuring units: [mm] millimetres

9.2.3 AU Mast Flange
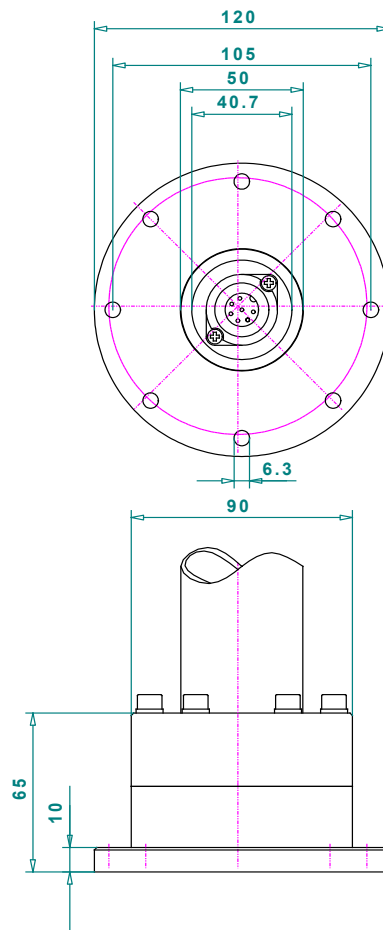
Figure 155. Antenna unit mast flange. Mechanical dimensions.

Measuring units: [mm] millimetres

10 Disposal within the European Union

Product Recycling

Product labeling in accordance with EN 50419

At the end of the life of the product, this product may not be disposed of with normal household waste. Even disposal via the municipal collection points for electrical and electronic equipment is not allowed.

The correct disposal of this product will help to conserve resources and prevent potential negative effects on the environment and human health which may occur due to improper handling of the product.

- Therefore, carry out the inoperative device, an electronics recycling.
  or
- The RHOTHETA Elektronik GmbH takes back all its products, subject to redemption, in accordance with the requirements of the WEEE Directive (2012/19 / EC) of the European Union to deliver it to a professional disposal.

11 Disposal outside the European Union

For proper disposal of used electronic equipment in accordance with the respective national regulations in countries outside the European Union please check it with your dealer or the local authorities.

12   Maintenance and Cleaning

12.1   Maintenance

UV irradiation can age the front foil of the RT-500-M DCU with time, which can lead to brittleness of the front foil.
Depending on the operating conditions of the RT-500-M DCU, there is the possibility that moisture can penetrate through small hairline cracks in the front foil. An impairment of the functionality up to the damage of the product can result.

The exchange of the front foil may only be done by RHOTHETA Elektronik GmbH or an authorized maintenance facility; otherwise this will void the warranty.

12.2   Cleaning

RHOTHETA Elektronik recommends cleaning the RT-500-M with warm water and a microfiber cloth. Persistent stains can be washed with a dishwashing detergent. Do not use any abrasives or cleaning agents containing alcohol.

13 Appendix

13.1 Error Messages

Error message	Error location	Cause
Error 01 AU No Receiver	Antenna Unit: Receiver	defective receiver circuit board in AU
Error 04 AU Rec. No PLL	Antenna	Error in receiver synthesizer oscillator in AU
Error 05 DCU>AU No Data	Connection Display → Antenna	No serial data from DCU to AU
Error 06 DCU>AU BadData	Connection Display → Antenna	Incompatible respective bad data connection between DCU and AU
Error 07 AU Low Voltage	Main voltage supply	Voltage supply below 10 V
Error 08 AU>DCU BadData	Connection Antenna → Display	Incompatible respective bad data connection between AU and DCU
Error 09 No AntennaUnit	Connection Antenna → Display	No serial data (RS485) from AU Missing or damaged cable connection between AU and DCU respective defective AU

13.2 Warnings

Warning message	Error location	Cause
Warning 01 AU low Voltage	Main voltage supply	Low voltage supply of AU
Warning 02 NoCompassFound	External device	Compass data not available
Warning 10 NMEA DataRange	External device	Incorrect NMEA data: Value out of allowed range
Warning 11 NMEA Bad Data	External device	Defective data recognized on NMEA interface
Warning 12 NMEA CheckSum	External device	Defective data recognized on NMEA interface: Check Sum
Warning 13 NMEA Bad Frame	External device	Defective data recognized on NMEA interface: Bad Frame
Warning 20 AU DataRange	Connection Display → Antenna	Bad data of DCU, mismatch of telegram length
Warning 21 AU Decode Err	Radio distance transmitter ↔ direction finder	Data error in Cospas-Sarsat data block, data could not be decoded.
Warning 22 Send Freq.Ofs-	Received transmitter	Frequency of transmitter too low
Warning 23 Send Freq.Ofs+	Received transmitter	Frequency of transmitter too high
Warning 30 FLASH Config	DCU Flash memory	The stored settings cannot be read (device is operating with default settings).

13.3 Frequencies of Channels in Marine Band

Channel No.	frequency (ship - station)	Frequency (coast - station)
0	156,000 MHz	160,600 MHz
1	156,050 MHz	160,650 MHz
2	156,100 MHz	160,700 MHz
3	156,150 MHz	160,750 MHz
4	156,200 MHz	160,800 MHz
5	156,250 MHz	160,850 MHz
6	156,300 MHz	160,900 MHz
7	156,350 MHz	160,950 MHz
8	156,400 MHz	
9	156,450 MHz	
10	156,500 MHz	
11	156,550 MHz	
12	156,600 MHz	
13	156,650 MHz	
14	156,700 MHz	
15	156,750 MHz	
16	156,800 MHz	
17	156,850 MHz	
18	156,900 MHz	161,500 MHz
19	156,950 MHz	161,550 MHz
20	157,000 MHz	161,600 MHz
21	157,050 MHz	161,650 MHz
22	157,100 MHz	161,700 MHz
23	157,150 MHz	161,750 MHz
24	157,200 MHz	161,800 MHz
25	157,250 MHz	161,850 MHz
26	157,300 MHz	161,900 MHz
27	157,350 MHz	161,950 MHz
28	157,400 MHz	162,000 MHz
60	156,025 MHz	160,625 MHz
61	156,075 MHz	160,675 MHz
62	156,125 MHz	160,725 MHz
63	156,175 MHz	160,775 MHz
64	156,225 MHz	160,825 MHz
65	156,275 MHz	160,875 MHz
66	156,325 MHz	160,925 MHz
67	156,375 MHz	
68	156,425 MHz	
69	156,475 MHz	
70	156,525 MHz	
71	156,575 MHz	
72	156,625 MHz	
73	156,675 MHz	
74	156,725 MHz	
75	156,775 MHz	
76	156,825 MHz	
77	156,875 MHz	
78	156,925 MHz	161,525 MHz
79	156,975 MHz	161,575 MHz
80	157,025 MHz	161,625 MHz
81	157,075 MHz	161,675 MHz
82	157,125 MHz	161,725 MHz
83	157,175 MHz	161,775 MHz
84	157,225 MHz	161,825 MHz
85	157,275 MHz	161,875 MHz
86	157,325 MHz	161,925 MHz
87	157,375 MHz	161,975 MHz
88	157,425 MHz	162,025 MHz

13.4 Abbreviations

Abbreviation	Meaning	Remarks
AU	Antenna Unit	
CP/SS	Cospas-Sarsat	
DCU	Display & Control Unit	
DF	Direction finder	
Deg	Degree (° = 60')	
ELT	Emergency Locator Transmitter	
GND	Ground	
GPS	Global Positoning System	
ID	Identification	
IP	Ingress Protection rating	IP67
LAN	Local Area Network	
LCD	Liquid Crystal Display	
LED	Light-Emitting Diode	
MOB	Man-Over-Board	
MMSI	Maritime Mobile Service Identity	Ship's Ident. No.
NF	Audio Frequency	
NMEA (0183)	National Marine Electronics Association	Interface- and data telegram standard
PLB	Personal Locator Beacon	
PS RAM	Averaging Random Access Memory	
PTT/SBS	Push-To-Talk/ Self Bearing Suppression	
RAM	Random Access Memory	
Rx	Receiver	
S/N	Signal to Noise	
SAR	Search And Rescue	
SNR	Signal to Noise-Ratio	
SQL	Squelch	
TFT	Thin Film Transistor (see also LCD)	
Tx	Transmitter	
VDC	Volts of Direct Current	
VTS	Vessel Traffic Service	

14 Notes