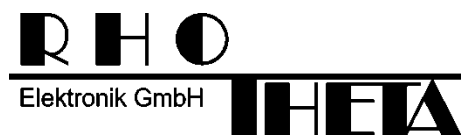


User Manual

RT-500-M



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Note

The manufacturer reserves the right to make modifications to the product described here at any time and without previous information.

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1 Legend of Signal Words

Note

This symbol designates tips or additional notes that must be paid attention to and make work easier.

Caution

Means that ignoring the instructions may lead to property damage or loss of data.

Warning

Means that ignoring the instructions, there may be a danger to health or life.

2 Safety

2.1 General Safety Information

RHOTHETA Elektronik GmbH is constantly trying to keep the safety standard of their products up to date and to offer their customers the highest possible level of safety.

RHOTHETA products are designed and tested in accordance with the valid safety regulations. The compliance with these standards is continuously monitored by our quality assurance system.

This product is tested and left the factory in perfect technical and safety-relevant condition. To maintain this condition and to ensure safe operation, the user must pay attention to all instructions and warnings given. For any questions regarding these safety instructions, RHOTHETA Elektronik GmbH can be contacted at any time.

The observance of the safety instructions will help to prevent personal injury or damage caused by all kinds of dangers. This requires that the following safety instructions must be read carefully and understood before using the product, as well as observed while using the product. Other additional safety instructions, such as for protecting persons, appear in relevant parts of the product documentation and must also be paid attention to.

In addition, it is the responsibility of the user to use the product appropriately. The product RT-500-M, a professional VHF direction finder system, shall not be used in any way that results in personal injury or property damage.

The use of this product for other than its designated purpose or in disregard of the instructions of the manufacturer is the responsibility of the user. The manufacturer takes no responsibility for the misuse of the product.

The manufacturer is not liable beyond the scope of legal rules!

This guide is part of the product RT-500-M and must be kept with the product throughout its lifetime.

2.2 Basic Safety Instructions

Caution / Warning

Read and observe the following instructions, warnings and safety guidelines from the manufacturer!

- At all times, the local or national safety and accident prevention regulations must be observed.
- When installing or operating with the product, always follow the manufacturer's instructions.
- Only place the product on appropriate locations.
- Do not expose the product to environmental conditions (heat, humidity, wind load etc.) that exceed the specified conditions in the manuals.
- Use only the manufacturer's prescribed components and/or use only recommended materials and do not change them. Any other use or unauthorized modifications to the product will void the authorization to operate it.
- Connect only approved accessories kits or additional equipment.
- This product contains a Lithium battery cell containing harmful substances.
- Ensure that the connections with information technology equipment, e.g., industrial computers, comply with the IEC 62368-1/EN 62368-1 standards that applies in each case.
- This product may only be opened by authorized personnel. The connector must always be disconnected before opening.

3 Legal Information

3.1 Declaration of Conformity (EU)

Hereby RHOTHETA Elektronik GmbH declares that the product RT-500-M complies with the essential requirements and other relevant provisions of:

- Directive 2014/53/EU relating to radio equipment (relevant for RT-500-M AU)
- Directive 2014/30/EU relating to electromagnetic compatibility (relevant for RT-500-M DCU)
- Directive 2014/35/EU relating to the making available on the market of electrical equipment designed for use within certain voltage limits (relevant for RT-500-M DCU)
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (relevant for RT-500-M AU and RT-500-M DCU)

The full text of the Declaration of Conformity can be found at:

https://www.rhtheta.com/products/rt_500_m

3.2 Legal Limitations of Use within the EU

Due to its conformance to “Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC”, declared in the EU declaration of conformity, the equipment may be used within the European Union without limitations regarding the use of frequencies in those countries.

Please also consider national limitations or requirements for special operational permissions in your country.

3.3 FCC Information (USA)

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

Note

RT-500-M AU has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note

RT-500-M DCU has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

3.4 ISED Information (Canada)

This device contains license-exempt transmitter(s) / receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

A radio license must be obtained prior to possession and use of this scanner receiver.

Une licence radio doit être obtenue avant la possession et l'utilisation de ce récepteur de scanner.

4 General Description

The RT-500-M is a wideband radio direction finder system for professional use in maritime sector. The system operates within a frequency range from 118 to 470 MHz (the whole range can be unlocked to the full extend by using the options F1 – F4 listed below).

Designed for professional use under extremely rough conditions, the SAR standard version covers the whole VHF marine band and all relevant distress frequencies, such as emergency frequencies 121.5 / 243 MHz, marine channel 16 (156.8 MHz) and all 19 frequencies of the international satellite search and rescue system COSPAS-SARSAT (406 MHz). While locating a COSPAS-SARSAT EPIRB, the direction finder can also decode and display its transmitted information (e.g. Beacon ID and GPS Position). The wide frequency range and frequency steps of 5 kHz allow using the system not only for search and rescue operations but also for detecting illegal vessels operating in a non-standard frequency grid or using PMR (446 MHz) and LPD (433 MHz) radio transmitters. Therefore the system is also widely used by police, coast guards and other maritime law enforcement organisations.

The MOB (Man Over Board) surveillance for the crew safety is a standard function of the RT-500-M. The fine frequency steps (5 kHz) allow discovering hidden transmitters in the marine band and in the additional UHF band.

RT-500-M Frequency Range			
Standard Range		Optional Extended Range	
VHF emergency band	118.000 ... 124.000 MHz	F1: VHF air band	118.000 ... 136.992 MHz
VHF marine band ¹	154.000 ... 163.000 MHz	F2: extended VHF marine band	137.000 ... 224.995 MHz
UHF emergency band	240.000 ... 246.000 MHz	F3: UHF air band	225.000 ... 399.975 MHz
COSPAS - SARSAT	400.000 ... 406.092 MHz	-	-
UHF FM band	406.100 ... 410.000 MHz	F4: additional UHF FM band	406.100 ... 470.000 MHz

Table 1. RT-500-M frequency ranges

The DF-system consists of two units: the bearing device AU (antenna unit) and the operating device DCU (display control unit).

The antenna unit accommodates all the direction-finding electronics within its housing. Thus, short signal paths with low loss and insensitiveness to external disturbing fields are achieved.

The display control unit indicates bearing signals and acts as an instrument for operating and controlling the direction-finding system. External devices can be connected to the DCU, such as an external speaker, a PTT (push-to-talk) switch, etc. It is also possible to input and read data coming from various interfaces, such as external compass data via an NMEA interface. This allows the integration of compass data into the bearing data, which can be indicated on display.

¹ Inclusive all maritime channels (ship / coast): channels 00 ... 88 (156,000 ... 162,025 MHz)

5 Quick Start

1. Connect the power supply to the DCU.
2. Establish the connection of the AU and the DCU.
("Guideline for Optimal DF Antenna Position" can be found under 8.8)

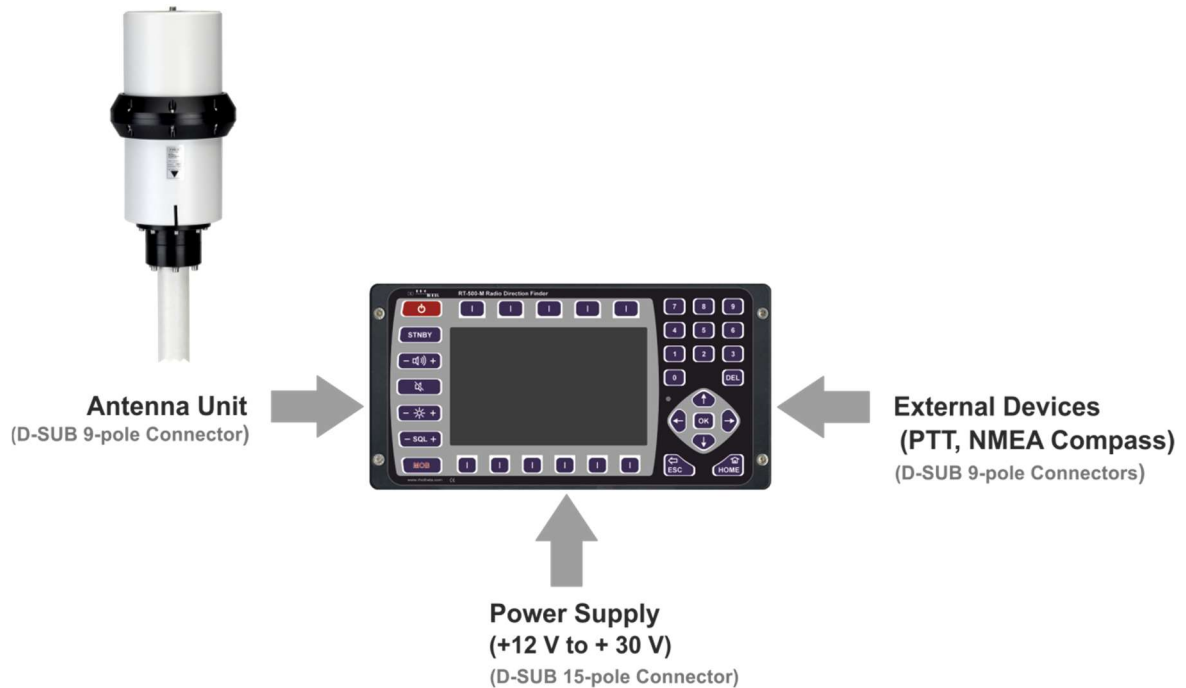



Figure 1. General connection schematic

3. Any additional devices like external speaker, compass etc. can be also connected to the DCU. For further information about the installation of the system please refer to chapter 8.
4. Push the ON/OFF button .
5. When the DCU is turned on, the ON/OFF button lights green and the DCU indicates the loading screen (s. Figure 2).

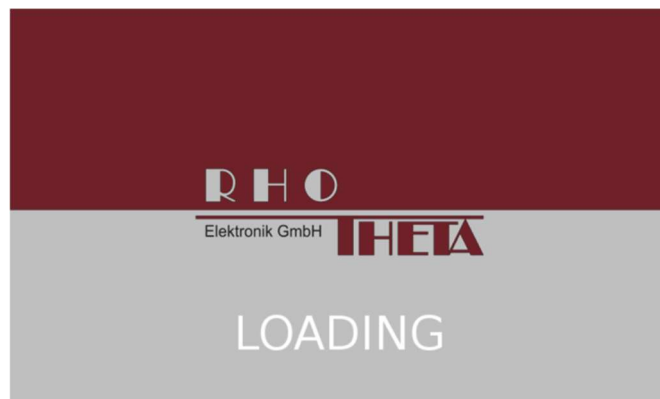


Figure 2. Loading screen

After approximately 15 s the loading is completed and the indication changes to the “RT-500-M” start screen for approx. 5 seconds (s. Figure 3).



Figure 3. RT-500-M start screen

6. As a final result, the bearing page is loaded (s. Figure 4). This is the first page that is displayed when the system is started for the first time.
The next time the device is restarted, the last page that was used before the restart will be loaded after the start screen.
To turn off the DCU hold the ON/OFF button pressed for about 2-3 seconds.

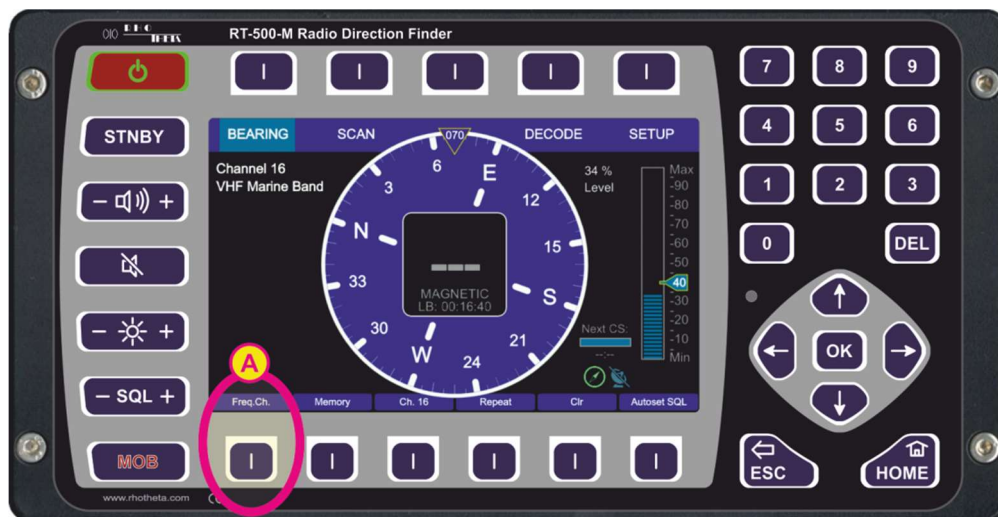


Figure 4. Start page (bearing page)

7. Adjust the needed main bearing frequency (the default frequency after first system start is marine channel 16):
 - Push the hotkey “Freq.Ch.” (s. field “A”, Figure 4).



Figure 5. Frequency input dialog

- Type the desired frequency into the lower input field “Standby ... [MHz]” by using the number-keys of the keypad (s. field “B”, Figure 5) and confirm by pressing “OK” (s. field “C”, Figure 5).
The system will accept only inputs within the permitted frequency ranges.
- Press the “Swap” hotkey (s. field “D”, Figure 5) to set the new frequency to main bearing frequency (“Active”).

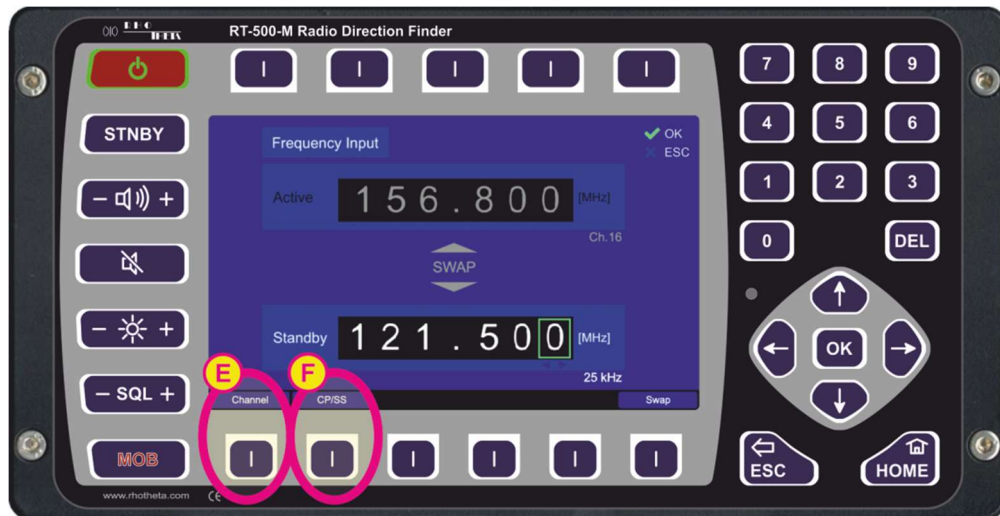


Figure 6. New frequency Input

- To input a maritime channel number, push the hotkey “Channel” (s. field “E”, Figure 6) and proceed by typing the number and pressing “OK”.
- To select a desired Cospas-Sarsat frequency (channel ABC – channel RS) from a drop-down menu press the “CP-SS” hotkey (s. field “F”, Figure 6). Confirm the desired frequency with “OK”.
- Press “HOME” button to open the “Bearing” page.

8. Adjust the squelch level:



- Use the arrow keys   to increase or decrease the squelch level manually (the squelch indicator will move up or down in one-percent steps and show the current value).



Figure 7. Squelch level adjustment

- By pressing the “Autoset SQL” hotkey (s. field “G”, Figure 7) the level of the squelch can be automatically adjusted to a suitable value for the current signal level. For more information on the setting of squelch please refer to chapter 7.5.3.





After all settings the system operates at the entered frequency.

6 Overview

6.1 Front View



Figure 8. DCU front view

Front Control Elements		
Pos.	Element	Function Description
1		Switches the system on/off. When the system is turned on, the key is highlighted in green. In the case of an error the key will blink red.
2		Provides the standby operation to save energy. By pressing this button, the standby is activated, and the button is highlighted in orange. While in standby, the brightness of the display's backlight is driven down to a defined value (configurable in the "Setup" page, s. 7.4.2.8), but the system continues monitoring the corresponding (emergency) frequency. The display will be turned on again if an event occurs (e.g. signal level rises above squelch level, alarm occurs, scan algorithm finds an active frequency). Pressing any button will return the system from standby to normal operation mode (the function of the pressed button will not be executed).
3		The volume adjustment button contains two keys (+ and -). Pressing any of the two keys opens a dialog for adjusting the internal and external speakers (s. 7.5.2).
4		Switches the volume off/on (mute function). The mute-status is indicated by the orange highlight of the button.








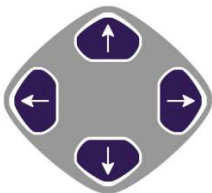
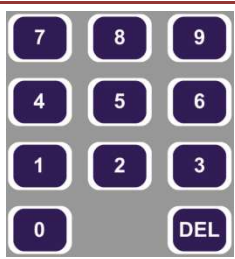

		The volume can be turned on by pressing the same button again. While the mute function is activated, it is still possible to increase or decrease the volume without producing any sound (using the button for volume adjustment, s. ③).
⑤		The brightness adjustment button contains two keys (+ and -). Pressing any of the two keys opens the dialog window for brightness adjustment of the TFT-display backlight, status keys (labeled “Keys” in the “Adjust Brightness” dialog) (colored highlighting of buttons ①, ② and ④) and the white illumination of buttons / legends (s. 7.5.4).
⑥		The squelch adjustment button contains two keys (+ and -). Pressing any of the two keys opens the dialog window for adjusting of the squelch level (s. 7.5.3).
⑦		Activates the “Man-Over-Board” dialog, if GPS data is available (s. 7.5.5).
⑧	5“ TFT full-color display	Shows the corresponding data content of the current page or dialog.
⑨		Hotkeys for activating variable functions. The assignment of the keys differs depending on the page or dialog.
⑩	Sensor of brightness	Measures the ambient brightness to automatically adjust the brightness of the TFT display, status keys (labeled “Keys” in the Adjust Brightness” dialog) and buttons/legends.
⑪		Returns one step back in a menu or leaves a dialogue or an adjusting field without storing changed parameters.
⑫		Confirms an input or selection. Leaves a dialogue or an adjusting field and stores changed parameters.
⑬		By pressing this button, the system returns to the bearing page from any other page or dialog, without storing changed parameters.
⑭		The arrow keys provide the navigation and selection within the menu or selection field. Furthermore, they allow increasing or decreasing of some values (e.g. squelch level).
⑮		Numeric keys for direct numeric input.
⑯		Navigation keys for switching between the pages. Within the “Setup” page, the navigation keys have different functions due to the large number of possible settings.

Table 2. Front control elements

6.2 Rear View

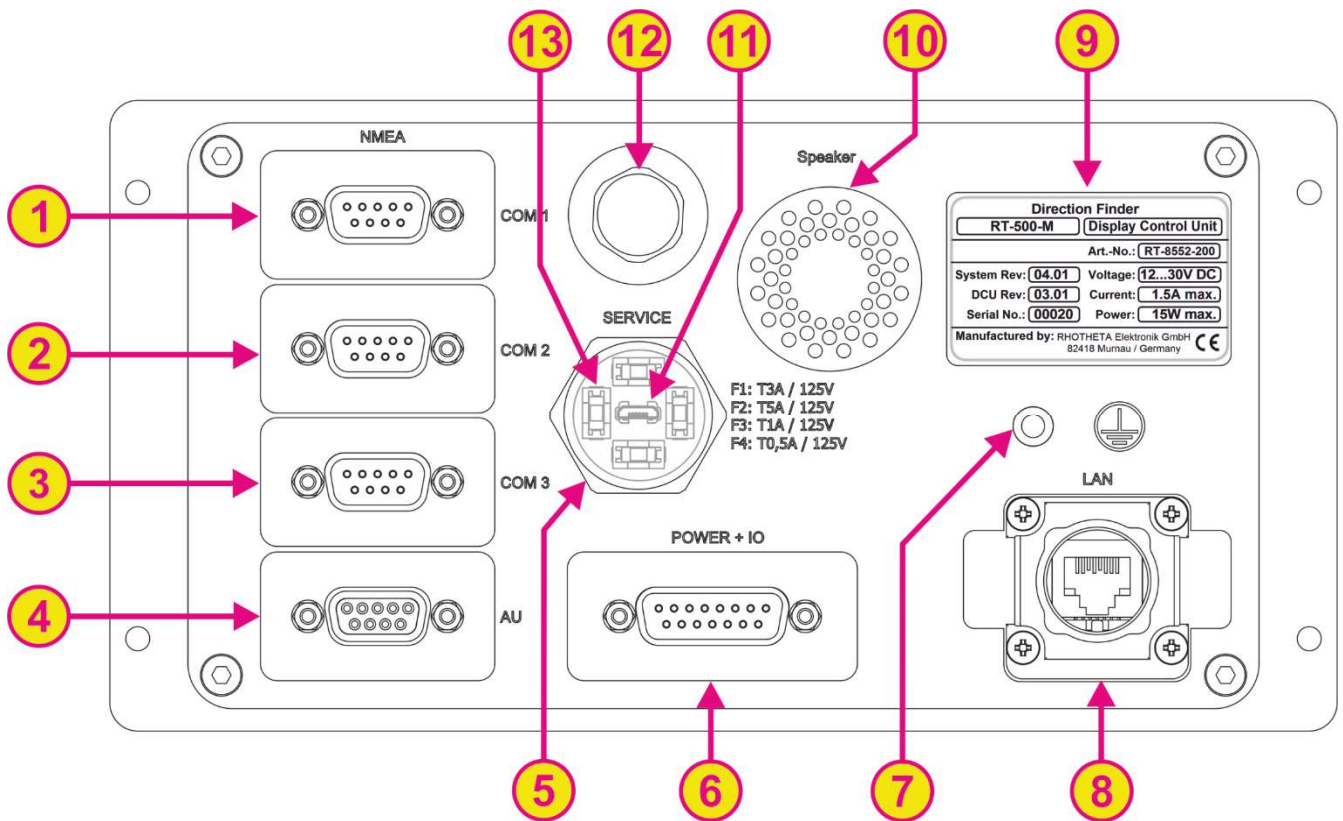


Figure 9. DCU rear view

Interfaces		
Pos.	Element	Function Description
1 2 3	Communication Ports: COM1 COM2 COM3	<p>NMEA 0183 Bus (RS422 / RS232):</p> <ul style="list-style-type: none"> Connection for input of external data, such as compass, GPS, remote control, etc. Connection for output of bearing data, e.g. for map plotter, PC etc. <p>When connecting to input use either RS232 Rx or RS422 Rx (not both)! For more information s. 8.4.</p>
4	AU	<p>Antenna connector: Connection between DCU and AU via cable For more information s. 8.3.</p> <p>Note The RT-500-M antenna unit is not compatible with the RT-800 direction finder and vice versa.</p>
5	Screw Cover	<p>Waterproof protection cover for USB connector and replaceable fuses Opening of the screw cover should be done in a dry room to prevent the ingress of moisture into the interior of the DCU.</p>
6	POWER + IO	<p>Source connector:</p> <ul style="list-style-type: none"> Connection for power supply


		<ul style="list-style-type: none"> • Connection for external speaker • Connection for self-bearing suppression (SBS / PTT) • Connection for audio line out • Contacts for alarm relay • Contacts for squelch out <p>For more information s. 8.1.</p>
7		<p>Ground connector: Connection of the DCU to the ground of the ship Thread/screw M5 For more information s. 8.7.</p>
8	LAN	<p>LAN connector for network communication For more information s. 8.5.</p>
9	Label	<p>Label with identifying information about the direction finder.</p>
10	Speaker	<p>Waterproof internal speaker</p>
11	USB (Only Service)	<p>USB 2.0 port: Used only for service / manufacturing purposes. For more information s. 8.6.</p>
12	Pressure Compensation Element	<p>Equipped with a Gore-Tex membrane, the pressure compensation element prevents over- and underpressure in the DCU.</p>
13	Fuses	<p>Replaceable fuses:</p> <p>F1: T3A/125V (Littelfuse 154003.T) F2: T5A/125V (Littelfuse 154005.T) F3: T1A/125V (Littelfuse 154001.T) F4: T0.5A/125V (Littelfuse 154.500T)</p> <p>Note It is recommended to use an additional external fuse: T2A</p>

Table 3. Interfaces

Warning

The voltage supply is not galvanically isolated from the frame (s. 8.2).

7 Operation

The RT-500-M is operated using the keys placed around the display.

In normal bearing mode, the keys call up common functions directly, opening the corresponding dialog window.

The basic structure of a DCU Page is as follows:

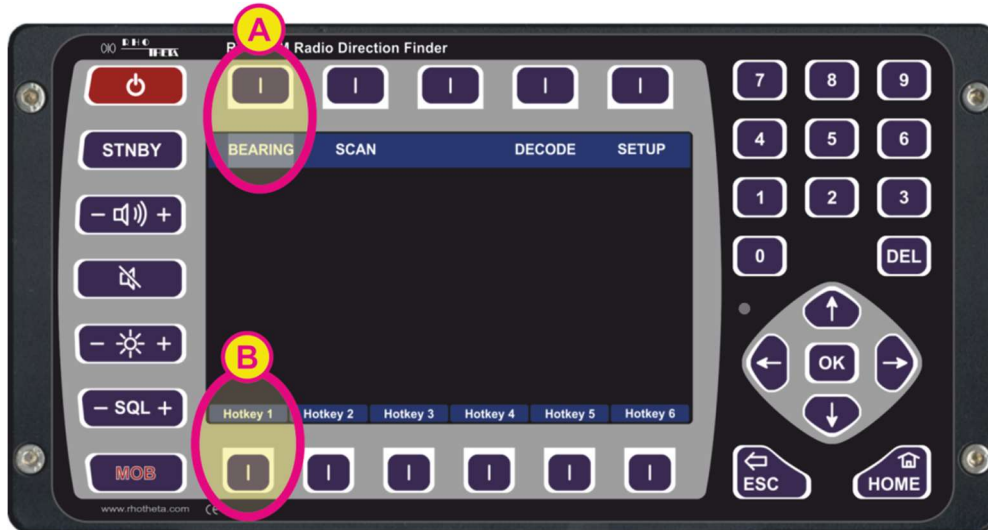


Figure 10. Basic structure of pages

The different pages are listed on the top line of the screen and the active page is highlighted in light blue. Switching between pages is done via the corresponding navigation keys, which are located directly above the page names (s. field “A”, Figure 10).

The top line of the screen is the same for all pages except the “Setup” page, which contains all the necessary system setup options.

The hotkeys differ from page to page to provide page-specific functions or settings. Activate the hotkey function or setting by pressing the corresponding hotkey (s. field “B”, Figure 10).

7.1 Bearing Page

The bearing page is the main page of the RT-500-M display unit as it provides the bearing information, settings and status reports at a glance.

This page can be opened by pressing the button “HOME” from any other page or dialog.

7.1.1 Bearing Indication

The “Bearing” page has the following structure (s. Figure 11).

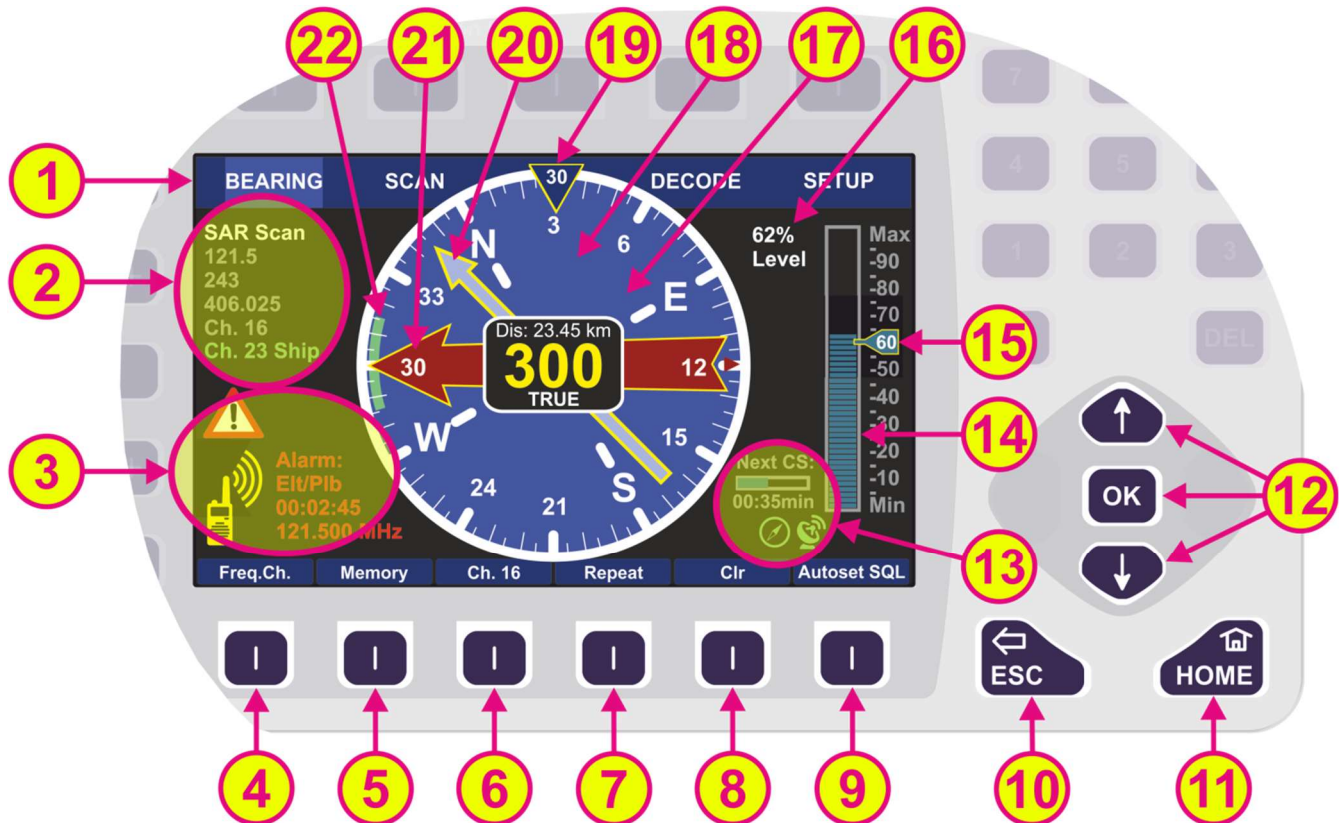
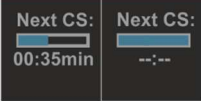

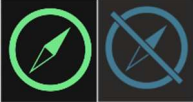

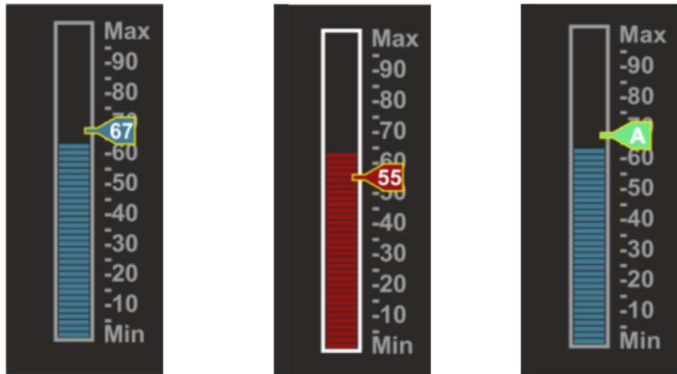










Figure 11. Bearing display

Indication on Bearing Page

Pos.	Element	Meaning / Description
1	Top line	Navigation line of the screen, which allows switching between pages (“Bearing”, “Scan”, “Decode” and “Setup”).
2	Frequency indication	Section for frequency/channel indication during bearing and scanning. The active frequency is displayed in white color. If the scanning function is activated, the currently active frequency (or channel) is displayed in green, and the other frequencies, monitored by the scanning algorithm, are displayed in gray. If the “Repeat” hotkey (s. 7) is pressed, the old frequency value will also be shown in gray. If there is not enough space to show all frequencies, only a subset of the frequencies around the currently active frequency will be displayed.
3	Alarms / Errors / Warnings	Section for indicating any faults in the system, alarms and/or warnings (s. 7.1.2.1).

4	Frequency / Channel hotkey	Pressing the “Freq.Ch.” hotkey will activate the frequency/channel input dialog (s. 7.1.2.2). If no input is detected for about 10 seconds, the dialog will be closed automatically. This waiting time can be changed in the “System” menu of the “Setup” page (s. 7.4.3.6).
5	Memory hotkey	Pressing the “Memory” hotkey will activate the memory dialog (s. 7.1.2.3). The memory dialog provides a list of saved frequencies or channels, which facilitates restoring any frequency from the list to the active bearing mode. Frequencies/channels (max. 8 frequencies) to be scanned in the mode “Fast Channel Scan” (available only with unlocked option), can be selected in the “Memory” dialog.
6	Channel 16	Instant access to most common maritime emergency channel (or emergency frequency 121.500 MHz).
7	Repeat hotkey	Calls up last valid bearing, heading and level values. The last bearing clock in the lowermost line of the digital bearing display (s. Figure 13) shows the time elapsed since the last valid bearing interruption.
8	Clear hotkey	Resets the internal value of the bearing averaging memory. Mutes the acoustic alarm (if such occurred, s. 7.1.2.1).
9	Autoset SQL / Squelch hotkey	Activates the automatic squelch level adjustment for the active frequency (for further information s. 7.1.6).
10	Escape button	Pressing this button while a dialog is open, will close the dialog without saving changes. If no dialog is open, pressing this button will go back to the last activated page. The “Bearing” page is the end-point. Pressing this button on the “Bearing” page will have no effect when no dialog is open. Monitoring/scanning operation will continue onto the next frequency/channel upon pressing the “ESC” button, if e.g. currently no data is being received on present frequency.
11	Home button	Pressing this button always leads to the “Bearing” page (home page) from any other page or dialog. If any scan is running, a dialog for leaving the scan will be opened when the “Home” button is pressed.
12	Arrows “Up” and “Down” and the “OK” button	The squelch level of the main bearing frequency/channel can be adjusted manually by using the arrow buttons (this is only possible if the main frequency is active). If any scan mode is active, pressing one of these buttons will open the squelch dialog (s. 7.5.3). If no dialog is open, the “OK”- button will not have any effect on the “Bearing” page. Whereas inside a dialog this button is used to confirm an input and close the dialog.
13	Additional data indication	Section for indicating additional data, such as activated or deactivated additional hardware or elapsed time indication for the next awaited Cospas-Sarsat pulse.

		 <p>This symbol indicates the time left until the next Cospas-Sarsat pulse. The small bar graph gets filled every second until the next Cospas-Sarsat pulse arrives. If after one minute no Cospas-Sarsat pulse arrives, the bar graph will be filled out and show “--:--” for the time.</p>  <p>This symbol indicates a USB connection. If a USB stick is connected to the DCU, the USB symbol turns green. If there is no USB connection available, the symbol does not appear.</p>  <p>If this symbol is green, then there is valid heading data from an external compass present. If there is no valid heading data available, the symbol stays blue and crossed out.</p>  <p>This indicator shows whether there is valid position data from an external GPS available or not. If there is no valid position data available, the symbol stays blue and crossed out. If there is valid position data, the symbol turns green.</p>
14	Indication of signal level	<p>Current signal level (bar graph):</p> <ul style="list-style-type: none"> Color “blue” means that the signal level is under the squelch threshold Color “red” means that the signal level is above the squelch threshold The bar graph has a numerical scale, showing the level either in [%] or in [dBm], which can be selected in the “Setup” menu. <p>See pictures below.</p>
15	Indication of squelch level	 <p>Current squelch level in [%] or [dBm]:</p> <ul style="list-style-type: none"> The squelch level can be set manually. In this case the

		<p>numerical value is shown inside the indicator.</p> <ul style="list-style-type: none">  No signal is received (squellch level > signal level). <p>By pressing "Autoset SQL" (s. ) the squellch level is set above the noise level by a defined value (only once every time this button is pressed). The indicator stays blue with the numerical value inside.</p> <ul style="list-style-type: none">  The signal is received (signal level > squellch level).  The option "Automatic SQL" is selected (no signal received).  The option "Automatic SQL" is selected (signal is received). <p>The squellch level will be held continuously at the best position over the noise. If set to automatic, the indicator turns green and shows an "A" instead of the numerical value.</p>
	Digital signal level indication	Signal level of active bearing frequency / channel in [%] or [dBm] (adjustable in the "Setup" page).
	Digital bearing display	<p>Indication of the bearing information:</p> <ul style="list-style-type: none"> Averaged bearing value in degrees as a three-digit number in the middle of the display Reference of the bearing ("True", "Magnetic" or "Relative") The last bearing clock is shown in the lowermost line of the digital bearing display (s. also Figure 13), if the bearing signal has disappeared. The clock counts the time elapsed since the signal was lost. <p>The indication is in [hh:mm:ss].</p> <ul style="list-style-type: none"> Distance from the current GPS position to the stored GPS position is shown in the uppermost line of the digital bearing display. <p>This information is only indicated, if GPS data is available and at least one GPS arrow is displayed (MOB or Decode mode). If there is more than one GPS arrow, only the distance to the closest coordinates will be shown.</p> <p>The indication is in [km] or [NM], depending on the configuration in the "Setup" menu or configuration file.</p> <ul style="list-style-type: none"> GPS True Bearing: indication in degrees Shows the calculated bearing angle from the current GPS position to the stored GPS position. This information is only indicated if GPS data is available. If a PTT signal has been detected and PTT is activated for that frequency ("Setup" page), the letters "PTT" will be shown instead of the reference direction (e. g. "TRUE") and the bearing value (e. g. "300") will be replaced by "---".
	360° display and compass rose indication	<p>If compass information is available, the graphic display of relative bearing value within the compass rose will be shown.</p> <p>Without compass data the relative bearing will be shown in the 360°-display.</p> <p>If the antenna is mounted correctly, the 0°-value corresponds to heading / longitudinal axis of the vessel.</p>

19	Heading pointer	<p>Heading direction indicator, which shows a value in [°] (here: "30"). Heading pointer is fixed in the 12 o'clock position and displays the present heading of the ship, if compass information is available.</p> <ul style="list-style-type: none"> ○ If the "Bearing Reference Direction" is set as "True bearing" (s. "Setup" page), then the heading direction is shown relatively to the true (geographic) North Pole direction. ○ If the "Bearing Reference Direction" is set as "Magnetic bearing", the heading direction is shown relatively to the magnetic North Pole direction. ○ If the "Bearing Reference Direction" is set as "Relative bearing", the heading pointer takes the zero-value (shows in the bow-of-the-vessel direction, if the antenna is installed correctly). This indication stays constant. <p>Note If the "Rel. Bearing" reference direction is chosen under "Setup/Display", but valid compass data is available, the heading value will change according to the compass data.</p>
20	GPS arrow	<p>The GPS arrow relates to the GPS position. Therefore, this indication is only possible, if GPS data is available.</p> <p>This indication can be activated for two scenarios:</p> <ul style="list-style-type: none"> ○ Pointing to the GPS coordinates that have been stored by pressing the MOB button (pink arrow). ○ Pointing to GPS coordinates that were decoded from Cospas-Sarsat messages on the "Decode" page (gray arrow). <p>For more information s. 7.3.</p>
21	Bearing arrow	<p>The bearing arrow is the graphical indication of the bearing value on the 360° display.</p> <p>The bearing arrow additionally displays the opposite direction on the compass rose.</p> <p>The bearing value can be indicated (s. also 19):</p> <ul style="list-style-type: none"> ○ Relative to the heading of the vessel. This is the case, if no external compass is used. ○ Relative to the magnetic north pole ○ Relative to the true (geographical) north pole
22	Spread of bearing	<p>Maximum deviation of unaveraged single bearing values.</p>

Table 4. Indication on bearing page

7.1.2 Bearing Operation

Once the bearing frequency and the squelch level are set, the bearing operation starts.

If a signal on the selected operating frequency/channel is received, its level will be indicated digitally in the range of 0% to 99% in the section for signal level indication besides the bar graph, which additionally represents the signal level in a graphical way (s. positions 14 and 16 in Figure 11). The squelch level will then be pictured on the scale of the signal level indication at the manually (or automatically) adjusted value (s. position 15 in Figure 11).

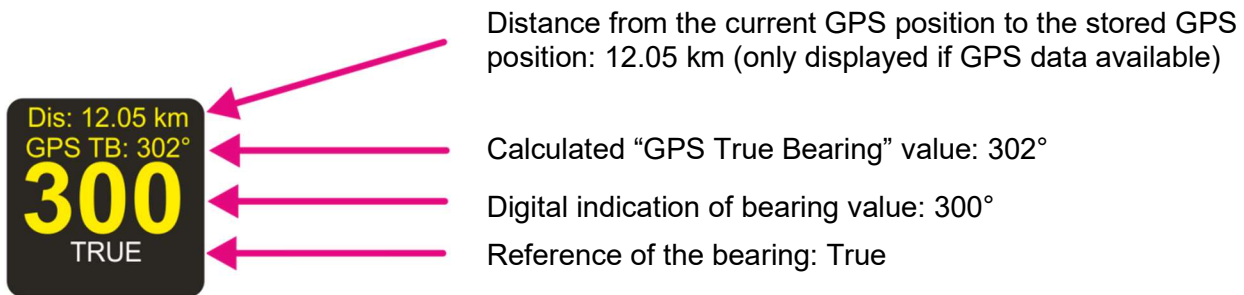
The bearing electronics will process data only if the signal level is above the selected **squelch level (= noise suppression)**. Even without a received signal the DF-system may display a certain signal level (= **noise**). To avoid distractions from environmental noise signals, the squelch level must be set above the noise level. For the correct setting of the squelch level, please pay attention to chapter 7.5.3.

The DF-system detects about 280 bearing values per second. These bearing values might vary significantly, depending on signal quality (signal strength and modulation). This range of spread is indicated as a green arc on the 360° display in front of the bearing arrow (s. position 22 in Figure 11). The smaller the arc, the better the signal quality. If the signal quality deteriorates, the arc becomes larger.

The bearing electronics process the detected bearing values over a certain time interval using a sophisticated internal algorithm, which provides a steady and reliable indication of the bearing value (e.g. the bearing arrow does not react to fast-changing reflections and noise signals). This averaging procedure produces good bearing results, even if there is a wide spread of single bearing values.

The bearing arrow represents the **relative bearing value**. This value is always relative to some fixed point, which could be either heading (the bow-of-the-vessel direction, if the antenna is installed correctly) or one of the north pole positions (magnetic or geographic), if compass information is available (via NMEA interface).

If using the heading of the ship as the reference direction (no compass data available), the bearing will be shown on top of the 360° display. If using one of the North Pole directions, it will be shown on the 360° display with additional indication of the cardinal points.



**Figure 12. Digital bearing display
(active signal reception)**

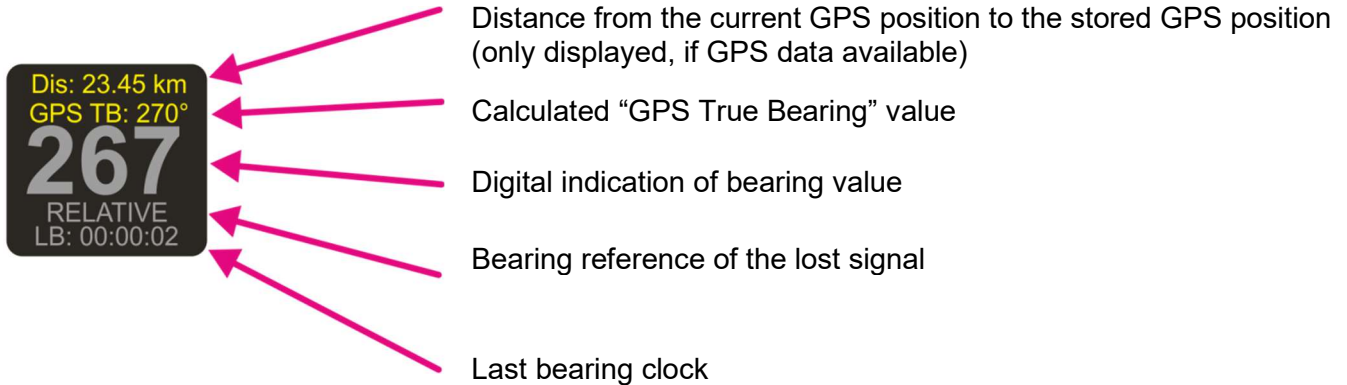
The digital bearing indication is a 3-digit number, rounded to the nearest degree. The reference of bearing is summarized again in the following table (s. Table 5).

Bearing reference directions		
Indication	Direction of Reference	Meaning
TRUE	True north pole	Bearing relative to true (geographic) North Pole. This is the case, if an external compass transmits true heading data (e. g. NMEA sentence "xxHDG" with valid variation or "xxHDT" sentence).
MAGNETIC	Magnetic north pole	Bearing relative to magnetic North Pole. This is the case, if an external compass is connected and transmits only magnetic heading (e. g. NMEA sentence "xxHDG" without valid variation).
RELATIVE	Heading of the vessel	Bearing relative to the heading of the vessel This is the case, if no external compass is used.

Table 5. Bearing reference directions

If the signal stops being received, the last bearing value will be displayed as a transparent arrow for two seconds (default value). This value is called "Bearing Hold Time", and can be changed in "Setup" (s. 7.4.2.1).

After 2 seconds, the arrow will disappear, and the time elapsed after the last signal reception will be shown inside the digital bearing display as "LB" (s. Figure 13).



**Figure 13. Digital bearing display
(signal reception ended 2 seconds
ago)**

It is possible to show the arrow of the last bearing again by pressing the "Repeat" hotkey (s. position 7 in Figure 11). The arrow will be displayed again for the time that has been set under "Bearing Indication Hold Time" in "Setup" (s. 7.4.2.1).

7.1.2.1 Alarms, Errors, Warnings

If during the operation either an emergency signal occurs, or an error is detected, or operating parameters exceed their specified limits, the system will inform the operator by activating an alarm-, error-, or warning-indication.

While a signal is being received (signal level > squelch level), it is examined in the background to determine if it is a modulated emergency signal. The emergency signals (ELT = Emergency Locator Transmitter, PLB = Personal Locator Beacon, MOB = Man Over Board) are modulated with a typical repeating and distinct sweeping tone. Once recognized as an emergency signal, the alarm will be activated.

In addition to the graphical indication, a special internal warning tone will inform the operator about the reception of the emergency signal. The acoustic alarm will remain activated (even after the signal reception has ended) until confirmed or deactivated (hotkey "Clr", s. position 8 in Figure 11). If no emergency signal is received for more than a minute, the alarm will be canceled automatically.

Note

The alarm relay output will be activated as well when recognizing an emergency signal. Like the internal warning tone, the relay output can be deactivated by pressing the hotkey "Clr". The alarm relay output may be used for an external siren, a MOB function, or similar.




Alarms/ Errors/ Warnings	
Indication Example	Meaning
	<p>Alarm: An emergency signal has been detected. The source, the counter of the elapsed time since the last alarm, and the related frequency are shown beside the actual alarm indication.</p> <p>The hotkey “Clr” deactivates the warning signal and the alarm relay output.</p>
	<p>Error: An error message will be displayed if:</p> <ul style="list-style-type: none"> ○ one or more operating parameters are out of the admitted limits ○ the system has recognized a malfunction (in this case the system is not working) <p>The hotkey “Clr” deactivates the acoustic warning.</p>
	<p>Warning: The system indicates a warning, if:</p> <ul style="list-style-type: none"> ○ external signals are not available (anymore) ○ operating parameters are close to the tolerable limits <p>The warning means that the system’s basic functions are not affected yet, but it is recommended to check the system in order to prevent damages.</p>

Table 6. Alarms, Errors, Warnings

7.1.2.2 Frequency / Channel Input Dialog

The frequency input dialog is called up by pressing the hotkey “Freq.Ch.” (s. Figure 11, position 4) while the “Bearing” page is active.

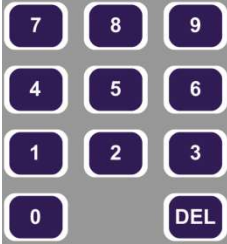


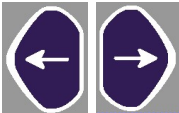





The frequency input dialog appears in three variants with different input dialogs for:

- Frequencies (s. [Input of Frequencies](#), page 28)
- Channels (s. [Input of Channels](#), page 31)
- Cospas-Sarsat frequency groups (s. [Selecting Cospas-Sarsat Frequency Groups](#), page 33)

The confirmed input of the dialog is displayed and stored, so after pressing the “Freq.Ch.” hotkey later again, the dialog opens with the last activated dialog variant (“Frequency Input” or “Channel Input”). If no input is detected for 10 seconds (default value), the dialog will be closed automatically. This input time can be changed in the “Frequency Input Dialog Time” setting (s. 7.4.3.6).

The following table explains the use of the keypad elements in the “Frequency/Channel Input” dialog.

List of Elements

Element	Function
	<p>Numeric keys for direct input of the frequency or channel number</p> <p>Note The input of invalid or not licensed frequency values will not be accepted.</p>
	<p>This button deletes all digits in the input field.</p>
	<p>The arrow buttons “up” and “down” allow the input of the frequency/channel, using a sophisticated input scheme.</p> <p>In the dialog variant selecting Cospas-Sarsat frequency groups, the “up” and “down” arrow buttons are used to select the desired frequency group.</p>
	<p>These buttons are used to navigate from one digit to another inside the input field for new frequency/channel.</p>
	<p>If the input of the frequency/channel is complete and valid, pressing this button saves the new value as “standby” frequency/channel.</p> <p>If the input is not correct, the system informs about it with following warnings:</p> <ul style="list-style-type: none"> ○  Ch. Spacing This indication appears for marine band frequencies, when the entered frequency is not in the typical grid (step width) but is still valid. ○  This indication appears when the entered frequency is out of the reception range of the direction finder. ○  This indication appears when the entered frequency is: <ul style="list-style-type: none"> ▪ not in the allowed grid (step width) of the corresponding band ▪ currently locked (s. 7.4.1.8) ○  This indication appears when the entered frequency belongs to the optional extended range that is not licensed in the given direction finder system (s. Table 1).



	In the drop-down menu for Selecting Cospas-Sarsat Frequency Groups, pressing this button selects the currently marked frequency group.
	Pressing this button closes the dialog without adopting values.
	Pressing this button closes the dialog without adopting the values and opens the “Bearing” page.
“Frequency”	This hotkey opens the dialog variant for frequency input (s. <u>Input of Frequencies</u> , page 28).
“Channel”	This hotkey opens the dialog variant for channel input (s. <u>Input of Channels</u> , page 31).
“Ship”	This hotkey appears only for duplex channels (s. Figure 16) in the dialog for channel input. It allows selecting the “Ship” frequency for a duplex channel.
“Coast”	This hotkey appears only for duplex channels (s. Figure 16) in the dialog for channel input. It allows selecting the “Coast” frequency for a duplex channel.
“CP/SS”	This hotkey opens the dialog variant for selecting Cospas-Sarsat frequency group (s. <u>Selecting Cospas-Sarsat Frequency Groups</u> , page 33).

Table 7. Frequency input dialog. List of elements

1. **Input of Frequencies**

In the frequency input dialog two ways of entering a new frequency are possible:

- 1) input using the numeric buttons, and
- 2) input using the arrow buttons.

The “Frequency/channel input dialog” is divided into:

- Section “Active... [MHz]”, which shows the currently active frequency (s. Figure 14, field A).
- Section “Standby ... [MHz]”, which allows the input of a new frequency (s. Figure 14, field B).

Note

The frequency, which is simply typed in, is not immediately set to the “Standby”.
To set the new value to “Standby” value, press “OK”.

- “SWAP” function (s. Figure 14, field C and position 3) allows switching between the two displayed frequencies.
Thus, one of them is always active and the other one can be set to “active” at one button press, whereby the previously active frequency becomes the “standby” frequency instead.

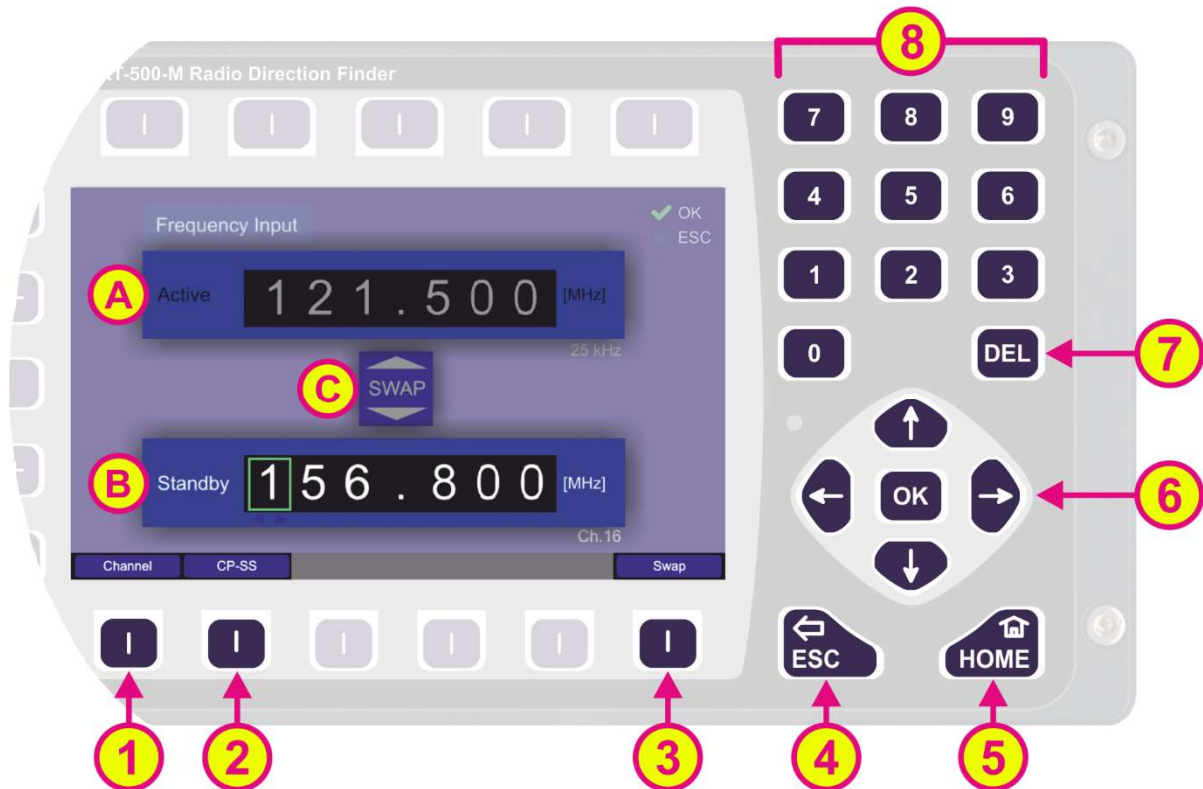


Figure 14. Input of a new frequency

The currently selected digit is indicated by a green-colored frame.

The input of digits can be done with the numerical buttons on the front of the device (s. Figure 14, field 8).

The arrow buttons “up” and “down” (s. Figure 14, field 6) allow the input of the frequency/channel, using a sophisticated input scheme. Depending on the other digit values, that are already set, the system allows the selection of only correct numbers for the current digit.

Note

If the system does not allow entering the desired number for a current digit, control other digits in the input field and correct them if necessary. The system shows you, which digit is wrong by flashing the cursor-frame in red.

Note

Frequency step width depends on the selected frequency band (s. 9.1):

UHF / VHF Air Band: 25 kHz / 8.33 kHz (s. Appendix, 13.7)

Marine Band: 5 kHz



COSPAS-SARSAT: 8.33 kHz

UHF FM Band: 5 kHz

Note

The input of invalid or not licensed frequency values will not be accepted.

Following actions are possible:

- Pressing  skips to and marks the next digit, left to the previous one.
The button  returns to the previous digit position / marks the next digit to the right.
- The “DEL” button (s. Figure 14, position 7) deletes the whole input.
The input field shows “---.---”.
- Pressing the “OK” button (s. Figure 14, field 6) adopts the frequency value as the new “Standby” value. This is not possible until the input is complete and valid from the first to the last digit (s. warnings in Table 7).

Note

After the new value for frequency was adopted, the second pressing of the “OK” button will not have any effect. To return to the “Bearing” page, use either the “ESC” or “HOME” button (s. below).

- Pressing “Swap” hotkey (s. Figure 14, position 3 and field C) sets the “standby” frequency to the active bearing frequency and the previously active frequency is set to “standby” (s. Figure 15).

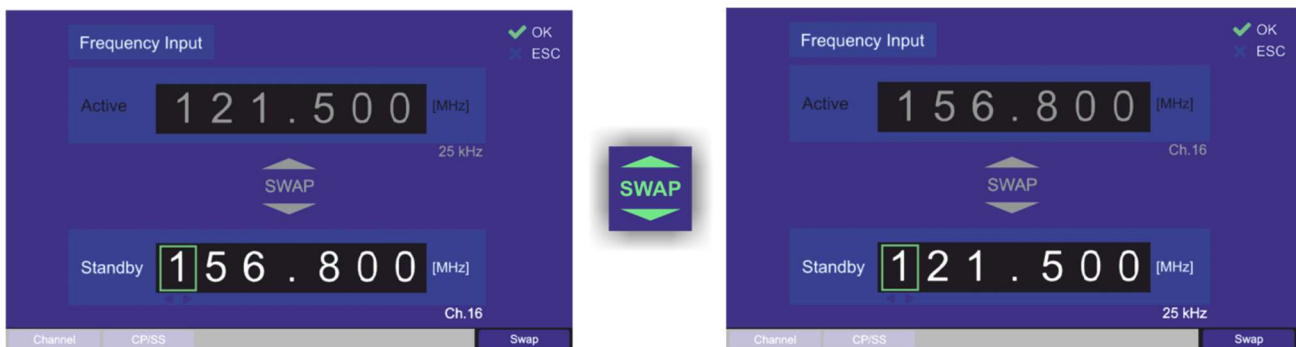


Figure 15. Swap frequencies

If you press „Swap” hotkey again, the frequencies will switch back.

- Pressing the “CP/SS” hotkey (s. Figure 14, position 2) opens the dialog variant for selecting “Cospas-Sarsat” frequency groups (description s. page 33).
- Pressing the “ESC” button (s. Figure 14, position 4) closes the dialog without saving changes.
- Pressing “HOME” button (s. Figure 14, position 5) closes the dialog without saving changes and leads to the bearing page.

The corresponding channel spacing for the entered frequency is automatically shown in the right lower corner under the frequency input field. It is also shown for the active frequency.

For a valid input of a marine band frequency, the number of the corresponding channel is shown under the frequency input field in the right lower corner. It is also shown for the active frequency.

If a Cospas-Sarsat frequency is entered, the value will be automatically converted to an input in the 8.33 kHz grid (s. **Selecting Cospas-Sarsat Frequency Groups**, page 33).

The inputs will be set to the following values:

406.025000 MHz = Channels: A (406.022 MHz), B (406.025 MHz), and C (406.028 MHz)

406.033333 MHz = Channels: D (406.031 MHz), E (406.034 MHz) and F (406.037 MHz)

406.041666 MHz = Channels: *G* (406.040 MHz) and *H* (406.043 MHz)

406.050000 MHz = Channels: *I* (406.046 MHz), *J* (406.049 MHz) and *K* (406.052 MHz)

406.058333 MHz = Channels: *L* (406.055 MHz), *M* (406.058 MHz) and *N* (406.061 MHz)

406.066666 MHz = Channels: *O* (406.064 MHz), *P* (406.067 MHz) and *Q* (406.070 MHz)

406.075000 MHz = Channel: *R* (406.073 MHz) and *S* (406.076 MHz)

Corresponding Cospas-Sarsat channels for the entered Cospas-Sarsat frequency are shown in the right lower corner of the “Standby” frequency field. They are also shown for the active frequency.

Note

The squelch level is set to 30% by default for the first input of the “Standby” frequency.

After changing the squelch level, the new value is stored together with the corresponding frequency (active frequency with squelch / standby frequency with squelch).

For Cospas-Sarsat frequencies the squelch is set to “Auto” by default.

For more information about squelch s. chapter 7.5.3.

2. Input of Channels

Generally, channel input works the same way as frequency input: the input dialog is divided into a section for the active channel and a section for the new channel (s. Figure 16, fields A and B).

With the “swap” function the “standby” channel can be set to “active” and the currently active channel becomes “standby”.

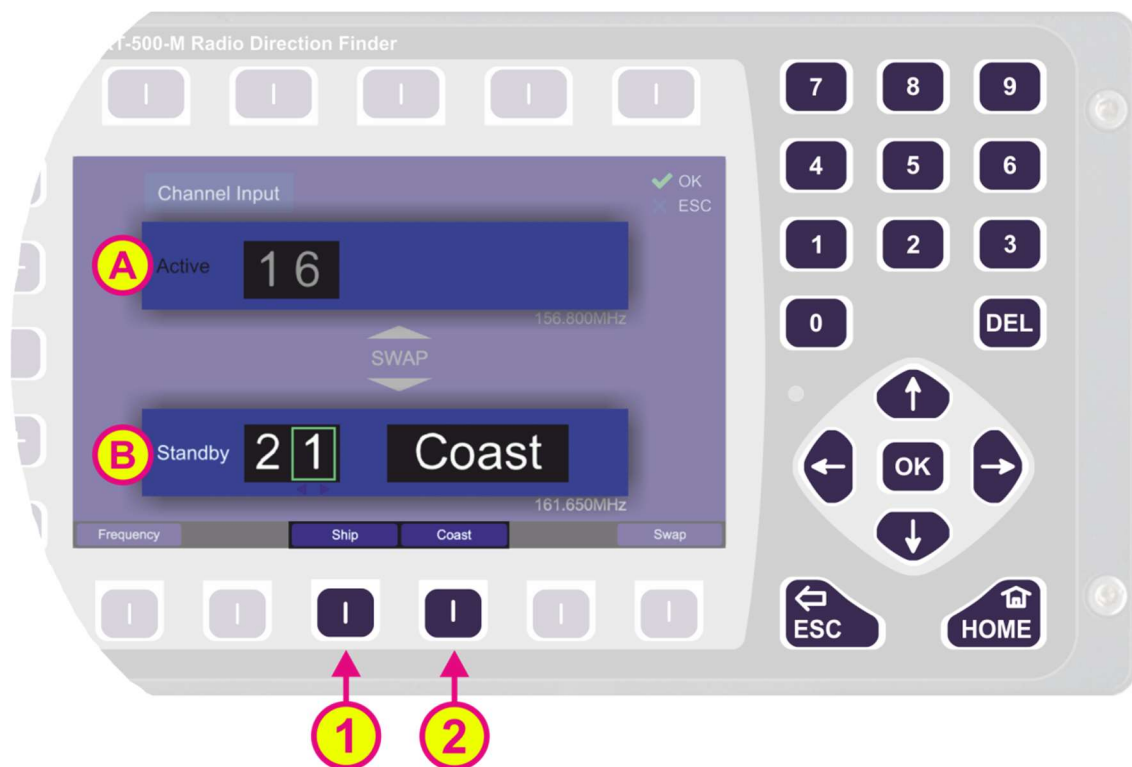


Figure 16. Input of a new channel

However, there are two additional hotkeys: “Coast” and “Ship” (s. Figure 16, positions 1 and 2), which allows switching between “ship”- and “coast”- frequencies in the case of a duplex channel. These hotkeys are only visible if there is a valid input for a duplex channel (e. g. the hotkeys will not be visible for an input “16”, as channel 16 is not a duplex channel). For the non-duplex channels, the new channel is entered as a number without any additional input.

Switching from “Channel” input dialog variant to “Frequency” input dialog variant while entering a channel number will have the following outcomes:

- If channel input is not completed, the frequency input dialog will show only the current frequency in the “Active” field.
- If all digits of channel input are entered and the input is valid, the frequency input dialog will show the new frequency (which belongs to the channel), in the “Standby” section.

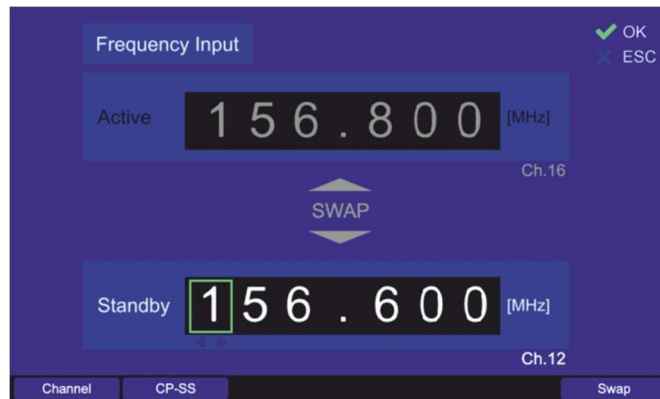


Figure 17. Changing from "Channel" to "Frequency" when channel input is complete

Switching from “Frequency” input to “Channel” input dialog variant when the “Standby” frequency does not belong to marine band, will show the empty “Standby” field and a warning (s. Figure 18).

The warning will disappear as soon as a valid channel number is entered in the “Standby” field.

Changing back to “Frequency” input dialog variant from this view, the previously set standby frequency is displayed if no channel has been entered.

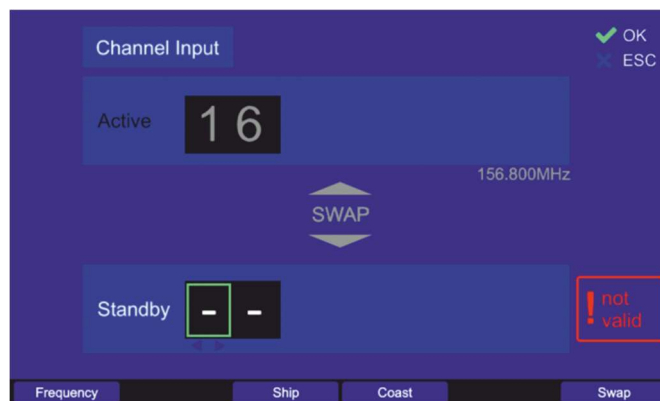


Figure 18. Switching to "Channel" when "Standby" frequency = 121.500 MHz

Switching from “Frequency” to “Channel” input dialog variant when the “Active” frequency does not belong to marine band, will show the “Active” frequency in MHz and the “Standby” input field for the channel input (s. Figure 19).

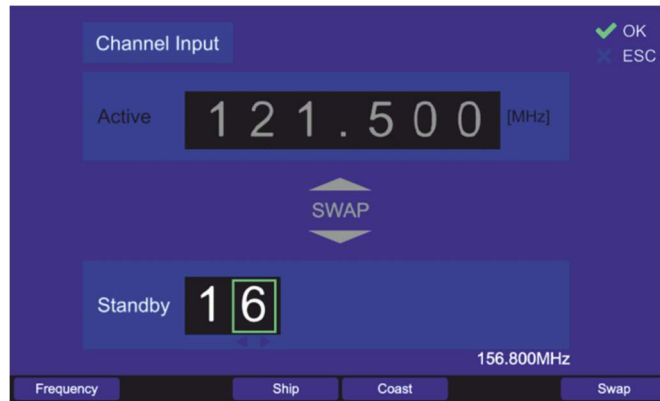


Figure 19. Channel input with non-marine active frequency

3. Selecting Cospas-Sarsat Frequency Groups

The hotkey “CP-SS” (s. Figure 14, position 2) opens a drop-down menu with selectable Cospas Sarsat frequency groups. The currently active frequency group is highlighted in green, whereas the other groups are gray. By pressing the “up” and “down” arrows (s. Figure 20, position 3), the green frame moves and marks the next frequency group, which can be selected by pressing “OK”. Pressing “ESC” will close the dialog without adopting the new frequency.

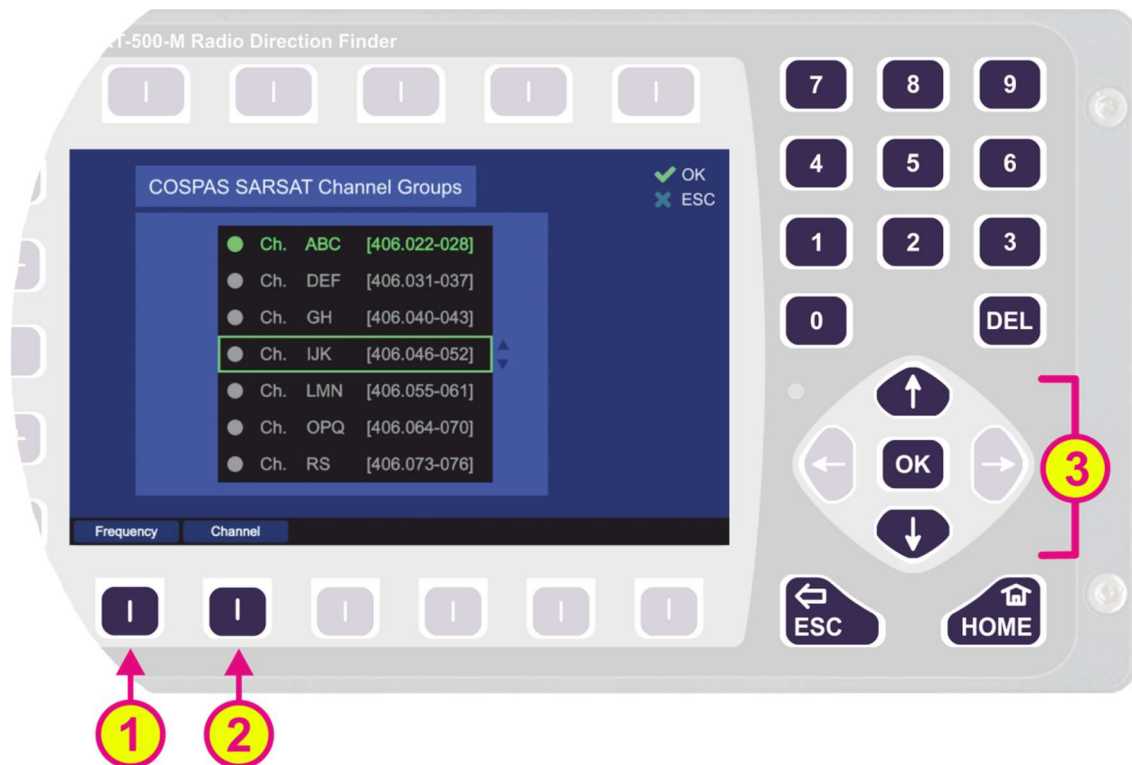


Figure 20. Input of a new COSPAS-SARSAT frequency

With hotkeys “Frequency” or “Channel” (s. Figure 20, positions 1 and 2) the corresponding variant of the input dialog is selected.

As a result of the 8.33 kHz grid of the AU, after selecting any channel group, the indication on the “Bearing” page will be as follows:

- “406.025 MHz” for Channel ABC
- “406.033 MHz” for Channel DEF
- “406.042 MHz” for Channel GH

- “406.050 MHz” for Channel IJK
- “406.058 MHz” for Channel LMN
- “406.067 MHz” for Channel OPQ
- “406.075 MHz” for Channel RS

The corresponding Cospas-Sarsat channels for the entered Cospas-Sarsat frequency are shown in the right lower corner of the “Standby” frequency field. It is also shown for the active frequency.

7.1.2.3 Memory Dialog

The memory dialog (s. position 5, Figure 11) provides a list of stored frequencies (channels), which facilitates restoring any frequency from memory to the active bearing mode.

Selection of the frequencies works by using the “up” and “down” arrows. Recalling the marked frequency into the active bearing mode is accomplished by pressing the button “OK”.

Furthermore, each frequency can be marked for the function “fast channel scan”, which means that by activating this function, the marked frequencies will be used for scanning. The fast scanning function itself is limited to a maximum of eight frequencies, so there is also a maximum of eight frequencies which can be marked for scanning in the “memory” dialog.

Inside the “memory” dialog, the sub-dialogs can be opened, e. g. frequency name editing dialog.

Note

The “List of stored frequencies” of the memory dialog is internally linked to the list of frequencies of “Fast Channel Scan” (s. 7.2.3.3, Figure 43). This only applies to frequencies that are marked for scanning (s. Figure 21, “Scan”) in the memory dialog. This means that activating / deactivating or deleting a frequency in the memory dialog causes activating / deactivating or deleting the same frequency in the “Fast Channel Scan”-list.

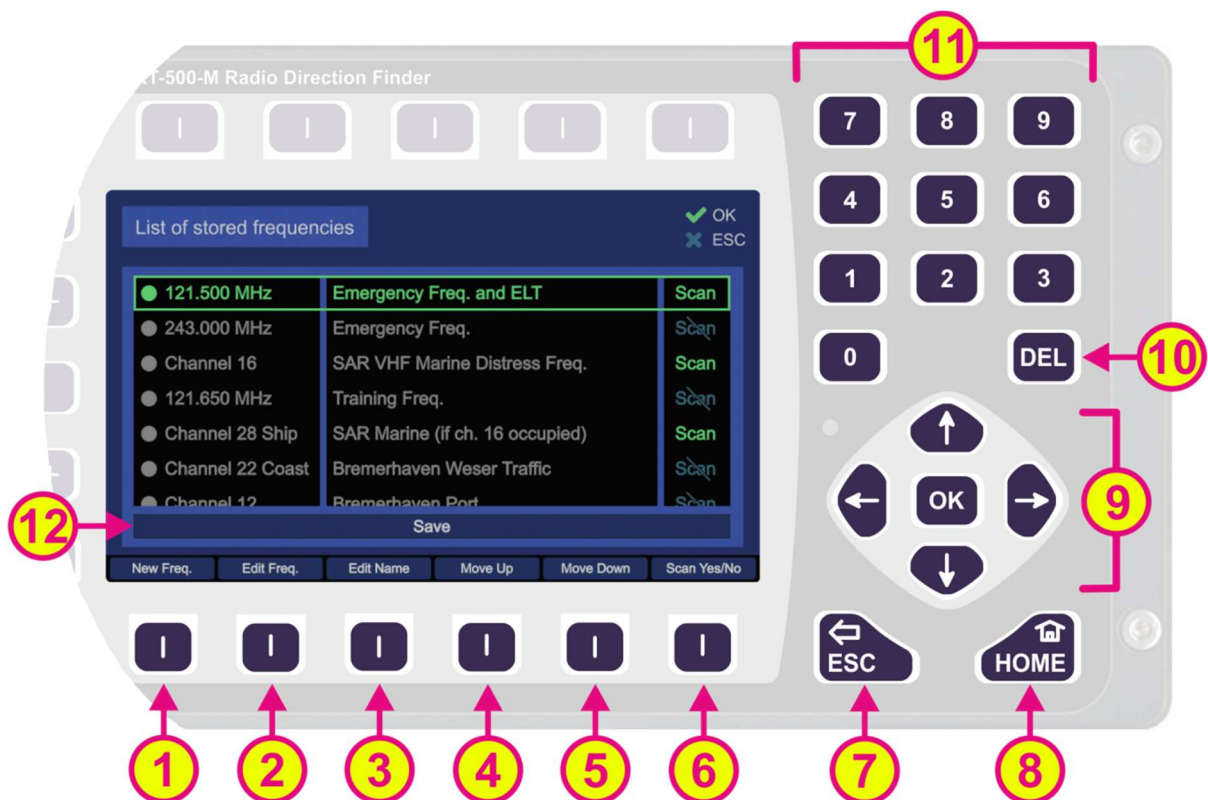


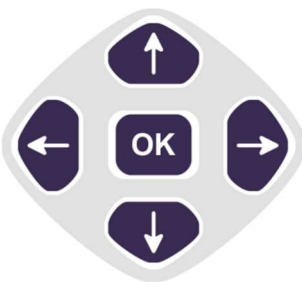



Figure 21. Memory Dialog. Top level

List of Elements		
Pos.	Element	Function
①	"New Freq."	Creates a new entry at the end of the list. By pressing this hotkey, the "Frequency input dialog" opens immediately and the new frequency can be entered into the list.
②	"Edit Freq."	Pressing this hotkey opens the "Frequency input dialog" for changing the currently marked frequency/channel.
③	"Edit Name"	Pressing this hotkey opens the virtual keyboard, which allows textual input of the name for the currently marked frequency/channel.
④	"Move Up"	By pressing this hotkey, the currently marked line will be moved one position upwards in the list.
⑤	"Move Down"	By pressing this hotkey the currently marked line will be moved one position downwards in the list.
⑥	"Scan Yes/No"	This hotkey marks the currently selected frequency for the function "Fast channel scan". That means, when "Fast channel scan" is activated, this marked frequency will be scanned as one of the eight possible frequencies for this scan function. If the frequency/channel is already marked for scan and the hotkey "Scan Yes/No" is pressed once again, the marking for "Fast channel scan" will be removed.
⑦		Pressing this button will close the dialog (or frequency / name input) without adopting the new values.
⑧		Pressing this button will close the dialog without adopting the values and open the "Bearing" page.
⑨		<p>The "up" and "down" arrows are used to select between the stored frequencies in the "memory" dialog. When editing the name of a frequency, these buttons are used to navigate on the displayed keyboard.</p> <p>The "right" and "left" arrows are used to navigate on the displayed keyboard while editing the name of a frequency.</p> <p>Button "OK":</p> <ul style="list-style-type: none"> On the top level of the "memory" dialog pressing "OK" will activate the currently marked frequency and close the dialog (previously used frequency on the "Bearing" page will be changed to the selected frequency). In the sub-dialogs "New Freq.", "Edit Freq." and "Edit Name", pressing "OK" will confirm the edited values (frequency, entered letters or numbers, or the whole input).
⑩		<p>This button deletes the currently marked frequency from the list.</p> <p>Note</p> <p>Deleting the frequency from the list will follow immediately after pressing the "DEL" button, without asking for confirmation of the deleting procedure.</p> <p>Pressing the button "DEL" within the sub-dialogs "New Freq.", "Edit Freq." and "Edit Name" clears the input field (all digits).</p>

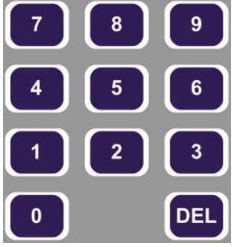
11		The number keys can be used for inputting the frequency name (s. also 3, “Edit Name”) since the names of frequencies may contain numbers and characters.
12	“Save”	Pressing the “down” arrow until the green frame reaches the “Save” button and confirming with “OK” will save all previously made modifications within the “memory” dialog (editing frequencies, names etc.). Once done, the dialog can be closed by pressing “ESC”, all changes will remain saved. Using the “ESC” button without previously confirming the changes with “Save” will close the memory dialog without saving the changes.

Table 8. Memory Dialog. List of elements

Edit Name Sub-Dialog



This dialog is opened from the top level of the “Memory” dialog by using the corresponding hotkey and allows editing the name for the marked frequency.

This dialog cannot be closed with the button “OK” because that button is used to confirm each individual character for the text input. The characters are selected by navigating on the virtual keypad using the arrow keys (s. position 3, Figure 22). The dialog is closed by confirming with the button “End of User Input” on the virtual keyboard.



Figure 22. Editing the frequency name

If the frequency name contains numbers, they can be entered using the number keys on the keypad (s. position 5, Figure 22) since the virtual keyboard itself does not contain number keys. Using the “DEL” button (s. position 4, Figure 22) the whole input will be deleted.

The arrow-keys   on the virtual keypad have the same function as “shift” and “caps lock” on a standard PC keyboard. The thick “up” arrow acts as “shift” (the next input will be interpreted as capital letter, but the following inputs are interpreted as lowercase letters unless this button is pressed again). The thin “up” arrow acts as “caps lock” (the following inputs will be interpreted as capital letters if the button is not pressed for the second time).

The “End of User Input” is used to confirm the whole text in the input field. By confirming this button with “OK”, the edit name sub-dialog will be closed, adopting the new name for the frequency which can be seen in the control field above (here: “Edit Name of Frequency” 121.650 MHz).

Pressing the “ESC” or “HOME” (s. positions 1 and 2, Figure 22) will close the dialog without adopting the values (and open the “bearing” page in case of the “HOME” button).

7.1.3 Function Channel 16

Pressing hotkey “Ch. 16” (s. position 6, Figure 11) enables instant access to maritime emergency channel 16.

If this function is activated, the hotkey name indication adopts the value of the previously active frequency, so that it can be quickly switched back if needed.

Note

Please verify correct squelch adjustment. For squelch adjustment see 7.5.3.

7.1.4 Function Repeat

Pressing the hotkey “Repeat” (s. position 7, Figure 11) after a signal loss during the normal bearing operation shows the last valid bearing, reference and level values (s. Figure 23, field B).

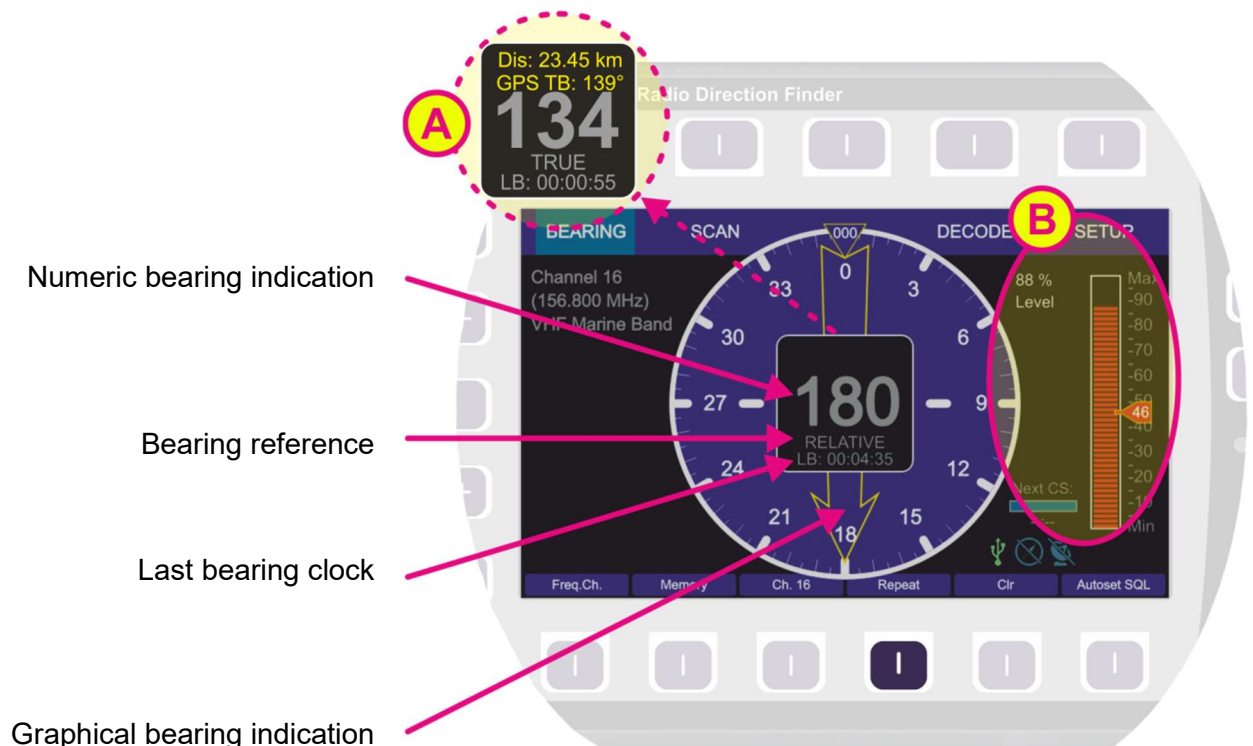


Figure 23. Repeat indication

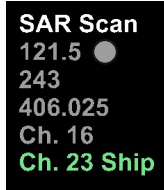
The last bearing clock in the lowermost line of the digital bearing display (s. Figure 23) shows the elapsed time since the last valid bearing was interrupted/lost.

Depending on the availability of compass or GPS data, also other information can be displayed in the numeric bearing indication window (s. Figure 23, field A).

The last valid bearing data will be shown for 2 seconds (by default) after pressing the “Repeat” hotkey. This hold time can be changed on the “Setup” page (“Bearing Indication Hold Time”, s. 7.4.2.1).

The repeat function during a scan is displayed differently depending on the current scan procedure. For all scan procedures, except “SAR Scan”, “Fast Channel Scan” and “Monitoring”, the repeat function shows the information about the last valid bearing in the left upper corner of the DCU display e.g. as it is shown in the Figure 45 in the chapter 7.2.4.

For “SAR Scan”, “Fast Channel Scan” and “Monitoring” the last result is shown in the digital bearing display (s. Figure 23, digital bearing display indication with bearing arrow) and the corresponding frequency is marked with a gray circle, e.g.:



If a new signal is detected, the repeat indication interrupts and adopts the new bearing value.

If an external compass is activated (“true” / “magnetic” bearing), a change in the heading of the ship is automatically considered for the bearing.

Note

If no external compass is activated (“relative” bearing), the indicated bearing value corresponds to the vessels heading at the time of the bearing. A change of heading in the meantime must be considered.

7.1.5 Function Clear

The function “Clr” (s. position 8, Figure 11) clears the internal bearing value averaging memory.

The averaging memory improves the bearing accuracy and provides a useful bearing indication even with poorly received signals (e.g. distant transmitter, receiving gaps).

The averaging procedure can cause a dragged error, which might affect the bearing value, if the heading changes too fast¹. In this case, the indicated bearing value will slightly lag behind the actual bearing value.

Pressing the hotkey “Clr” after a distinct change of heading will correct the displayed bearing value immediately.

If an alarm was activated, this hotkey is used to mute the acoustic alarm (s. 7.1.2.1).

If the “GPS Arrow” was exported to the “Bearing” page (s. 7.3.5), keep the “Clr” hotkey pressed for a few seconds in order to remove the GPS arrow indication.

7.1.6 Function Autoset Squelch

In normal bearing mode (no scan active) the hotkey “Autoset SQL / Squelch / Automatic / Manual” hotkey is designated as “Autoset SQL” (s. position 9, Figure 11). Pressing this hotkey will automatically set the squelch level above the noise level by 6 dB (this is a default value and can be modified in “Setup”, s. 7.4.3.12). A manual readjustment might be necessary (s. chapter 7.5.3).

When bearing a Cospas-Sarsat frequency this hotkey is designated as “Manual”/ “Automatic”, which allows switching between these squelch adjustment possibilities. For further information please refer to chapter 7.5.3.

¹ Typical case is a quick pass on the transmitter, which is in the near field of the DF-antenna.

If any scan algorithm is activated, this hotkey is designated with “Squelch”, or is empty (s. “Scan” page). Pressing this hotkey will open the squelch dialog to adjust the squelch levels for the different frequencies.

7.2 Scan Page

The “Scan” page enables starting scanning modes as simply and quickly as possible.

Various scan modes are shown as a list with the currently activated mode highlighted in green. If no scan is currently active, all scan modes in the list are displayed in gray, where one of the scan modes is marked one is indicated by a green frame.

The scan procedures can also be configured on this page.

If a scan procedure has been activated, all relevant data of the activated mode will be displayed after switching to the “Bearing” page. Figure 24 shows the most important elements of the “Scan” page.

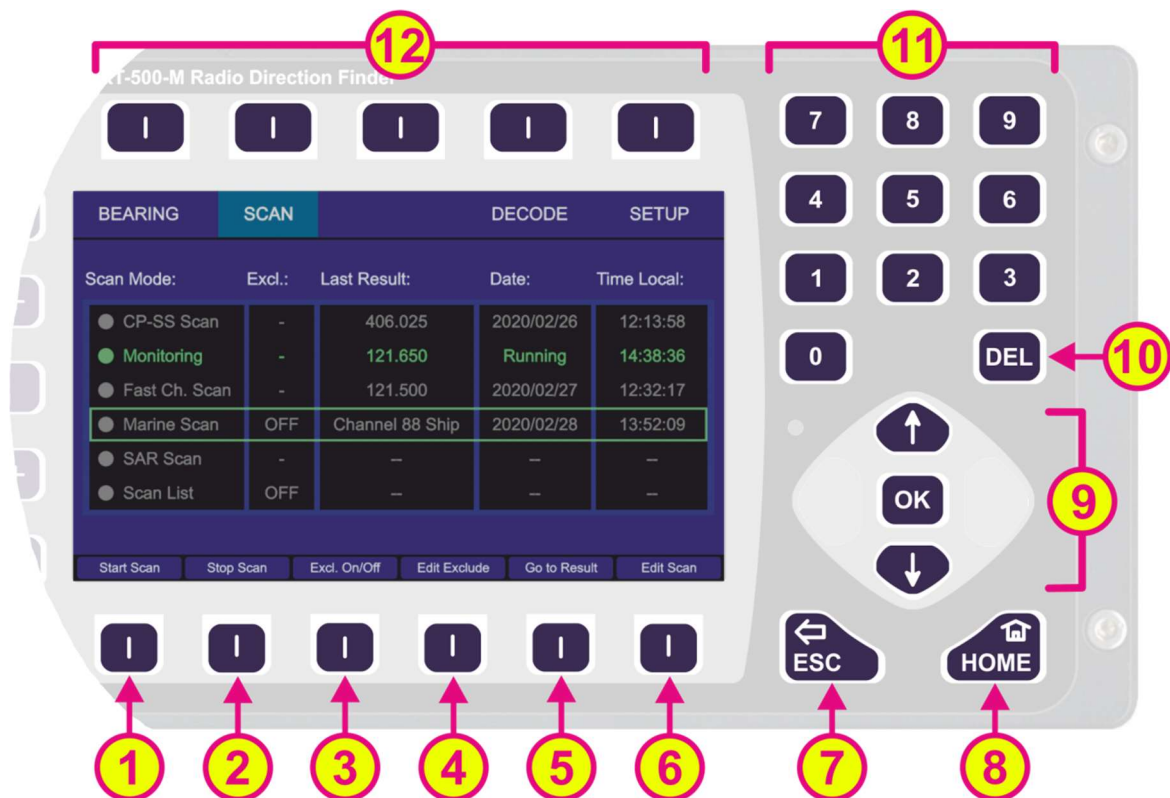






Figure 24. Scan page. General view

Indication on Scan Page		
Pos.	Element	Meaning / Description
①	„Start Scan“	Activates the currently marked scan algorithm. On the “Setup” page you can set the behavior for when this hotkey is pressed (switching to the “Bearing” page or remaining on the “Scan” page, s. 7.4.3.13)
②	“Stop Scan”	Stops the currently activated scanning algorithm, regardless of whether it is marked in the list or not.
③	“Excl. On/Off”	This hotkey appears only when the “Marine Scan” or “Scan List” is marked. By pressing this hotkey, the algorithm of the currently marked scan mode takes the “Exclude List” into account during the scan. If this setting was already activated for the currently marked scan, pressing this hotkey will deselect this option and the “Exclude List” will

		not be regarded during the scan.
4	"Edit Exclude"	<p>This hotkey appears only when the "Marine Scan" or "Scan List" is marked.</p> <p>By pressing this hotkey, the dialog for editing the "Exclude List" is opened (s. 7.2.4.3).</p>
5	"Go to Result"	<p>Terminates the currently activated scan algorithm, acquires the frequency which was found during the last scan and switches to the "Bearing" page.</p> <p>If "Scan List" is marked, pressing this hotkey opens the corresponding dialog.</p> <p>This hotkey appears only if there is a result for the currently marked scan algorithm.</p>
6	"Edit Scan"	Opens the dialog to edit the currently marked scan algorithm.
7		<p>When there is a dialog opened, pressing this button will close the dialog without adopting new values.</p> <p>When there is no dialog opened, pressing this button will go back to the last activated page. The Bearing Page is the endpoint.</p>
8		<p>Pressing this button while on the "Scan" page will close the "Scan" page and open the "Bearing" page (home page).</p> <p>Pressing this button on the "Bearing" page while any scan procedure is currently active will open a confirmation dialog for ceasing the currently running scan procedure.</p> <p>Confirming with "OK" terminates the scan operation and the system will change to the normal bearing mode on the previously selected frequency.</p> <p>By pressing the "ESC" the scan procedure will be continued.</p> <p>If a sub-dialog is opened, pressing this button will close it and lead to the "Bearing" page, without adopting the changed values.</p>
9		<p>"Up" and "Down" arrows are used to select between the general settings (move the green frame). Inside the dialogs (e.g. value editing) they are used to navigate between the characters of the virtual keypad.</p> <p>"Right and "left" arrows have no function on this page.</p> <p>If no scan mode is currently activated, pressing "OK" will activate the marked scan mode.</p> <p>With the "OK" button the confirming of values or opening the general settings dialogs is accomplished.</p> <p>If you want to use the frequency determined during the scan as the bearing frequency, press "OK". This will quit the scan procedure and start the normal bearing mode on this frequency.</p>
10		<p>If any scan mode is currently activated, by pressing this button the scan mode will be stopped, regardless of whether it is marked in the list or not.</p> <p>Inside the settings dialogs, the "DEL" button is used to clear the whole input at once</p>

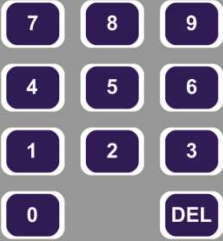
11		Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the “Scan” page, they have no function.
12	Top line	Navigation line of the screen, which allows switching between setup menus (“Bearing”, “Scan”, “Decode” and “Setup”).

Table 9. Scan page. List of Elements

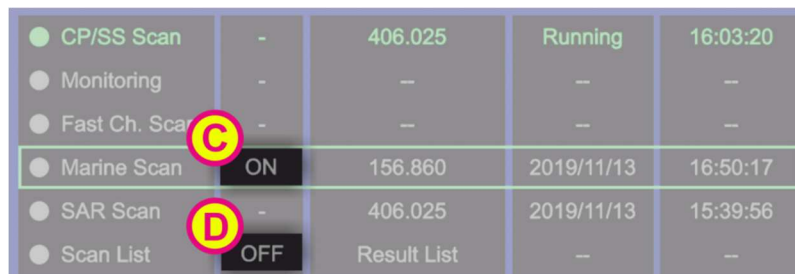
The last result, which was found during the last scan is displayed with frequency/channel, day and time besides the scan mode (s. Figure 25, field A). This allows the direct opening of a frequency for bearing, which was found in an earlier scan cycle.



● CP/SS Scan	-	406.025	2019/07/11	14:47:20
● Monitoring	-	-	-	-
● Fast Ch. Scan	-	-	-	-
● Marine Scan	OFF	156.140	Running	16:46:47
● SAR Scan	-	406.025	2019/11/13	15:39:56
● Scan List	OFF	Result List	-	-

Figure 25. Cospas-Sarsat scan mode with the last result indication

During any scan is active, the field for the day indication shows “Running” instead of the actual day indication (s. Figure 25, field B).



● CP/SS Scan	-	406.025	Running	16:03:20
● Monitoring	-	-	-	-
● Fast Ch. Scan	-	-	-	-
● Marine Scan	ON	156.860	2019/11/13	16:50:17
● SAR Scan	-	406.025	2019/11/13	15:39:56
● Scan List	OFF	Result List	-	-

Figure 26. "Exclude List" use indication

Further, if the “Exclude List” is used for a scan algorithm (only for “Marine Scan” and “Scan List” available), this will be shown in the table in the second column as “ON” (s. Figure 26, field C). If the “Exclude List” is not used, it is marked with “OFF” (s. Figure 26, field D).

7.2.1 COSPAS-SARSAT Scan

In this scan mode, the direction finder keeps scanning the entire COSPAS-SARSAT range of channels (s. 7.1.2.2, section “Input of Frequencies” and “Selecting Cospas-Sarsat Frequency Groups”) until a signal is detected on one of the channel groups (s. Figure 27, field A).



Figure 27. Cospas-Sarsat Scan indication on the "Bearing" page

After a Cospas-Sarsat frequency has been detected, the scan mode stops automatically and the direction finder changes to the normal bearing mode on this frequency (s. Figure 27, field B).

- To start the "Cospas-Sarsat Scan" mode select the corresponding line on the "Scan" page and press "OK" or the hotkey "Start Scan" (s. Figure 28, position 1)

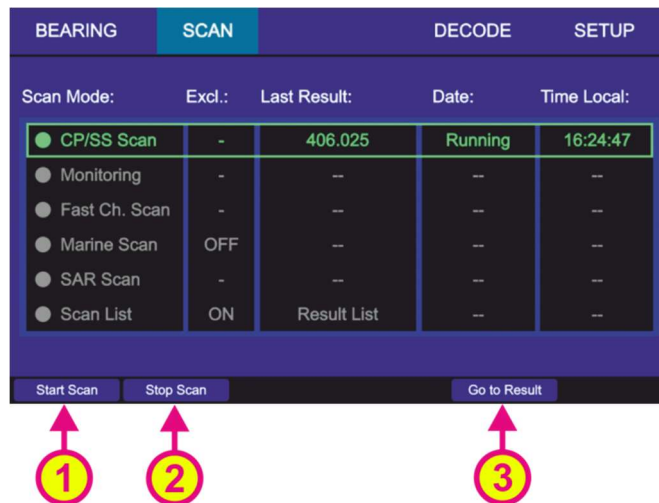


Figure 28. "Cospas-Sarsat Scan" mode has been activated

- Pressing the hotkey "Stop Scan" (s. Figure 28, position 2) will terminate the current scan mode and change to the bearing of the frequency, that was set before the scan mode has been activated.

Note

You can also stop the scan mode by pressing the "HOME" button on the "Bearing" page with activated scan. After you have confirmed the special dialog (s. Figure 29), this mode will be terminated.

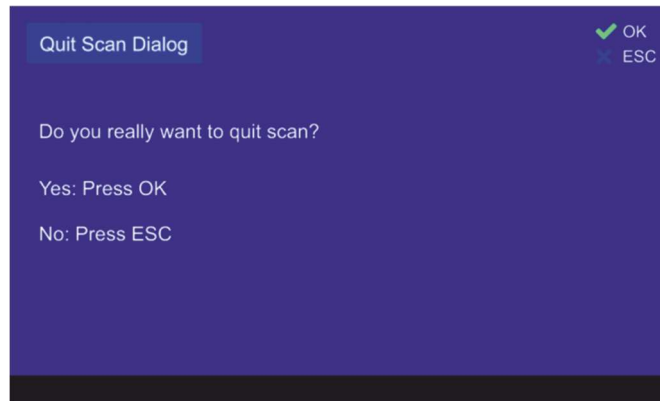


Figure 29. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 28, position 3) during the Cospas-Sarsat scan is running, will terminate the scan mode, adopt the frequency which was found in this scan last time and change to the “Bearing” page.
Pressing the hotkey “Go to Result” if the scan mode is not activated, will lead to the “Bearing” page with the last result as the activated frequency.
This hotkey appears only if there is a result for this scan.

7.2.2 Monitoring

The DF-system RT-500-M can receive only one frequency at a given time. For simultaneous surveillance of the emergency frequencies (especially MOB = man over board alert) and any other frequency/channel, this monitoring function can be used.

Note

The COSPAS-SARSAT frequencies cannot be set as the monitoring frequencies, but they still can be used as the main bearing frequency.

Monitoring scan has two different modes of operation, which depends on the main bearing frequency:

- Monitoring (normal): the mode of operation with any main frequency that does not belong to the COSPAS-SARSAT band.
- Monitoring CP-SS: the mode of operation with a COSPAS-SARSAT frequency as the main frequency.
This particular scan mode is convenient for the use case when the expected COSPAS-SARSAT frequency of a particular emergency beacon is not known and should be determined. If the exact COSPAS-SARSAT frequency is known, then using the “SAR scan” (s. 7.2.5) might be a better choice for simultaneous surveillance of several frequencies.

The surveillance of up to five different frequencies (within the specified frequency bands) is possible:

- One main bearing frequency
- And four monitoring frequencies:
The emergency frequencies 121.500 MHz and 243.000 MHz are stored permanently in the “Monitoring” algorithm.
Two more frequencies/channels can be set additionally in this scan (s. Figure 30).

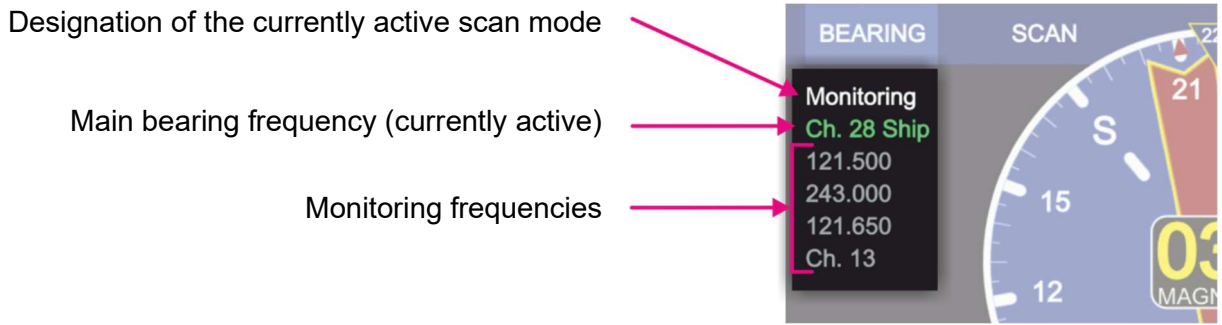


Figure 30. “Monitoring” mode. Indication of frequencies.

If the Monitoring (normal) function is activated, the DF system switches alternating from the main bearing frequency to the selected monitoring scanning frequencies (s. 7.2.2.1).

The currently monitored frequency is displayed highlighted in green, so you can see, which frequency is active at a given moment (s. Figure 30).

A frequency will be monitored for 3 seconds if ELT/PLB is not activated, and 10 seconds if ELT/PLB is activated.

If a signal is received during monitoring, the bearing value is indicated on the “Bearing” page for 30 seconds.

- In order to interrupt the current reception, press the “ESC” button. The system will continue with the next monitoring frequency.

Active reception will be interrupted after 30 seconds for a short moment in order to examine the other monitoring frequencies (safety function). This behavior can be changed under “Monitoring Settings” (s. 7.2.2.4, “Edit Scan” hotkey-description).

If the signal is lost during the monitoring procedure, the scanning process continues with the next frequency/channel after 30 seconds (depending on the settings of the bearing indication time and how many seconds (e.g. of 30 s - period) have already elapsed until the signal was interrupted).

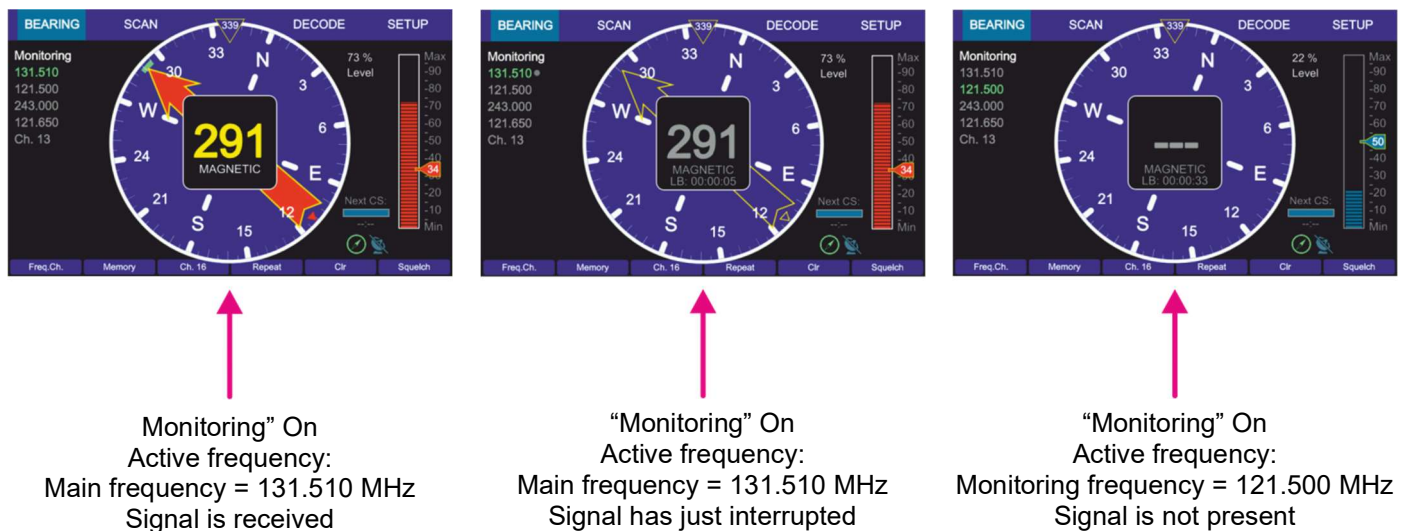


Figure 31. “Monitoring” mode. Example views of the “Bearing” page

- If at some point of scanning procedure the signal on the desired frequency is received, and monitoring of other frequencies is not desired anymore, press the “OK” button. The frequency, that receives a valid signal at the moment of pressing the “OK” button, will be adopted as the main frequency, and the system will change to a normal bearing mode.

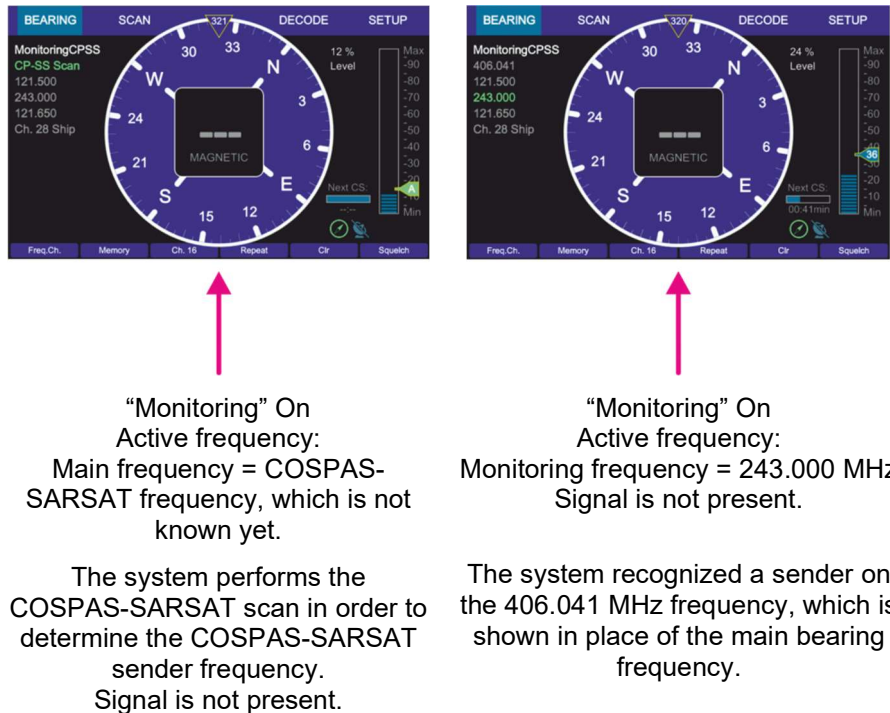


Figure 32. “Monitoring CP-SS” mode. Example views of the “Bearing” page

In the case of COSPAS-SARSAT frequency as the main bearing frequency, the Monitoring CP-SS function is activated automatically, when the “Monitoring” scan is selected.

This operation mode differs from the normal monitoring mode with a non-CP-SS-frequency as the main bearing frequency (s. 7.2.2.2).

The “CP-SS” monitoring procedure will first look for the COSPAS-SARSAT signal and then, if no pulse has been detected for 60 seconds, it will search for other monitoring frequencies one after another (not alternating with the main frequency as it is in the standard case).

If a COSPAS-SARSAT signal is detected, the system releases an alarm and decode the pulse, which can then be seen on the “Decode” page.

Note

If a valid COSPAS-SARSAT signal is detected during the 60-seconds-period of the monitoring procedure, the correct COSPAS-SARSAT frequency channel of the sender is determined in the first cycle (first 60 seconds period of the CP-SS scan).

Only at the second cycle of this scan algorithm the bearing and decoding information of a COSPAS-SARSAT signal is stored and shown on the corresponding pages.

7.2.2.1 Timing of Normal Monitoring Operation

The main frequency (here channel 16) is monitored with the highest priority. The duration of the monitoring cycles may be extended if signals are received on the monitoring frequencies.

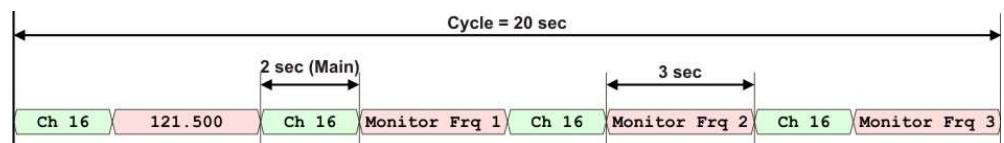


Figure 33. Example: Timing normal monitoring

Note

Receiving on the monitoring frequencies can be triggered by the wrong adjustment of the squelch level!

Please always prove the correctness of the squelch adjustment on the scan frequencies.

7.2.2.2 Timing Monitoring with Selected Cospas-Sarsat Main Frequency

If the main frequency is adjusted to a Cospas-Sarsat frequency, the timing cycle will be changed automatically.

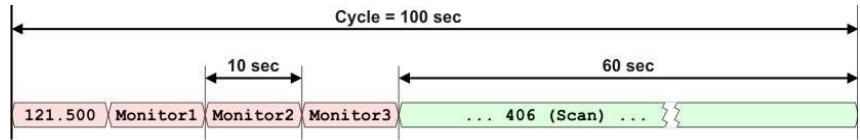


Figure 34. Example: Timing Cospas-Sarsat monitoring

Additionally, the Cospas-Sarsat-scanning is activated, in order to catch the short pulse (duration of pulse ca. 400 msec, every ca. 50 seconds).

7.2.2.3 Monitoring with Filtering of Emergency Transmitters: ID-Only

In order to activate the emergency transmitter filtering function see 7.2.2.4 (Figure 37, position 6).

Signals transmitted by emergency transmitters (PLB/ELT/MOB) are modulated with a typical sweeping tone. In order to exclude false alarms caused by disturbing signals or by not authorized radio-communication during monitoring mode, the function "emergency transmitter filtering ID-Only" can be activated.

Once activated, the alarm for all radio signals without the prescribed sweeping tone for emergency transmitters will be suppressed. Alert will be triggered only if a modulated emergency signal is recognized.

Note

For very weak signals the recognition of modulation may take a certain time. Releasing an alarm can be delayed in this case.

7.2.2.4 Monitoring Settings

- To start the “Monitoring” mode select the corresponding line on the “Scan” page and press “OK” or the hotkey “Start Scan” (s. Figure 35, position 1).

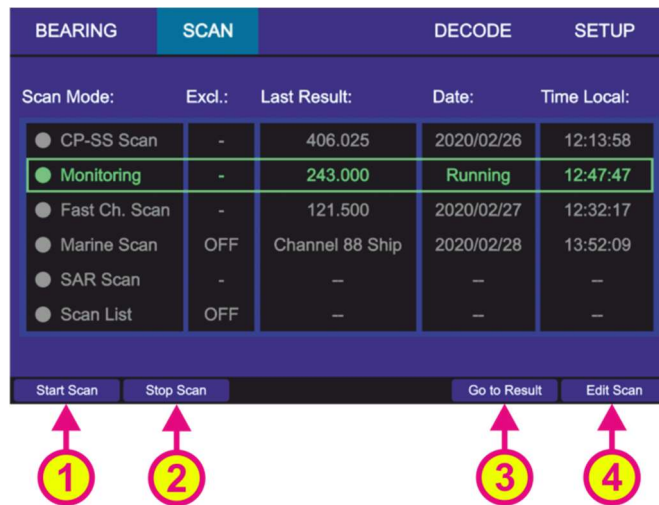


Figure 35. "Monitoring" has been activated

- Pressing the hotkey “Stop Scan” (s. Figure 35, position 2) will terminate the current scan mode and change to the bearing of the frequency that was set before the scan mode has been activated.
- You can also stop the scan mode by pressing the “HOME” button on the “Bearing” page with activated scan. After you have confirmed the special dialog (s. Figure 36), this mode will be terminated.

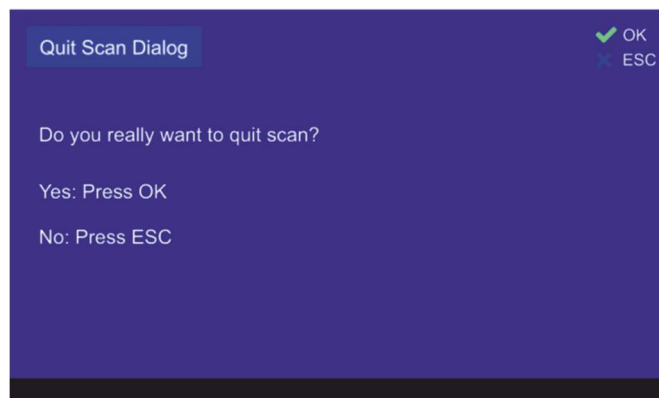


Figure 36. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 28, position 3) during the monitoring is currently running, will terminate the scan mode, adopt the frequency which was found in this scan last time and change to the “Bearing” page.
- Pressing the hotkey “Go to Result” if the scan mode is not activated, will lead to the “Bearing” page adopting the last result as the bearing frequency. This hotkey appears only if there is a result for this scan.
- Pressing the hotkey “Edit Scan” (s. Figure 24, position 6) opens the dialog for changing the monitoring settings (s. Figure 37).

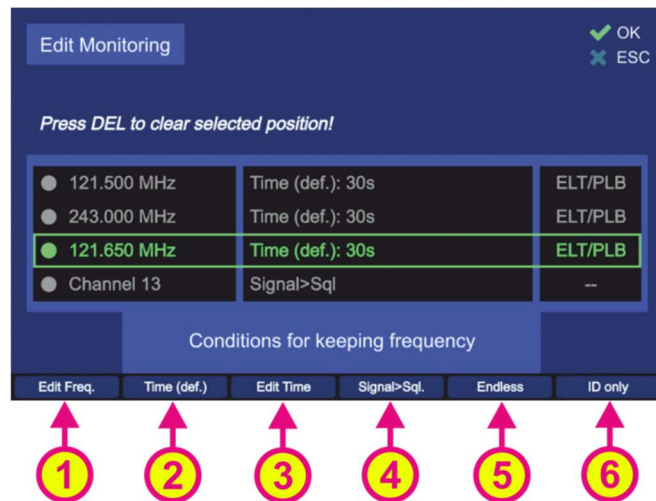


Figure 37. Monitoring mode settings

- The hotkey “Edit Freq.” (s. Figure 37, position 1) opens the dialog which allows the modification of the currently marked frequency.
Type the new value in the input field “New Frequency” using the keyboard of the DCU.
Or use one of the hotkeys (s. Figure 38, position 1 or 2) to switch to the “Channel” or “Cospas-Sarsat” input mask.

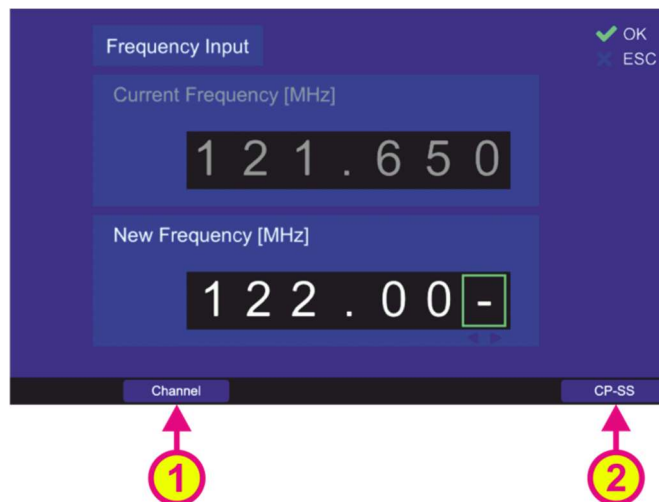


Figure 38. Editing the current frequency

- Pressing the hotkey „Time (def)“ (s. Figure 37, position 2) will set the hold time (duration of staying in the scanning on this particular frequency) to the default value of 30 seconds.
- Pressing the hotkey “Edit Time” (s. Figure 37, position 3) will open the sub-dialog for changing the hold time to the customized value (s. Figure 39). Use the number keys of the DCU keypad to type the new value in and confirm it with “OK”.

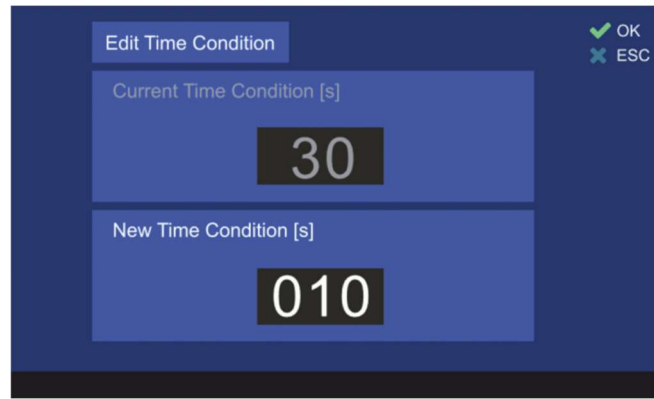


Figure 39. Hold time setting

- The hotkey “Signal > Sqi” defines the behavior of the monitoring algorithm to “signal level > squelch level” (s. Figure 37, position 4).
If this hotkey has been pressed, the scan algorithm will stay on the active frequency until the signal level value becomes higher than the squelch value.
- The hotkey “Endless” (s. Figure 37, position 5) defines the behavior of the monitoring algorithm when an active frequency has been found.
If this hotkey is pressed, the monitoring algorithm will stay on an active frequency as long as the user terminates the monitoring mode or skips the actual frequency.
- Pressing the hotkey “ID only” (s. Figure 37, position 6) activates or deactivates the feature “ID Only” (s. 7.2.2.3):
 1. **“ELT/PLB”:**
The alarm is only triggered if an ELT/PLB signature is set and the corresponding modulation has been detected. Otherwise the alarm will not be activated.
 2. **“ – “:**
Alarm is never triggered, regardless of whether the signal is modulated or not.

The hotkey “ID only” is only visible for the following frequencies:

- 121.500 MHz
- 243.000 MHz
- 121.650 MHz

7.2.3 Fast Channel Scan (Licensed Option)

The scan mode “fast channel scan” is only available with an unlocked option (licensed option “F5”).

Note

If the fast channel scan mode is not supported by the connected AU, it cannot be selected in the dialog.

7.2.3.1 Fast Channel Scan Operation

In this scan mode, it is possible to scan up to eight freely selectable frequencies/channels across all the specified bands (available frequency bands are visible in the “Frequency Information” dialog, s. 7.4.1.8).

The selection of the 8 frequencies/channels which have to be scanned in the “Fast Channel Scan” mode, can also be done via “Memory” dialog, which can be opened by a hotkey on the “Bearing” page.

Note

If the fast channel scan is running, the hotkey “memory” does not react on pressing. Memory dialog is available after the fast channel scan mode is terminated.

Note

The “List of stored frequencies” of the “Memory” dialog (s. 7.1.2.3) internally linked to the list of frequencies of “Fast Channel Scan” (s. 7.2.3.3, Figure 43). This only applies to frequencies that are marked for scanning (s. Figure 21, “Scan”) in the “Memory” dialog. That means that activating/deactivating or deleting of a frequency in the “Fast Channel Scan” list causes the activating or deactivating (for scanning) of the same frequency in the “List of stored frequencies” of the “Memory” dialog.

The duration of the scan cycle for the maximal number of selectable frequencies is approximately two seconds, whereat all channels are scanned continuously one after another. If less than eight frequencies are selected, the duration of the scanning cycle decreases equivalently to their number (e.g. if four frequencies/channels are selected, one cycle of the scan procedure takes approximately one second).

In fast channel scan mode the auto squelch is set automatically. The behavior of the auto squelch can be slightly influenced by adjusting the SNR value (Signal to Noise Ratio, s. 7.4.3.12). The SNR value indicates the number of level points above the noise level to which the auto squelch is set. For example, if the noise level on a specific channel is at 27% and the SNR value is adjusted to “7”, then the auto squelch level is set to 34%.

Since the selected frequencies in this mode can have different noise levels and originate from different bands, the SNR value for each frequency/channel can be adjusted separately.

After detection of a signal, the bearing is shown for 5 to 7 seconds for frequencies with the activated beep tone detection, additionally, the alarm is released. For frequencies with deactivated beep tone detection, the active bearing indication time is 30 seconds.

After the elapsing of this time, the scan algorithm interrupts the bearing indication and continues with scanning of other selected frequencies.

If the signal was lost, one second after the scanning process starts again at the next frequency/channel.

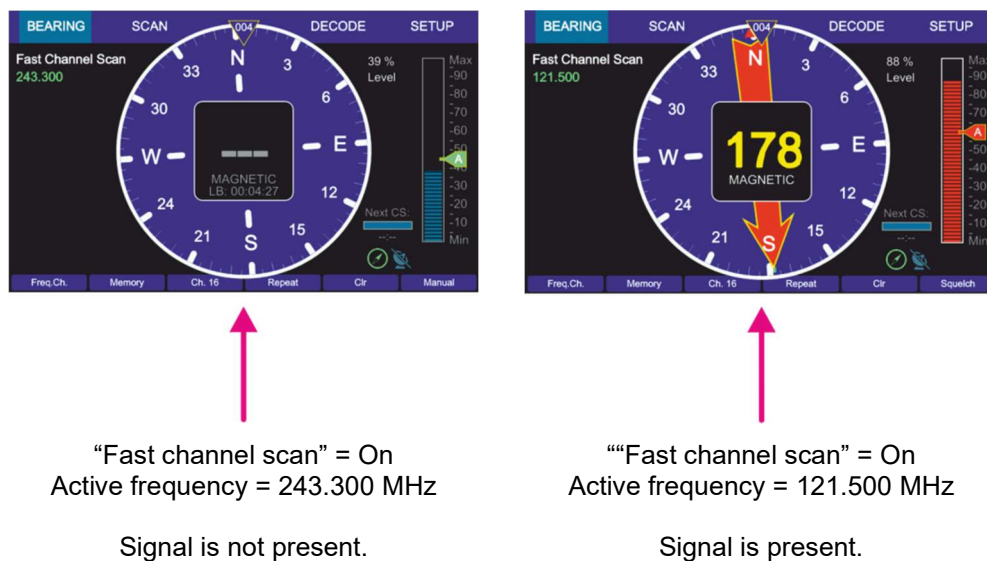


Figure 40. Fast channel scan indication on the “Bearing” page.

In case that an unwanted signal is found, the scanning process can be proceeded immediately by pressing the “ESC” button.

If a signal is found and should be beared permanently, the scanning process can be ceased either by pressing the button “OK” (the current frequency will become the new bearing frequency on the “Bearing” page), or by pressing “HOME” (in the scan dialog “Stop Scan”) and then using the “Go to result” hotkey (s. 7.2.3.3).

Note

If there are interferences on the frequency band which are above the squelch level, scanning stops as well at these interferences (they are interpreted as signals). This may be avoided by adjusting the squelch level manually adjusting the SNR value.

Because of this, it may be possible that weak signals are not received anymore (for correct squelch adjustment see also chapter 7.5.3)

7.2.3.2 „Alarm Only Decoding“ / „Beep Tone“

If the mode “fast channel scan” is activated, a “Beep Tone” filter can be activated for each frequency additionally.

The alarm is only activated for signals with a distinct (preconfigured) audio frequency and activates an alarm immediately if such a signal was recognized.

The parameters of the audio signal (upper and lower audio frequency and the minimum required duration of the signal) can be configured on the “Setup” page (s. 7.4.3.5).

Note

This function can be used to search e.g. NOVATECH radio beacons which transmit a two-second signal with an 800Hz audio tone every six seconds.

7.2.3.3 Fast Channel Scan Settings

- To start the “Fast Channel Scan” mode select the corresponding line on the “Scan” page and press “OK” or the hotkey “Start Scan” (s. Figure 41, position 1)

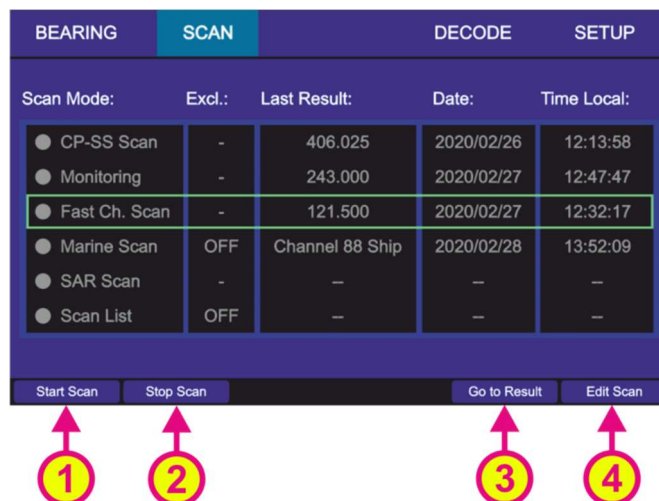


Figure 41. Activating the “Fast Channel Scan”

- Pressing the hotkey “Stop Scan” (s. Figure 41, position 2) will terminate the scan mode and change to the bearing of the frequency, that was set before the scan mode has been activated.
- You can also stop the scan mode by pressing the “HOME” button on the “Bearing” page with activated scan. After you have confirmed the special dialog (s. Figure 42), this mode will be terminated.

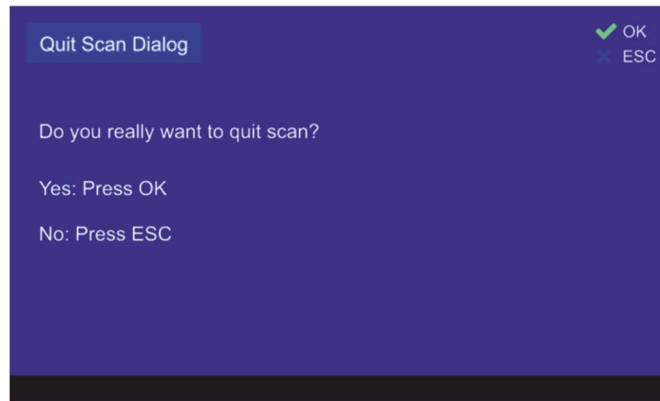


Figure 42. Confirming of leaving the scan mode

- Pressing the button “OK” during the time of the active reception of the signal, the scanning mode will be deactivated and the current frequency will become the new main frequency.
- Pressing the hotkey “Go to Result” (s. Figure 41, position 3) during the fast channel scan is currently running, will terminate the scan mode, adopt the frequency which was found in this scan last time and change to the “Bearing” page into normal bearing mode. Pressing the hotkey “Go to Result” if the scan mode is not activated, will lead to the “Bearing” page with the last result as the activated frequency. This hotkey appears only if there is a result for this scan.
- Pressing the hotkey “Edit Scan” (s. Figure 41, position 4) will open the dialog for changing the settings of the fast channel scan (s. Figure 43).

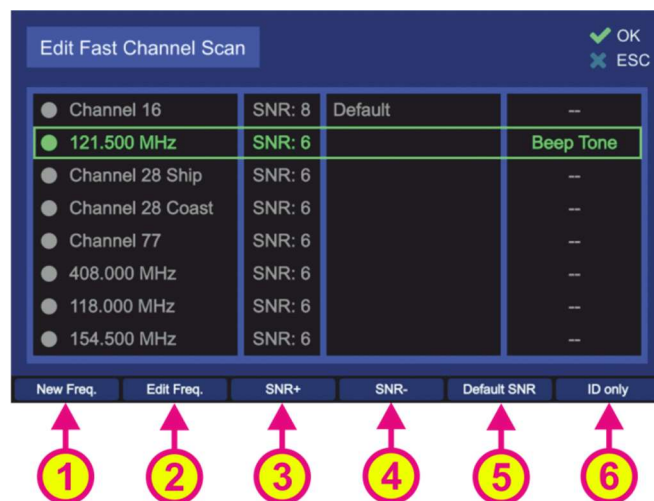


Figure 43. Fast channel scan settings

- The hotkey “New Freq.” opens the dialog for adding the new frequency in the list (maximum 8 frequencies/channels). Use the keyboard of the DCU to input the new frequency into the corresponding input field, or use one of the hotkeys (s. Figure 44, positions 1 and 2) to open the “Channel” or “Cospas-Sarsat” input mask.

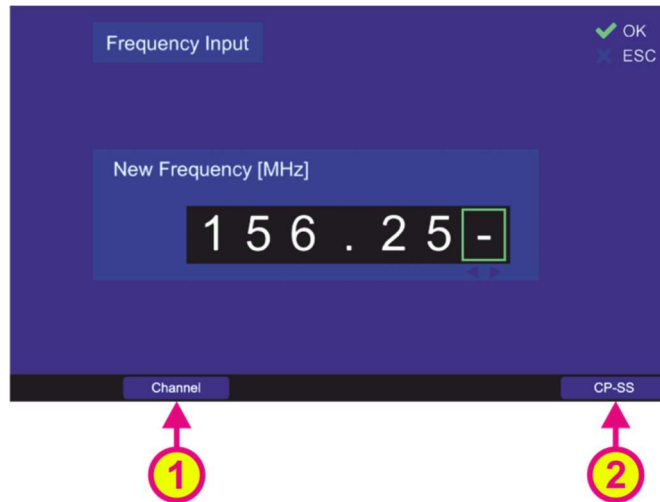


Figure 44. Input of a new frequency to be scanned

- The hotkey “Edit Freq.” (s. Figure 43, position 2) opens the input dialog that allows the modification of the currently marked frequency (s. Figure 38 and its description in 7.2.2.4, the appearance of the dialog is different from the input of a new frequency that is presented in the Figure 44).
- Pressing the hotkey „ SNR+” (s. Figure 43, position 3) will increase the SNR value of the currently marked frequency by 1%.
- Pressing the hotkey „ SNR-” (s. Figure 43, position 4) will decrease the SNR value of the currently marked frequency by 1%.
- Pressing the hotkey “Default SNR” (s. Figure 43, position 5) will set the SNR value of the currently marked frequency to the default value, which can be defined on the “Setup” page (s. 7.4.3.12).
- Pressing the hotkey “ID only” (s. Figure 43, position 6) activates or deactivates the feature “ID Only” with two possible settings:
 - **“Beep Tone”:**
Alarm is only triggered if an audio tone in the valid range (configured via Setup, s. 7.4.3.5) has been detected. Else the bearing is suppressed.
 - **“--”:** Alarm is never triggered no matter if there is any modulation on it or not.

Note

“Beep Tone” is only active in “Fast Channel Scan”.

7.2.4 Marine Scan

The “Marine Scan” mode provides a quick scanning of the lower marine band.

The frequency range of the “Marine Scan” is defined from 156.050 MHz (Channel 01) to 157.425 MHz (Channel 88) and is scanned with 5 kHz frequency steps without gaps. The frequency range cannot be changed. The duration of one scanning cycle is approx. 3 seconds.

Designation of the currently active scan mode

Scan frequency (changing until a signal is detected)

Time of the last signal detection

Frequency and the number of the equivalent channel of the last signal detection

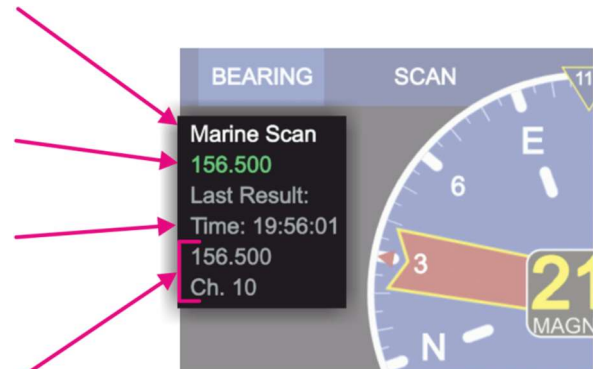


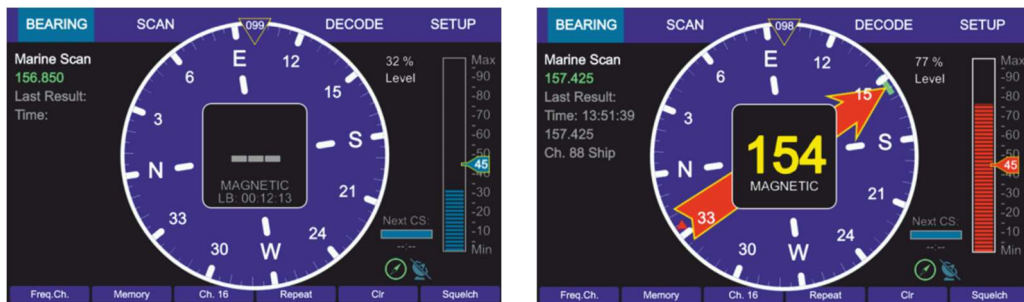
Figure 45. Marine scan. Indication of frequencies

7.2.4.1 Marine Scan Operation

If a signal is found during the scan (signal level above squelch level), the scanning is interrupted and the bearing of the signal is held for 30 seconds (default value, which can be changed in the scan settings, s. 7.2.4.2), then the algorithm continues with scanning of next frequencies .

If the button “OK” is pressed during the time of the active reception of the signal, the scanning mode will be deactivated and the current frequency will become the new main frequency.

If the signal was lost during the scan mode, the scanning process continues with the next frequency / channel after up to 30 seconds (depending on the setting of the bearing indication time, and how many seconds of the indication-time has already elapsed until the signal was interrupted).



“Marine Scan” = On
Active frequency = 156.850 MHz

Signal is not present.

“Marine Scan” = On
Active frequency = 157.425 MHz

Signal is present.

Figure 46. Marine scan indication on the “Bearing” page.

In case that an unwanted signal is found, the scanning process can be proceeded immediately by pressing the “ESC” button.

Note

If there are interferences on the frequency band which are above the squelch level, scanning stops as well at these interferences (they are interpreted as signals). This may be avoided by adjusting the squelch level manually using the “Up” and „Down“ arrow buttons.

Because of this, it might be possible that weak signals are not received anymore (for correct squelch adjustment read also chapter 7.5.3).

7.2.4.2 Marine Scan Settings

- To start the “Marine Scan” mode select the corresponding line on the “Scan” page and press “OK” or the hotkey “Start Scan” (s. Figure 47, position 1).



Figure 47. Marine scan is activated.

- Pressing the hotkey “Stop Scan” (s. Figure 47, position 2) will terminate the scan mode and change to the bearing of the frequency, that was set before the scan mode has been activated.
- The scanning process can be ceased also by pressing the button “HOME”. Then the direction finder changes to the bearing of the frequency, which was set before the scan mode was started.
- The hotkey “Excl. On/Off” is only visible, if “Marine scan” or “Scan List” is marked (s. Figure 47, position 3).
By pressing this hotkey the currently marked scan mode will proceed the “Exclude List” during the scan.
If this setting was already set for the currently marked scan mode, pressing this button will deselect this option and the “Exclude List” will be ignored during the scan procedure.
- “Edit Exclude” is only visible, if “Marine scan” or “Scan List” is marked (s. Figure 47, position 4).
By pressing this hotkey, the dialog for editing the “Exclude List” will be opened (s. 7.2.4.3).
- Pressing the hotkey “Go to Result” (s. Figure 47, position 5) during the marine scan is currently running, will terminate the scan mode, adopt the frequency which was found in this scan last time and change to the “Bearing” page into normal bearing mode.
Pressing the hotkey “Go to Result”, if the scan mode is not activated, will lead to the “Bearing” page with the last result as the activated frequency.
This hotkey appears only, if there is a result for this scan.
- Pressing the hotkey “Edit Scan” (s. Figure 47, position 6) will open the dialog for changing the settings of the marine scan (s. Figure 48).

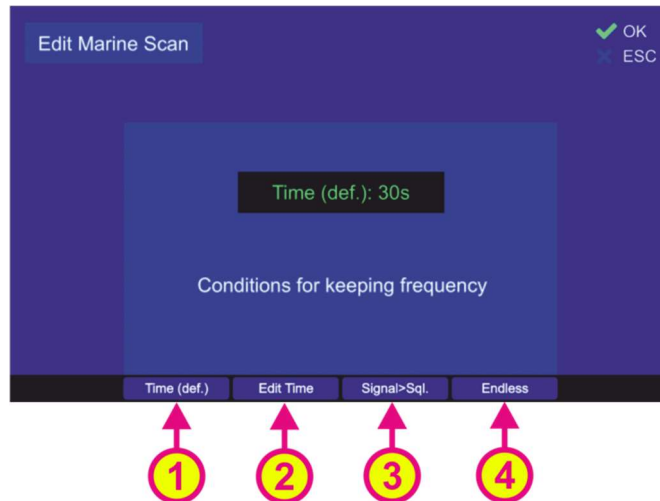


Figure 48. Marine scan settings

- “Time (def.)” hotkey (s. Figure 48, position 1) defines the behavior of the marine scan algorithm if the active frequency (signal level > squelch level) has been found. If this hotkey is pressed, the default time of 30 seconds will be adopted after confirming this setting with “OK”. Marine scan algorithm will stay for the default time of 30 sec on an active frequency before continuing with scanning of the lower marine band.
- Pressing the hotkey “Edit Time” (s. Figure 48, position 2) will open a dialog for editing the time of staying on the actively received frequency before continuing with the scan procedure.
- Pressing the hotkey “Signal>Sql.” hotkey (s. Figure 48, position 3) defines the time of staying on the actively received frequency before continuing with the scan procedure. If this setting is confirmed, the scanning procedure will stay on the actively received frequency as long as the signal level is higher than the squelch level.
- If the hotkey “Endless” (s. Figure 48, position 4) was pressed and confirmed with “OK”, the marine scan algorithm will stay on the actively received frequency as long as the user terminates the scan or skips the current frequency.

7.2.4.3 Exclude List (for “Marine Scan” and “Scan List” modes)

The “Exclude List” (s. Figure 24, position 4) is a dialog that allows defining single frequencies or frequency ranges that are to be excluded from the scanned frequency ranges for scan modes “Scan List” and “Marine Scan”.

Due to generating the scan algorithms in the AU (that always run through all the defined frequencies of the mode without the possibility of skipping), in case of signal reception of the “Exclude List”-frequency, this frequency will not be completely suppressed but there will be a short bearing indication. After less than one second, the indication interrupts and the marine scan procedure continues immediately with the next frequencies of the defined band.

- After pressing the hotkey “Edit Exclude” on the “Scan” page (see e.g. Figure 47, position 4), the dialog for editing the “Exclude List” will be opened. In the case of first opening this dialog, all fields will be empty.

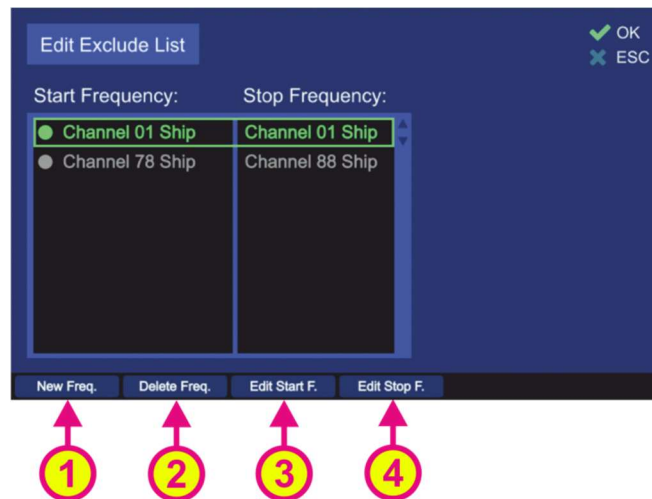


Figure 49. „Exclude List“ configuration

- To insert a new frequency/channel or a range of frequencies/channels, press the hotkey „New Freq.“ (s. Figure 49, position 1). The dialog for entering a new frequency will be opened (s. Figure 44 and its description in 7.2.3.3), where you can input any desired frequency. In order to define a scope of frequencies “from ... to ...”, it is necessary to input any new frequency first. Then it is possible to proceed with editing the start- and stop-frequencies.
- Mark any line in the list and press the hotkey “Edit Start F.” (s. Figure 49, position 3) to edit the start-frequency of the desired range to be excluded. The dialog for editing the frequency will be opened, where you can input any desired frequency (s. Figure 38 and its description in 7.2.2.4).
- Mark any line in the list and press the hotkey “Edit Stop F.” (s. Figure 49, position 4) to edit the stop-frequency of the desired range to be excluded. The dialog for editing the frequency will be opened, where you can input any desired frequency (s. Figure 38 and its description in 7.2.2.4).

Note

Start- and stop-frequencies must be in the same frequency band (s. Table 1 in chapter 4), as the AU cannot switch from one band to another while running the fast scan algorithms.

- By pressing the hotkey “Delete Freq.” (s. Figure 49, position 2), the marked line will be deleted immediately, regardless whether it is a single frequency or a whole frequency range. Leaving the dialog by pressing “OK”, the deleted frequency (or range) will not be excluded from the scanning procedure anymore.

7.2.5 SAR Scan

The main purpose of the “SAR scan” is finding COSPAS-SARSAT beacons, which usually transmit a signal on one of the 406-MHz-frequencies and additionally a continuous signal on other emergency frequency (mostly 121.500 MHz).

A COSPAS-SARSAT signal is a strong emergency signal (approx. 5 W), but its disadvantage is, that it is sent in the form of once-per-minute short pulses. They can be used to determine an activated emergency beacon over major distances. But since the direction of a pulsed signal, received from the great distance, might be influenced by reflections, noise, and distortions, it is still a rough ascertainment of the target.

The signals on other emergency frequencies are generally sent out with less power (approx. 100 mW) than the COSPAS-SARSAT pulses, but they are continuous, which allows better bearing performance compared to pulses. The bearing result becomes more precise the closer the direction finder antenna comes to the target.

The “SAR scan” procedure is organized in a way that facilitates the bearing of a COSPAS-SARSAT frequency and using breaks between the COSPAS-SARSAT pulses to observe other emergency frequencies. After a valid COSPAS-SARSAT signal was detected, it is possible either to change to the normal bearing mode on this frequency or stay in the scan mode in order to receive the continuous emergency signal on another emergency frequency after coming closer to the target.

The surveillance of up to five different frequencies (within the specified frequency bands) is possible:

- The main frequency is always a COSPAS-SARSAT frequency.
It is not possible to set other frequencies as the main frequency.
For the case that the exact COSPAS-SARSAT frequency of the emergency beacon is not known, there is a possibility to set “All CP-SS” in place of the main frequency, which will then trigger the COSPAS-SARSAT scan as the first step of this scan algorithm. After the first COSPAS-SARSAT impulse is detected, the exact COSPAS-SARSAT frequency will be identified automatically and used for the further bearing in this scan mode.
- Two next frequencies of this algorithm are always set by default and are not changeable:
 - 1) 121.500 MHz
 - 2) 243.000 MHz
- The two remaining scan frequencies are freely selectable.

Designation of the currently active scan mode

Main bearing frequency (currently active)

Scan frequencies
(here only one of the freely selectable
frequencies is set)

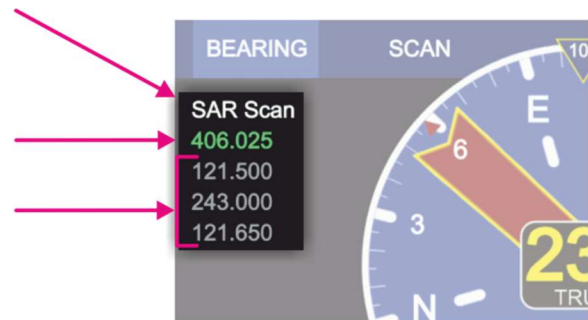


Figure 50. SAR scan. Indication of frequencies.

If the SAR scan function is activated, the DF system switches alternating from searching of the COSPAS-SARSAT pulse (main bearing frequency) to scanning of the other emergency frequencies using the breaks between the pulses (s. 7.2.5.1).

The currently monitored frequency is displayed highlighted in green, so you can see which frequency is active at a given moment (s. Figure 50).

If a signal is received during the scan procedure, the bearing value is indicated on the “Bearing” page.

- In order to interrupt the current reception, press the “ESC” button. The system will continue with the next scan frequency.

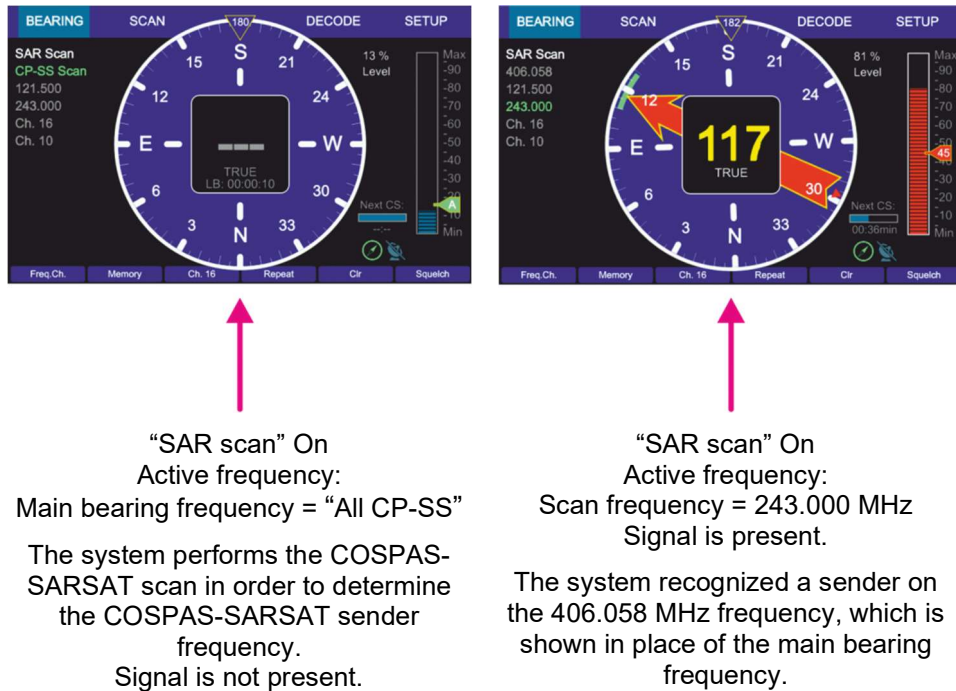


Figure 51. “SAR scan” mode. Example views of the “Bearing” page

- If at some point of scanning procedure the signal on the desired frequency is received, and monitoring of other frequencies is not desired anymore, press the “OK” button. The frequency, that receives a valid signal at the moment of pressing the “OK” button, will be adopted as the main frequency, and the system will change to a normal bearing mode.

7.2.5.1 Timing of the SAR Scan Operation

The SAR scan procedure has slightly different timing in the cases of the unknown COSPAS-SARSAT frequency and the already determined COSPAS-SARSAT frequency after the first reception of the valid pulse.

In the case that COSPAS-SARSAT frequency is not known and the setting “All CP-SS” is set instead of an exact frequency, the system performs the COSPAS-SARSAT scan (s. 7.2.1) first. The duration of this step is always 60 seconds, if the pulse is not detected. After elapsing of 60 seconds the system proceeds with the next frequencies.

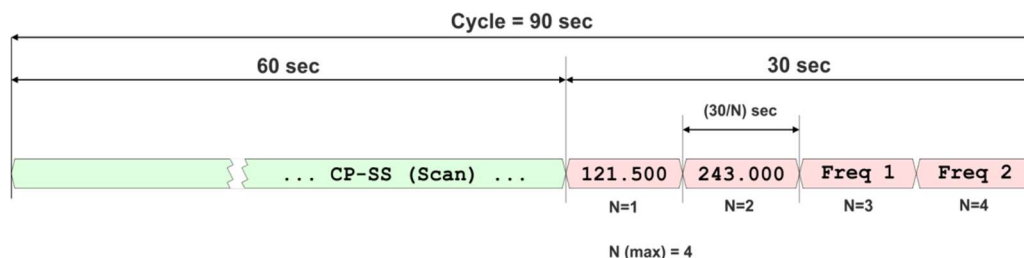


Figure 52. Example: Timing SAR scan, if no frequency is detected.

If during the 60 seconds-cycle a COSPAS-SARSAT pulse is detected, the scan procedure shows the bearing of the main frequency for approx. 3 seconds and then continues with the scan frequencies. So if the pulse is detected at the beginning of the 60 seconds cycle, this cycle shortens down to 3 seconds.

If the COSPAS-SARSAT pulse is not detected, after elapsing of 60 seconds, the total time for scanning of the scan frequencies is 30 seconds, which enables the faster run-through of them.

The scanning time for each scan frequency depends on the number of the selected frequencies ($30 \text{ sec} / N$, N = number of frequencies).

This total time changes to 45 seconds after the first reception of the COSPAS-SARSAT pulse, which enables the efficient scanning of the selected frequencies without missing the next COSPAS-SARSAT pulses.

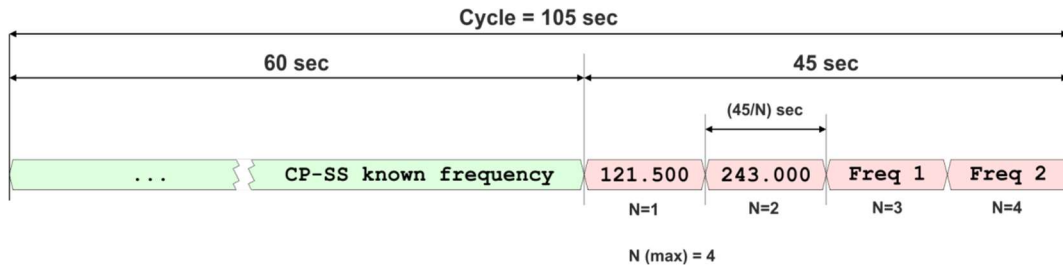


Figure 53. Example: Timing SAR scan, if only COSPAS-SARSAT frequency is detected.

If any of the selected emergency frequencies is detected, the scan algorithm will stay on this frequency (releasing the alarm, if this setting is activated under scan settings) until the 45-seconds-time elapses.

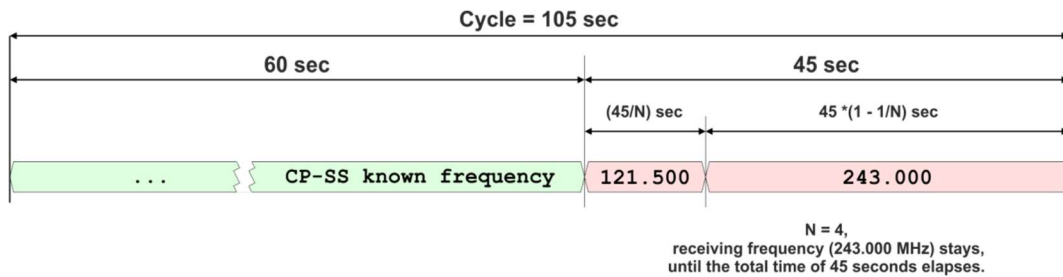


Figure 54. Example: Timing SAR scan, if no CP-SS pulse but a signal on an emergency frequency is detected.

The algorithm returns to the scanning of the main COSPAS-SARSAT frequency.

7.2.5.2 SAR Scan Settings

- To start the “SAR scan” mode select the corresponding line on the “Scan” page and press “OK” or the hotkey “Start Scan” (s. Figure 55, position 1).

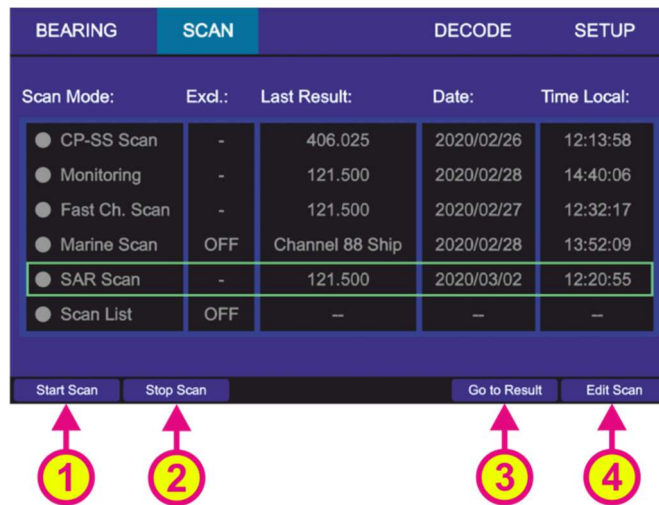


Figure 55. Selecting SAR scan

- Pressing the hotkey “Stop Scan” (s. Figure 55, position 2) will terminate the current scan mode and change to the bearing of the frequency, that was set before the scan mode has been activated.
- You can stop the scan mode by pressing the “HOME” while on the “Bearing” page with activated scan. After you confirm the dialog (s. Figure 56), this mode will be terminated.

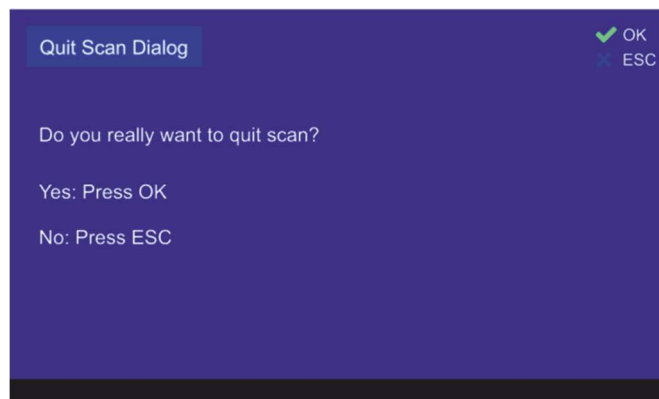


Figure 56. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 55, position 3) during the scan mode is currently running, will terminate the scan mode, adopt the frequency which was found in this scan last time and change to the “Bearing” page. Pressing the hotkey “Go to Result” if the scan mode is not activated, will lead to the “Bearing” page adopting the last result as the bearing frequency. This hotkey appears only, if there is a result for this scan.
- Pressing the hotkey “Edit Scan” (s. Figure 55, position 4) opens the dialog for changing the SAR scan settings (s. Figure 57).



Figure 57. SAR scan. Edit scan settings.

- The hotkey “Edit Freq.” (s. Figure 58, position A) is only visible if the COSPAS-SARSAT frequency (top frequency) or one of the free selectable frequencies is marked.

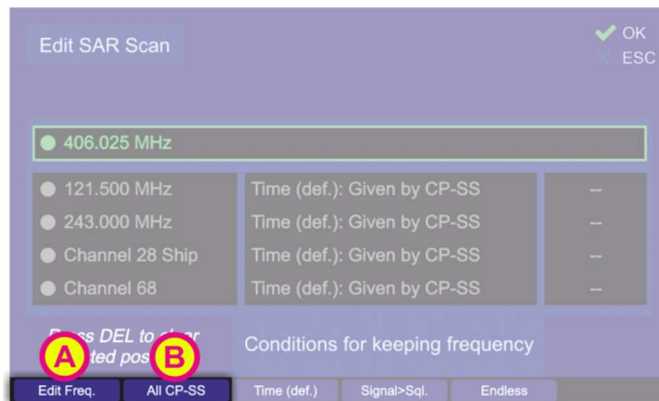


Figure 58. Alternating hotkeys

The hotkey “Edit Freq.” opens the input dialog that allows the modification of the currently marked frequency (s. Figure 38 and its description in 7.2.2.4). This hotkey only appears for the frequencies that are configurable (the last two displayed frequencies: Channel 28 Ship and Channel 68, s. Figure 57).

- The hotkey “All CP-SS” is only visible if the COSPAS-SARSAT frequency is marked (s. Figure 58, position B). By pressing this hotkey a COSPAS-SARSAT scan will be started in order to find an active COSPAS-SARSAT frequency during SAR scan algorithm.
- Pressing the hotkey „Time (def)“ (s. Figure 57, position 1) will set the hold time (duration of staying in the scanning on this particular frequency) to the value that is given by the CP-SS setting (30/N or 45/N), s. 7.2.5.1.
- The hotkey “Signal>Sql.” defines the behavior of the scan algorithm to “signal level > squelch level” (s. Figure 57, position 2).
If this hotkey is pressed, the scan algorithm will stay on the active frequency until the signal level value becomes higher than the squelch value.
- The hotkey “Endless” (s. Figure 57, position 3) defines the behavior of the scan algorithm when an active frequency has been found.
If this hotkey is pressed, the scan algorithm will stay on an active frequency as long as the user terminates the scan mode or skips the actual frequency.

- Pressing the hotkey “ID only” (s. Figure 57, position 4) activates or deactivates the feature “ID Only” (s. 7.2.2.3):
 3. **“ELT/PLB”:**
The alarm is only triggered if an ELT/PLB signature is set and the corresponding modulation has been detected. Otherwise the alarm will not be activated.
 4. **“ – “:**
An alarm is never triggered, regardless of whether the signal is modulated or not.

The hotkey “ID only” is only visible for the following frequencies:

- 121.5 MHz
- 243 MHz

7.2.6 Scan List

The function “Scan List” provides a comfortable scanning feature of different frequency bands in one scan procedure.

The scan algorithm in the full scan list mode compares “Search List” (accessible over “Edit Scan”) and “Exclude List” (s. 7.2.4.3) and out of this comparison it generates an internal list of frequencies which is scanned. All results (received signals) are saved in a “Result List”.

Note

To make any changes in the “Scan List” or “Exclude List” please always stop the running scan procedure first.

Note

The “Start” and the “Stop” frequencies of one scan section to be entered (either in the search- or in the scan-list) have to be inside one frequency band (s. Table 1 in chapter 4).

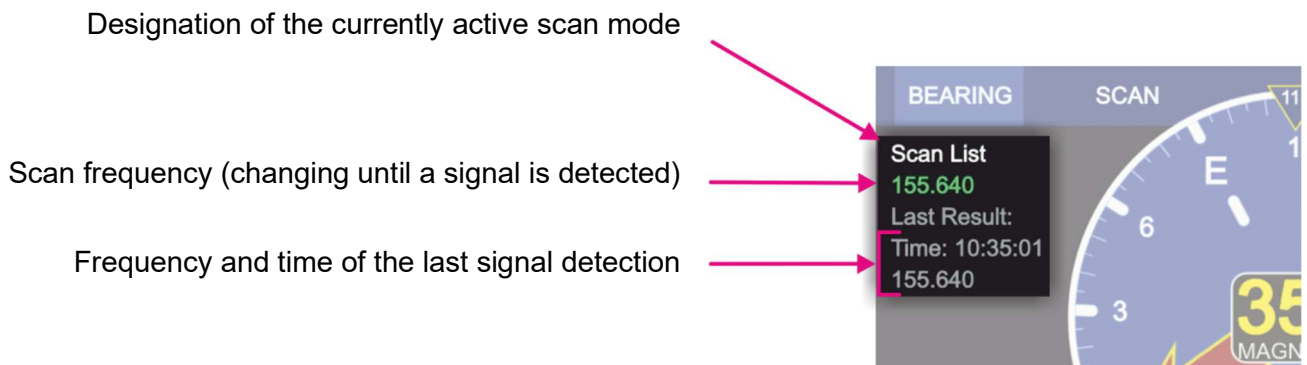


Figure 59. Scan List. Indication of frequencies.

Note

When restarting the “Scan List” mode, there is a possibility to scan the full-range-procedure that is given by comparison of search and exclude lists, or to scan only the result list.

The scan algorithm in the “Result List” mode starts the scan procedure, which runs only around the searched frequencies (last results). If the gap between the two frequencies is too large, the scan procedure will slightly slow down.

The actual scan operation works the same way as the scanning operation of “Marine Scan” (s. 7.2.4.1).

- To start the “Scan List” mode select the corresponding line on the “Scan” page and press “OK” or the hotkey “Start Scan” (s. Figure 60, position 1).

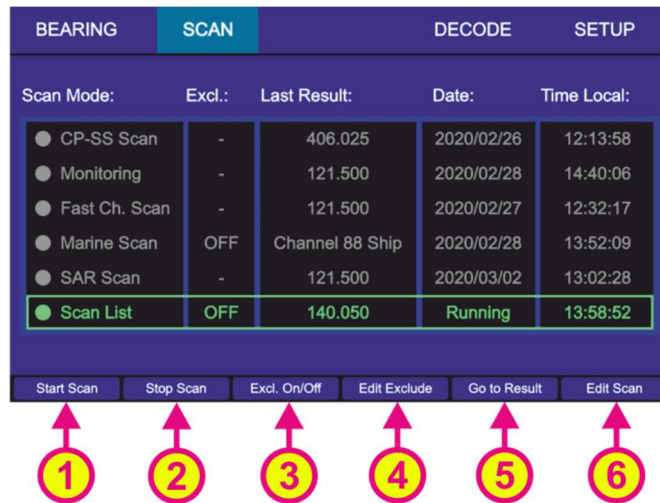


Figure 60. "Scan List" is activated.

- Pressing the hotkey “Stop Scan” (s. Figure 60, position 2) will terminate the scan mode and change to the bearing of the frequency, that was set before the scan mode has been activated.
- The scanning process can be ceased also by pressing the button “HOME” while on “Bearing” page. Then the direction finder changes to the bearing of the frequency, which was set before the scan mode was started.
- The hotkey “Excl. On/Off” is only visible if “Marine scan” or “Scan List” is marked (s. Figure 60, position 3).
By pressing this hotkey the currently marked scan mode will proceed the “Exclude List” during the scan.
If this setting was already activated for the currently marked scan mode, pressing this button will deselect this option and the “Exclude List” will be ignored during the scan procedure.
- “Edit Exclude” is only visible, if “Marine scan” or “Scan List” is marked (s. Figure 60, position 4).
By pressing this hotkey, the dialog for editing the “Exclude List” will be opened (s. 7.2.4.3).
- Pressing the hotkey “Go to Result” (s. Figure 60, position 5) during the scan list mode is currently running, will interrupt the scan mode, and open the “Result List”, where you can select the next action (s. Figure 61). This hotkey appears only if there is a result for this scan.

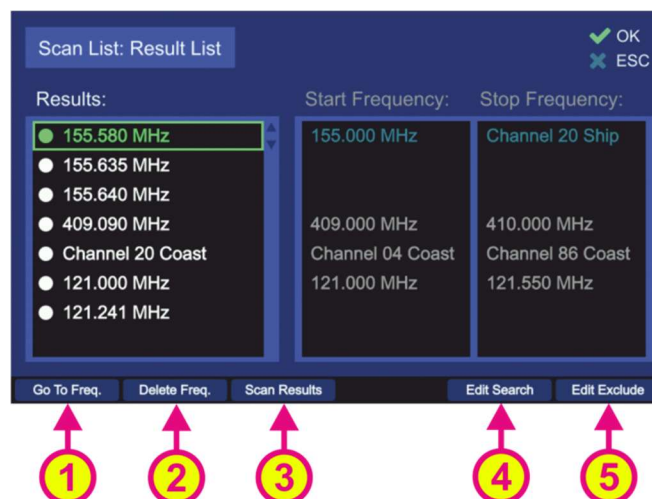


Figure 61. Result List Settings

- Pressing the hotkey “Go to Freq.” (s. Figure 61, position 1) adopts the currently marked frequency as main bearing frequency and switches to the normal bearing mode on the “Bearing” page.
 - Pressing the hotkey “Delete Freq.” (s. Figure 61, position 2) deletes the currently marked frequency from “Result List”. The deleted frequency will not be skipped anymore, when the results are scanned after pressing “Scan Results”.
 - Pressing “Scan Results” (s. Figure 61, position 3) starts the scan list mode, which runs only around the frequencies which had a result during the last scan (frequency span around 100 kHz).
 - Pressing “Edit Search” (s. Figure 61, position 4) will open the “Search List” dialog (s. “Edit Scan” below).
 - Pressing “Edit Exclude” (s. Figure 61, position 5) will open the “Exclude List” dialog (s. 7.2.4.3).
- Pressing the hotkey “Edit Scan” (s. Figure 60, position 6) will open the dialog for changing the settings of the “Search List” (s. Figure 62).



Figure 62. "Search List" settings

- Pressing the hotkey “New Freq.” (s. Figure 62, position 1) generates a new line in the “Search List” and opens the dialog for frequency/channel input (s. Figure 38 and its description in 7.2.2.4). When entering a new start frequency, the stop frequency is automatically set to the same value as the start frequency.
- Pressing the hotkey “Delete Freq.” (s. Figure 62, position 2) deletes the currently marked line from the “Search List”. After an entry has been deleted and the dialog left by pressing “OK”, the deleted frequency range will not be scanned anymore, when you restart the scan.
- Pressing the hotkey “Edit Start F.” (s. Figure 62, position 3) opens the “Frequency Input Dialog” (s. 7.1.2.2), which allows modifying the “Start” frequency of the currently marked frequency range.
- Pressing the hotkey “Edit Stop F.” (s. Figure 62, position 4) opens the “Frequency Input Dialog” (s. 7.1.2.2) which allows modifying the Stop Frequency of the currently marked frequency range.

Note

Start- and stop-frequencies must be in the same frequency band (s. Table 1 in chapter 4), as the AU cannot switch from one band to another while running the scan algorithms.

Note

When choosing a COSPAS-SARSAT frequency as “Start” frequency, the AU will perform a COSPAS-SARSAT scan and scan all CP-SS frequencies. A “Stop” frequency cannot be set for this option, as always all CP-SS frequencies are scanned.

Note

The squelch adjustment is only possible for a maximum of 8 frequency bands in the search list.

If there are more than 8 frequency bands in the search list, the squelch adjustment for the remaining bands, will be 30% (default value).

In order to avoid the bearing of the noise, it is recommended to stay in the number of eight bands. If a set-up of more bands is needed, you can set wider bands and split them into narrow bands using the “Exclude List”.

- Pressing the hotkey “Edit Cond.” (s. Figure 62, position 5) opens the “Scan List Conditions” dialog.

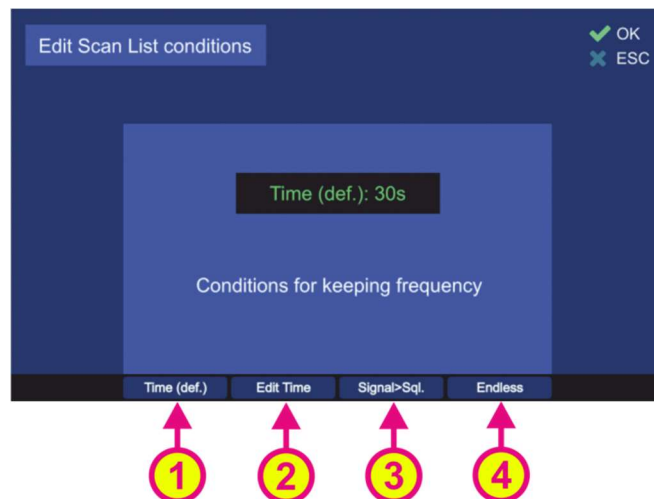


Figure 63. "Scan List Conditions" dialog

- “Time (def.)” hotkey (s. Figure 63, position 1) defines the behavior of the “Scan List” algorithm if the active frequency (signal level > squelch level) has been found. If this hotkey is pressed, the default time of 30 seconds will be adopted after confirming this setting with “OK”. The scan algorithm will stay for the default time of 30 sec on an active frequency before continuing with scanning of the next frequencies.
- Pressing the hotkey “Edit Time” (s. Figure 63, position 2) will open a dialog for editing the time of staying on the actively received frequency before continuing with the scan procedure.
- Pressing the hotkey “Signal>Sql.” hotkey (s. Figure 63, position 3) defines the time of staying on the actively received frequency before continuing with the scan procedure. If this setting is confirmed, the scanning procedure will stay on the actively received frequency as long as the signal level is higher than the squelch level.
- If the hotkey “Endless” (s. Figure 63, position 4) was pressed and confirmed with “OK”, the scan algorithm will stay on the actively received frequency as long as the user terminates the scan or skips the current frequency.

7.3 Decode Page

The “Decode” page manages the decoded COSPAS-SARSAT data. It does not only display the decoded COSPAS-SARSAT information but also stores the messages over time and calculates the true bearing and distance to the emergency beacon if the GPS data is available in the message. Furthermore, the calculated true bearing can be exported to the “Bearing” page which is displayed as a “GPS-Arrow” in gray.

Press on “DECODE” in order to open the decode page.

When switching to “Decode” page, the active COSPAS-SARSAT frequency is determined by the following conditions:

- By switching from “Bearing” page, the COSPAS-SARSAT frequency, which was active in the “Bearing” page, will be adopted.
- If no COSPAS-SARSAT frequency was active on the “Bearing” page, the last active frequency on the “Decode” page will be used.
- If on the “Decode” page no frequency was set or used, the frequency group “406.022...028” is selected per default (s. 7.1.2.2, Selecting COSPAS-SARSAT Frequency Groups).

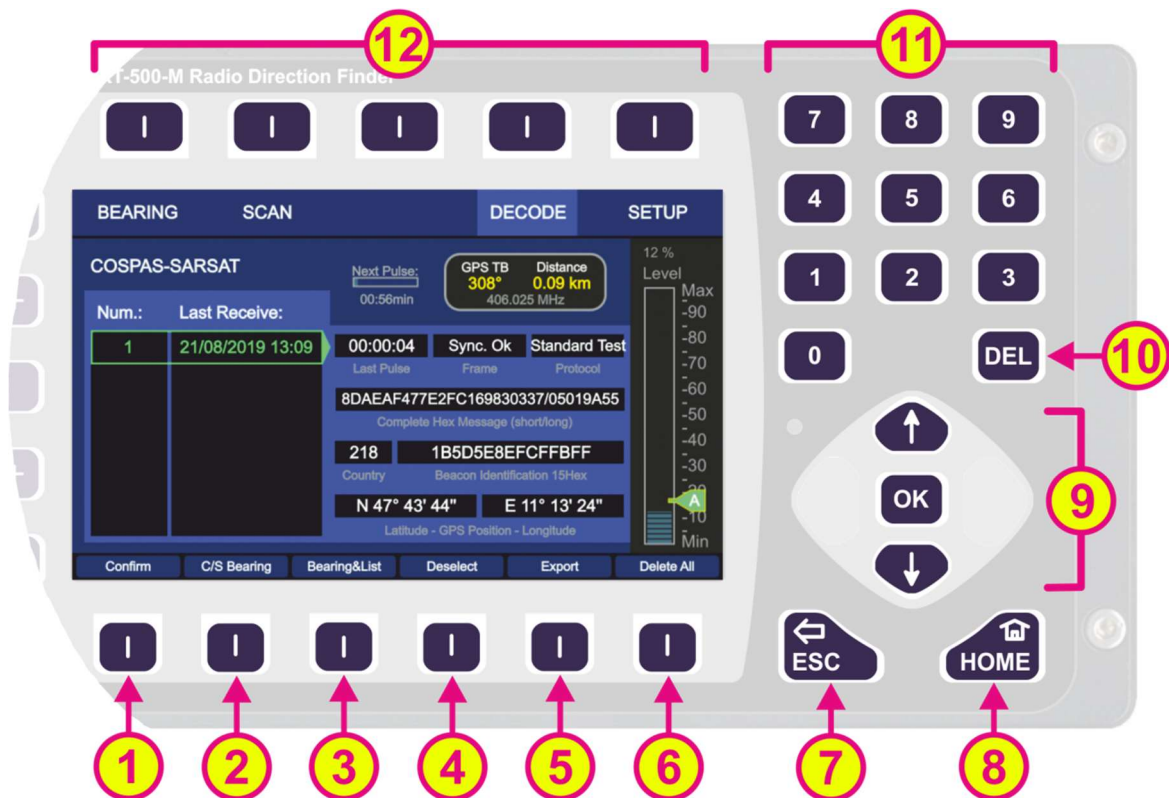


Figure 64. Decode Page. General view.





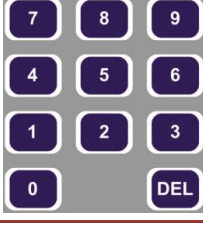
Indication on Decode Page		
Pos.	Element	Meaning / Description
①	„406.025“ / „Confirm“	Pressing this hotkey will open the “Frequency Input Dialog” with the COSPAS-SARSAT frequency groups (7.1.2.2). The hotkey label corresponds to the current operating frequency.
②	“C/S Bearing“	Pressing this hotkey will activate the view for “COSPAS-SARSAT Bearing”.
③	“Bearing&List“	Pressing this hotkey will activate the view for “Bearing&List”.
④	“Deselect“	Pressing this hotkey deselects the currently marked line. Deselected lines are indicated by gray text.
⑤	“Export“	Pressing this hotkey will export the selected messages to the “Bearing” page. On the “Bearing” page the GPS coordinates of these messages will be shown with “GPS arrows”.
⑥	“Delete All“	Pressing this hotkey will open a dialog for deleting all stored CP-SS messages.
⑦		If the dialog is opened, pressing this button will close the dialog without saving new values. If no dialog is opened, pressing this button will lead you back to the last activated page. The Bearing Page is the end point.
⑧		Pressing this button always leads to the “Bearing” page. Even an opened dialog will be closed. If a sub-dialog is opened, pressing this button will close it and lead to the “Bearing” page, without saving the changed values.
⑨		“Up” and “Down” arrows are used to select between the different lines from the list of received messages (move the green frame). Using “Left” and “Right” on the selected line, switches between decoded COSPAS-SARSAT messages with the same beacon ID but different time stamp. Pressing the “OK” button will select the currently marked line from the list of received messages.
⑩		Pressing the “DEL” button will open a dialog for deleting the currently shown COSPAS-SARSAT message of the currently marked line from the list of received messages.
⑪		Numeric keys are used to enter the numerical characters inside the dialogs. No function on the top level of the “Decode” page.
⑫	Top line	Navigation line of the screen, which allows switching between pages (BEARING, SCAN, DECODE, SETUP).

Table 10. Decode page, list of elements.

7.3.1 Selecting a COSPAS-SARSAT frequency

In order to receive a COSPAS-SARSAT data pulse and to decode its content, the main frequency has to be adjusted to a COSPAS-SARSAT frequency. This can be done on the “Bearing” page or directly on the “Decode” page using the hotkey „406.025“ (s. Figure 64, position 1).

7.3.2 COSPAS-SARSAT List View

Press the hotkey “C/S List” in order to get to the COSPAS-SARSAT list view. This view shows the list with the received COSPAS-SARSAT pulses.

When an emergency beacon is activated, it transmits a COSPAS-SARSAT pulse every 50 sec (± 5 sec). As soon as a valid pulse is received, the hotkey “406.025” changes its label to “Confirm” and blinks in yellow (s. Figure 65). Additionally, an acoustic warning tone is emitted. Press “Confirm” in order to accept the message and to clear the alarm.

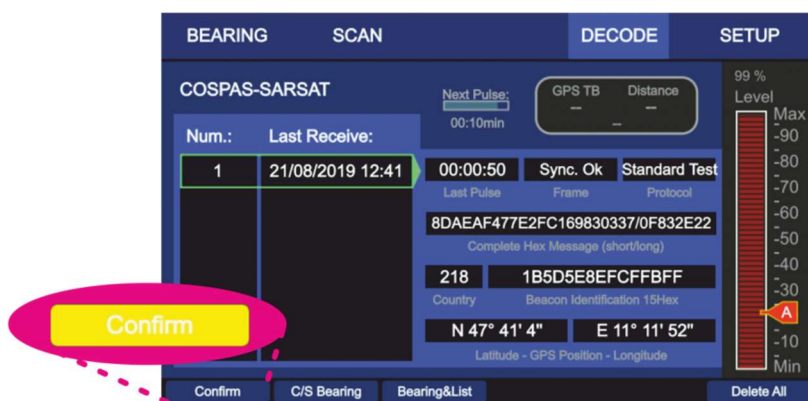


Figure 65. Confirming a new COSPAS-SARSAT message.

For each new received ID (different beacon) a new line is generated so that messages are sorted according to the beacon ID. Each line number (column “Num.:”) is related to a certain COSPAS-SARSAT beacon ID. The time entry in the line shows the receiving time of the message (s. Figure 66, “A”). The corresponding COSPAS-SARSAT message content of the selected beacon ID is displayed in the area “B” on the right side of the screen.

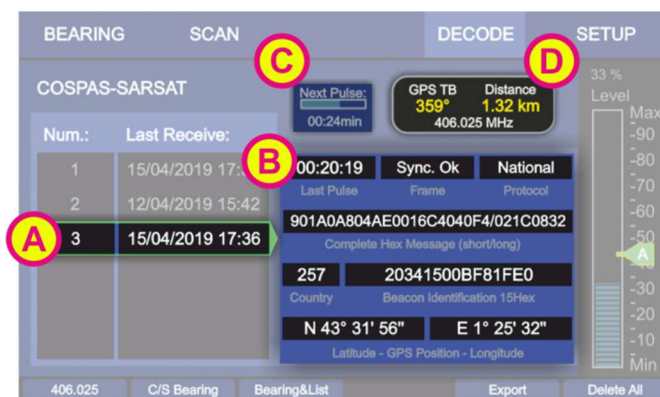


Figure 66. Decode Page. COSPAS-SARSAT List View.

Pressing the “Left” and “Right” arrow buttons of the keypad switches between the older and newer messages of the same emergency beacon.

Press “DEL” button of the keypad to delete a selected message.

Press hotkey “Delete All” to delete all COSPAS-SARSAT messages.

A detailed explanation of all hotkeys can be found in the next chapters.

Area C indicates the time when the next COSPAS-SARSAT pulse is expected. If after one minute no COSPAS-SARSAT pulse is received, the bar-graph-indicator is fully filled and shows the text "--:--".

The indicator in the area D (s. Figure 66, "D") shows the following values:

- Direction from the current GPS position to the position of the marked COSPAS-SARSAT message ("GPS TB" = GPS True Bearing).
- Distance from the current GPS position to the position of the actually marked COSPAS-SARSAT message (the indication "km" or "NM" is adjustable in the "Setup", s. 7.4.2.5).
- Frequency:
 - By viewing an old message frequency may be other than the current frequency. In this case the frequency is displayed in gray.
 - The current frequency is displayed in white. The current frequency is also displayed in the label of the hotkey for adjusting frequency.

Note

GPS TB data can be shown only if compass and GPS are available.

The distance can be shown without connection of vessels compass if GPS is connected to DCU.

7.3.3 COSPAS-SARSAT Bearing View

This COSPAS-SARSAT bearing view allows the graphical indication of the decoded COSPAS-SARSAT information of the selected beacon ID.

Press the hotkey "C/S Bearing" (s. Figure 64, position 2) to open the "COSPAS-SARSAT Bearing" view.

Note

Please note that the label of the hotkey will turn to "C/S List" in order to get to the list page again (s. 7.3.2).

The "C/S Bearing" page displays the following information, which corresponds to the selected beacon ID:

- The numerical bearing indication (True Bearing)
- The indication of the calculated bearing as the gray arrow ("GPS Arrow")
- The calculated distance to the target
- The COSPAS-SARSAT frequency
- The heading of the ship indicated by the compass rose and the top triangle (here: 61°)
- Corresponding number and beacon ID and
- the time of the last received pulse

Pressing the "Left" and "Right" arrow buttons of the keypad switches between the older and newer messages of the same emergency beacon.



Figure 67. Decode Page: Bearing View.

- Change the active COSPAS-SARSAT frequency by using the hotkey “406.025” (s. Figure 67, position 1).
- Pressing the hotkey “C/S List” (s. Figure 67, position 2) will open to the “COSPAS-SARSAT List” view (s. 7.3.2).
- Pressing the hotkey “Bearing&List” (s. Figure 67, position 3) will change to the “COSPAS-SARSAT Bearing and List” view (s. 7.3.4).
- Like in the “COSPAS-SARSAT List” view, it is possible to delete all stored COSPAS-SARSAT messages by pressing the hotkey “Delete All” (s. Figure 67, position 5). This action must be confirmed.

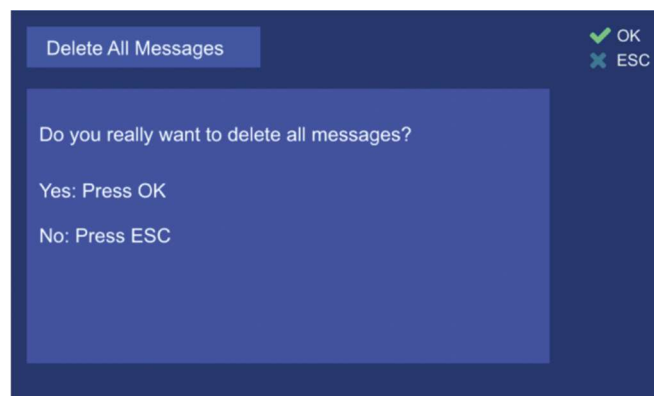


Figure 68. Dialog for confirming of deleting all CP-SS messages.

- Hotkey “Export” exports the GPS coordinates of the currently displayed COSPAS-SARSAT message to the “Bearing” page. (s. Figure 67, position 4). See also chapter 7.3.5 “Export to Bearing Page”

7.3.4 COSPAS-SARSAT Bearing and List

This view combines the “COSPAS-SARSAT Bearing” and “COSPAS-SARSAT List” views for the last arrived COSPAS-SARSAT messages (s. Figure 69).



Figure 69. "Decode" page. "Bearing and List" view.

- Use the hotkey "406.025" for changing the frequency (s. Figure 69, position 1).
- Pressing the hotkey "C/S Bearing" (s. Figure 69, position 2) will change to the "COSPAS-SARSAT Bearing" view (s. 7.3.3).
- Pressing the hotkey "C/S List" (s. Figure 69, position 3) will change to the "COSPAS-SARSAT List" view (s. 7.3.2).
- Hotkey "Export" exports the GPS coordinates of the currently displayed COSPAS-SARSAT message to the "Bearing" page (s. Figure 69, position 4). See also chapter 7.3.5 "Export to Bearing Page".
- Like in the "COSPAS-SARSAT List" view, it is possible to delete all stored COSPAS-SARSAT messages by pressing the hotkey "Delete All" (s. Figure 69, position 5).

7.3.5 Export to Bearing Page

The calculated bearing of an emergency beacon, which is based on the decoded GPS position, can be exported to the "Bearing" page by pressing the hotkey "Export" (s. Figure 67 or Figure 69, position 4). In this case, the RT-500-M is operating on the selected COSPAS-SARSAT frequency in the normal bearing mode.

The GPS based information like:

- numerical indication of the GPS true bearing,
- indication of the GPS true bearing as the "GPS Arrow" in gray,
- the calculated distance to the emergency beacon

is displayed at the same time.

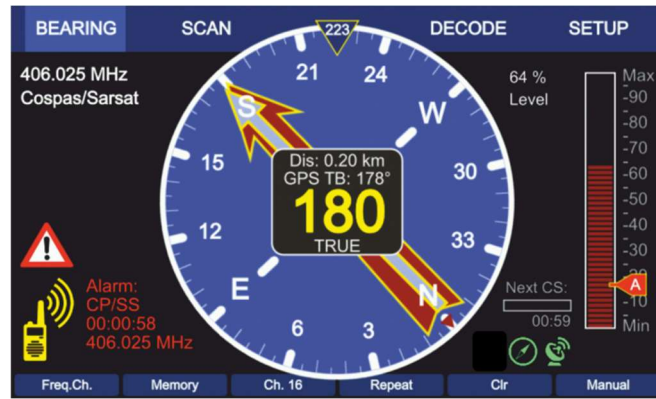


Figure 70. Indication of the GPS based bearing on the Bearing page

In order to remove the indication of the “GPS Arrow” from the “Bearing” page, keep the “Clr” hotkey pressed for a few seconds until the arrow disappears (the indication of GPS true bearing as well as the calculated distance will disappear together with the arrow).

7.4 Setup Page

After the AU and power supply were connected to the DCU and the system was switched on, it is ready to work with the default settings.

All system settings, configurations etc. are made in the "Setup" page.

The screen top line of the "Setup" page contains navigation keys that include system setup menus sorted by the common concept. The settings of these menus will be explained further in this chapter. The bearing runs in the background while changing settings on the "Setup" page. That means e. g. when bearing on 121.5 MHz and switching from "Bearing" page to the "Setup" page, an ELT signal will be detected and the alarm will be provided.

Note

Incorrect settings may lead to considerable malfunctions of the DF system RT-500-M. Therefore, sensitive parameters concerning the bearing operation are password-protected against not authorized alterations. Any changes of settings, which require password approval, are to be made only by instructed personnel.

7.4.1 General

After selecting the "Setup" over the corresponding hotkey (Figure 8, pos. 16) on the "Bearing" page, the following menu page opens (s. Figure 71).

The menu "General" contains uncritical settings which can be changed any time without influence on the important system parameters, therefore it is not password protected and can be used by the operator.

Furthermore, the menu provides general information like serial numbers and software versions of DCU and AU.

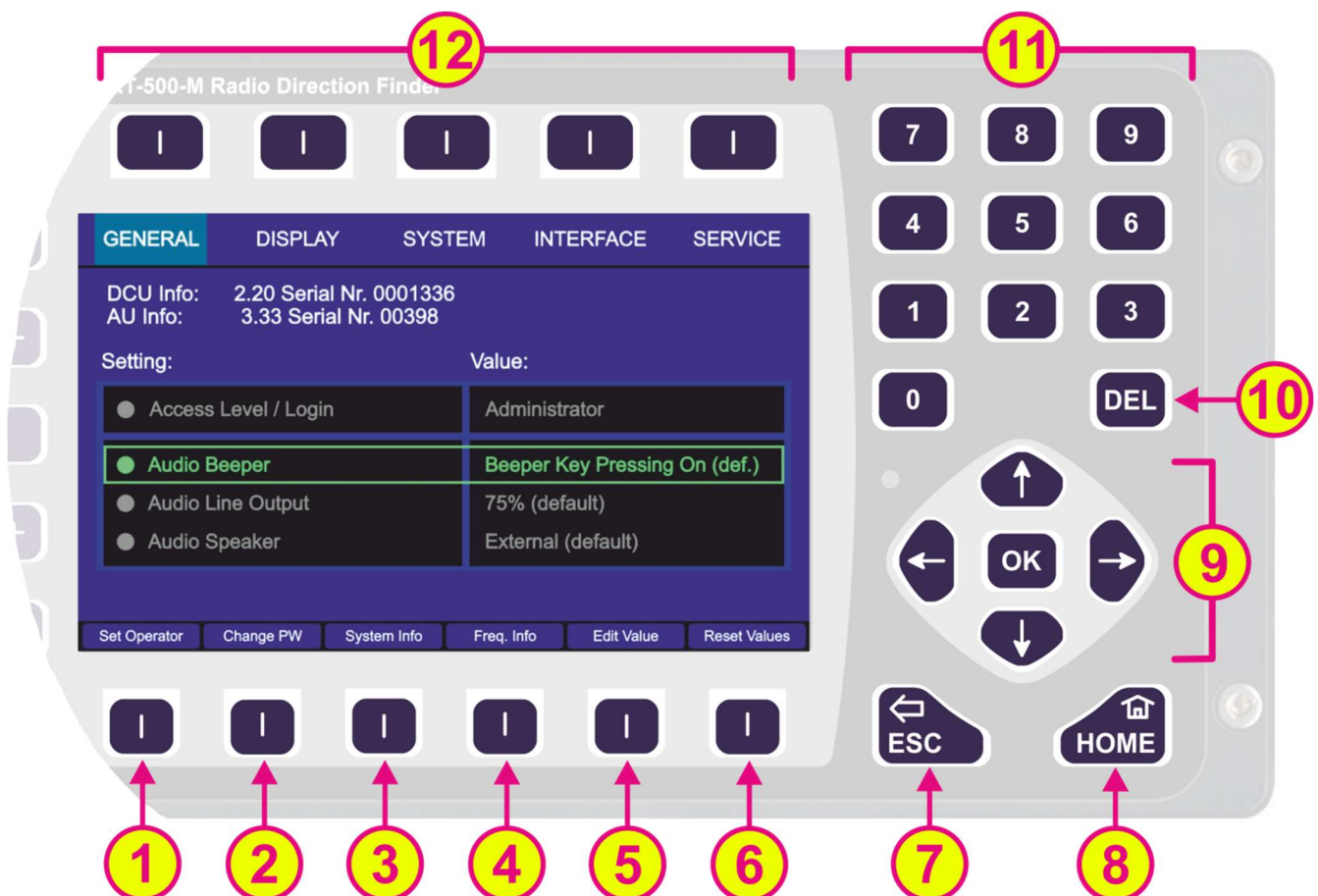


Figure 71. Setup page. General settings (administrator view)



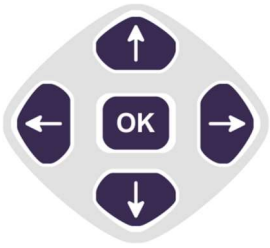


Indication on Setup Page, General Settings		
Pos.	Element	Meaning / Description
①	„Set Operator“ / „Set Admin“	Switches between two states: <ul style="list-style-type: none"> - Access level: operator - Access level: administrator
②	“Change PW”	Pressing this hotkey will lead to the dialog for changing the password for the “Administrator” access level, where a password has to be entered (the old password has to be entered first, whereupon the new password can be defined).
③	“System Info”	Opens a dialog which shows the information about the revisions status of the used system components (s. 7.4.1.9).
④	“Freq. Info”	Opens a dialog which shows the currently available frequencies (also not available or locked frequencies are shown) (s. 7.4.1.8).
⑤	“Edit Value”	Depending on the currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below).
⑥	“Reset Values”	Resets all values to the default settings (s. 13.4). The default values themselves cannot be changed by the user (RHOTHETA specification).
⑦		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.
⑧		Pressing this button always leads to the Bearing Page. Even an opened dialog will be closed, without adopting the changed values.
⑨		“Up” and “Down” arrows are used to select between the general settings (move the green frame). Inside the dialogs (e.g. password or value editing) they are used to navigate between the characters of the virtual keypad. “Right and “left” arrows have a function inside the dialogs, but not on the top level of the “Setup” page. With the “OK” button the confirming of values or opening the general settings dialogs is accomplished.
⑩		Inside the general settings dialogs the “DEL” button is used to clear the whole input at once. On the top level of the “Setup” page, this button has no function.
⑪		Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the “Setup” page they have no function.
⑫	Top line	Navigation line of the screen, which allows switching between setup menus (“General”, “Display”, “System”, “Interface” and “Service”).

Table 11. Setup page, general settings. List of elements.

7.4.1.1 Access Level / Login

Depending on the access level of the user, the scope of accessible and visible settings on the “Setup” page is different.

Operator:

The “Setup” page will only allow making settings in the menu “General”. This ensures that no essential system settings can be influenced or corrupted by mistake.

The access level “Operator” does not require any password as the operator has the minimum set of options for possible setup of the system.

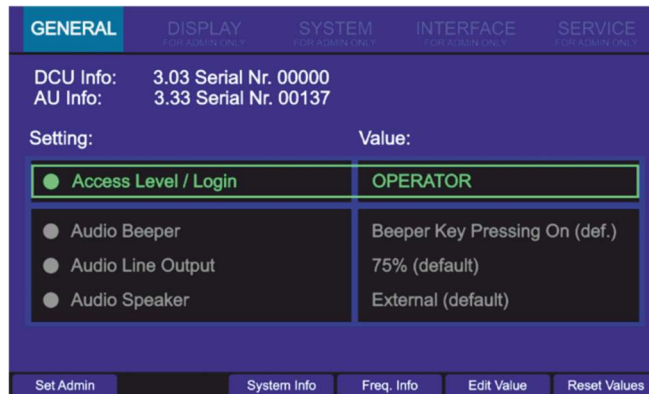


Figure 72. Setup page, General settings appearance for the access level “Operator”

Administrator:

The administrator has the maximum access to the possible settings (except a set of settings, which are predefined for RHOTHETA specialists for maintenance and support purposes).

After powering on of the system for the first time, the device will be started with the default access level “Administrator”. It is also possible to set the access level to “Administrator” (e.g. after the hotkey “Set Operator” was pressed) using the default password:

admin

All essential settings of the system, that have a direct influence on the bearing have to be done by authorized personnel.

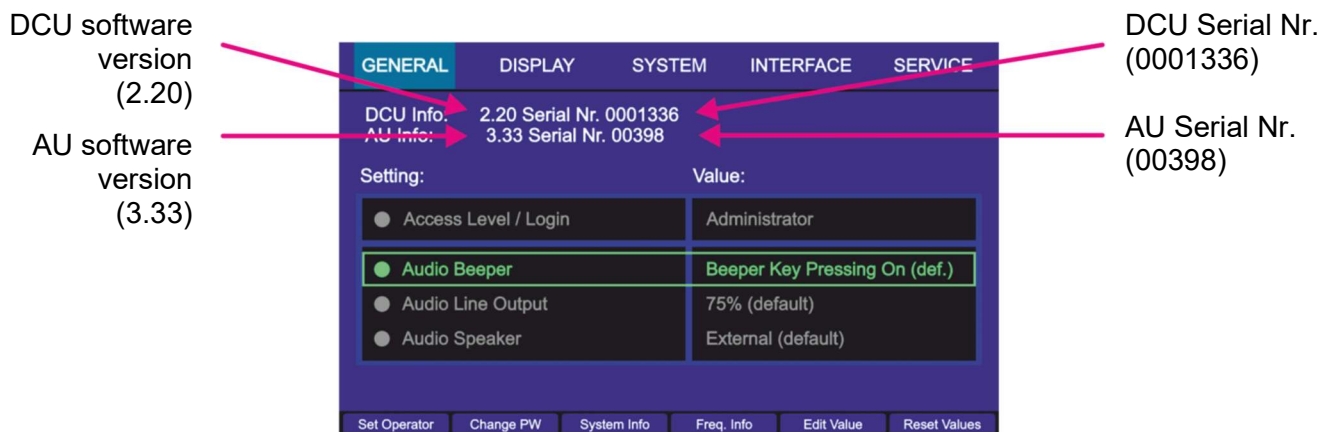


Figure 73. Setup page, General settings appearance for the access level “Operator”

Note

After the setting up of the system, it is recommended to change the password from default to a new value and set the access level to “Operator” (s. 7.4.1.7). The access level is then stored permanently on the device and remains after the restart of the device.

7.4.1.2 Audio Beeper

Pressing any key of the DCU keypad produces a short beep.

This behavior is defined as the default setting for “Audio Beeper” after the first booting of the DCU. The acoustic reaction on the key pressing can be changed anytime in the setup menu “General”. Setting for the beeper can be changed by pressing “OK” or the hotkey “Edit Value”, while the line “Audio Beeper” is marked. Both actions call up the same dialog (s. 7.4.1.7, Edit value for setting “Audio Beeper”).

Pressing the hotkey “Beep On/Off” will directly switch between the “On” and “Off” settings.

7.4.1.3 Audio Line Output

Audio line output signal can be found at the POWER + IO connector. It can be used for connection to the audio system of the vessel.

The level of the line out signal is adjustable from 0% to 100% (s. 7.4.1.7, Edit value for setting “Audio Line Output”). Audio line exit has a determined output level and is independent of the volume adjustment.

7.4.1.4 Audio Speaker

The RT-500-M DCU has an internal speaker that can be used to monitor the audible signals or acoustic alarms. Alternatively, the external speaker can be used e.g. for release an alarm on the ship.

7.4.1.5 Set Operator / Set Admin Dialog

If the “Administrator” access mode is currently active and the hotkey “Set Operator” is pressed, it will instantly set the access level to “Operator” without asking for permission or password. The appearance of the “Setup” page will change immediately and the hotkey designation will change to “Set Administrator”

If the “Operator” access mode is active, pressing the hotkey “Set Admin” will open the “Input Password” dialog, where either the default or the own (previously changed from the default) password should be entered into the “Input Password for Administrator” field.

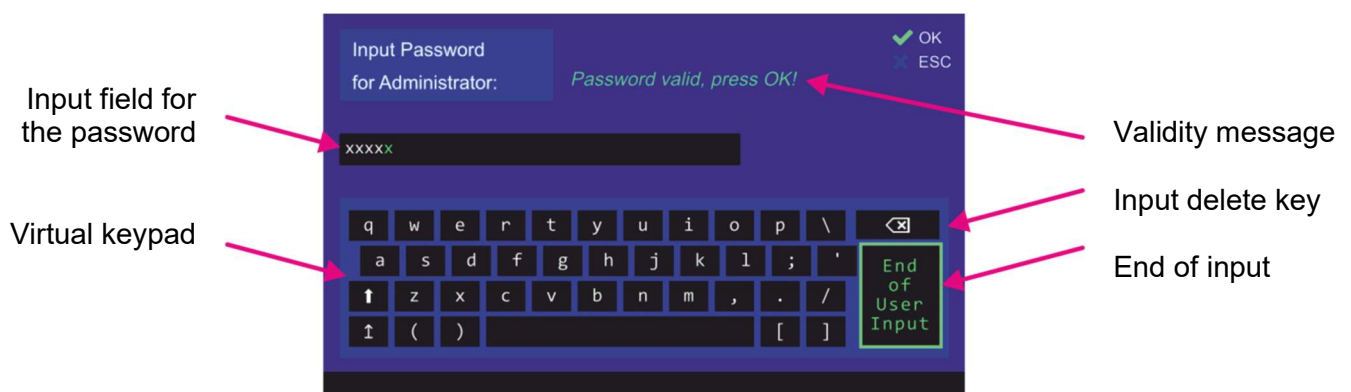


Figure 74. Accessing the administrator level

After the input of the password is complete it should be confirmed using the “End of User Input” button.

The validity message: “Password valid, press OK!” or “No valid password!” will appear.

If the password is not valid, delete the input (s. Figure 74, “Input delete key”) and proceed with the next try.

If the password is valid, by confirming with “OK” the administrator access level will be achieved.

7.4.1.6 Change Password Dialog

Pressing the hotkey “Change PW” (s. Figure 75) will open the dialog for changing the current (or default) administrator access level password. This hotkey is only visible in the administrator access mode.

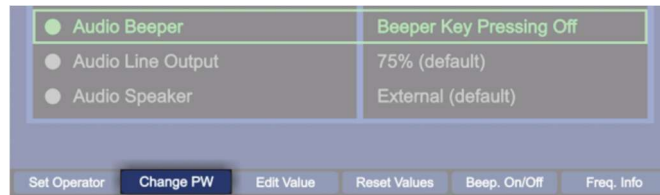


Figure 75. Changing password

Continue with the next instructions in order to change the password.

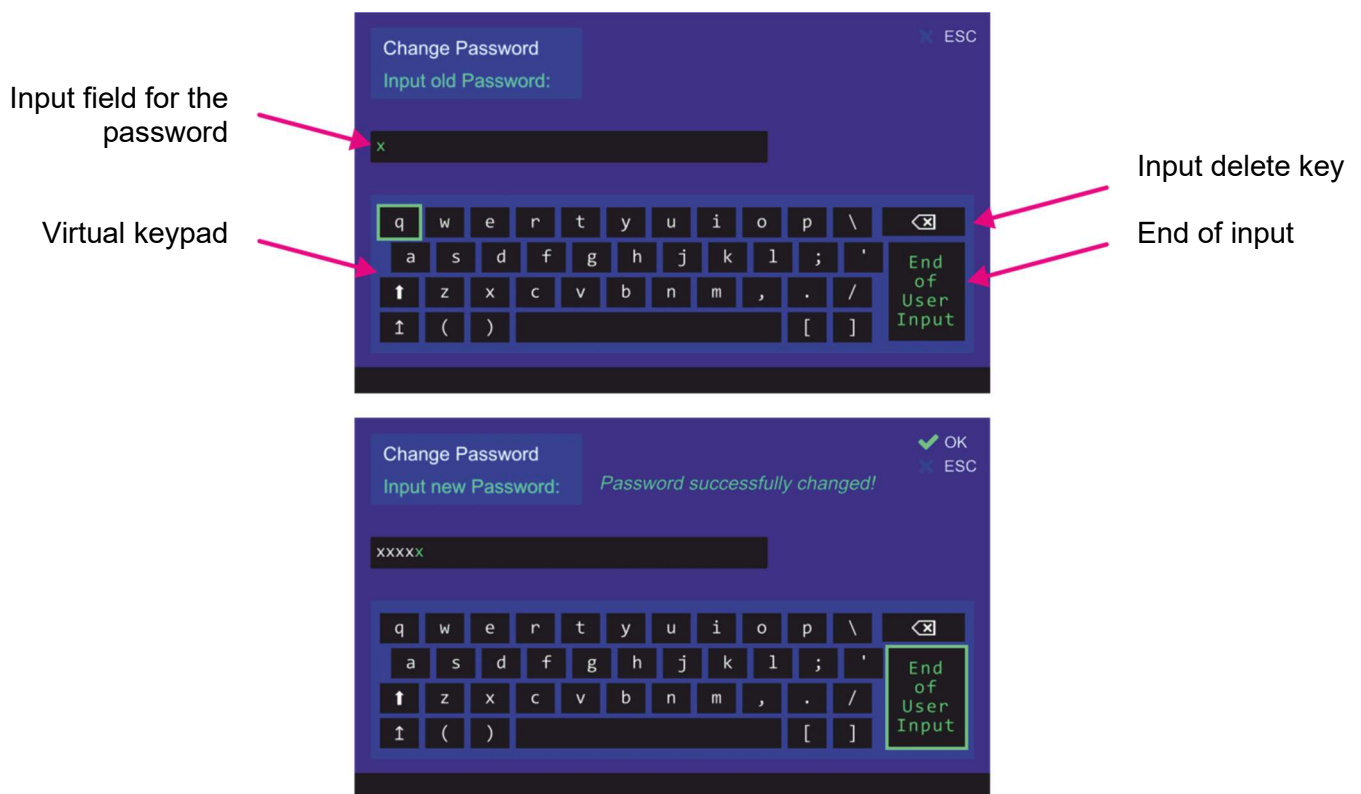


Figure 76. Changing the administrator password

First, the old password will be requested (“Input old Password”).

If the input is correct, the new password will be requested in the next step (“Input new Password”).

The password change dialog can be canceled by pressing "ESC" at any step, except after confirming the new password value.

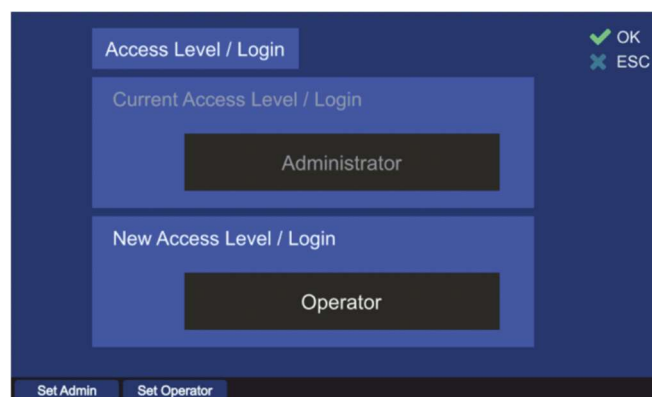
If all the inputs are correct and confirmed, the message “Password successfully changed!” will appear (s. Figure 76) and the dialog can be left by pressing the “OK” button.

7.4.1.7 Edit Value Dialog

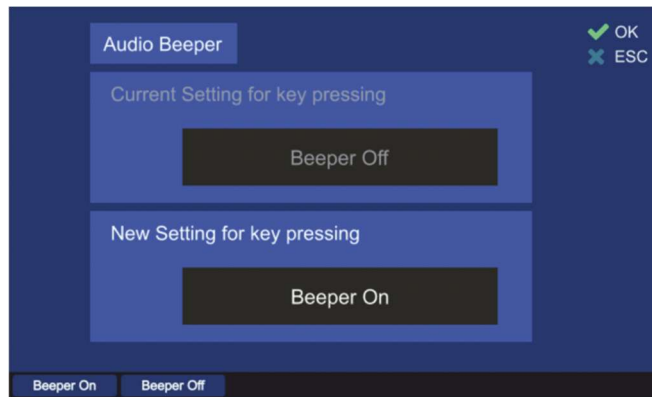
Depending on the currently marked line, pressing the hotkey “Edit Value” will lead to the corresponding dialog.

Edit value for setting “Access Level /Login”**Figure 77. Edit value dialog for access level**

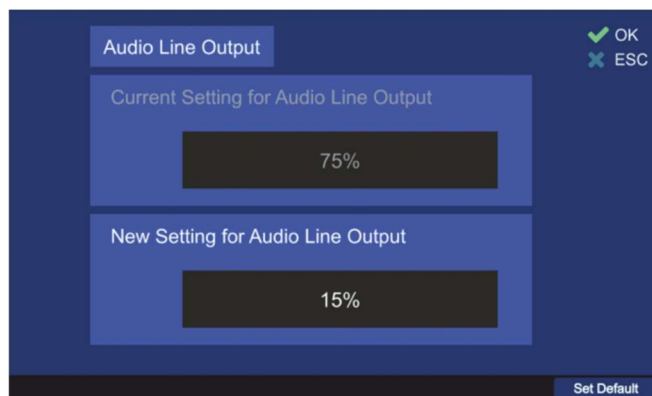
1. Pressing the hotkey “Set Admin” will lead to the “Set Admin” dialog, where the password input is required (s. 7.4.1.5).
Pressing the hotkey “Set Operator” will change the “New Access Level /Login” field to access level “Operator” (s. Figure 78):

**Figure 78. Editing the access level to "Operator"**

2. By pressing “OK” the new access level will be accepted and pursued.
Pressing “ESC” closes the dialog and administrator access level will be retained.

Edit value for setting “Audio Beeper”**Figure 79. Editing the value for the audio beeper**

1. Pressing the hotkey “Beeper On” or “Beeper Off” will write the corresponding message into the “New Setting for key pressing”.
2. By confirming with “OK” the setting will be accepted and the dialog will be closed.
For discarding the changes press “ESC” at any step and escape the dialog without saving the new value.

Edit value for setting “Audio Line Output”**Figure 80. Edit value of the audio line output level**

1. In the edit value dialog, the level of the audio line output in percent can be changed using the numeric keys of the DCU keypad.
2. Pressing the “Set Default” hotkey will set the line output to the default value of 75%.
3. Press “OK” to confirm the input and leave the dialog.
For discarding the settings, press “ESC” at any step and escape the dialog without saving the new value.

Edit value for setting “Audio Speaker”

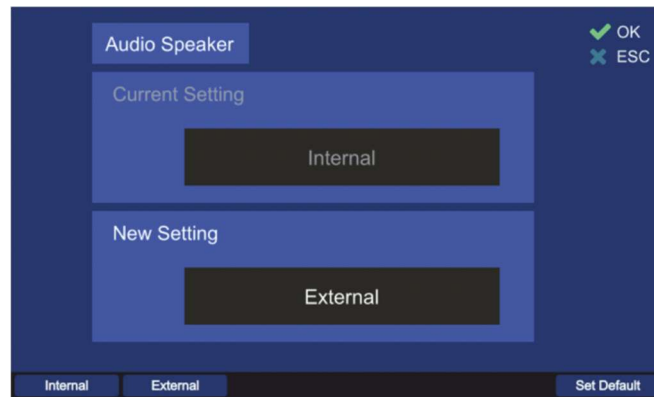


Figure 81. Edit value for the speaker

1. Pressing the hotkey “Internal” or “External” will write the corresponding message into the “New Setting” field.
2. By confirming with “OK” the setting will be accepted and the dialog will be closed.
For discarding the settings, press “ESC” at any step and escape the dialog without saving the new value.

7.4.1.8 Frequency Information Dialog

After pressing the hotkey “Freq. Info” (s. Figure 73) the frequency information dialog opens. The frequency information is presented in the form of a list of the available and not available frequency bands.

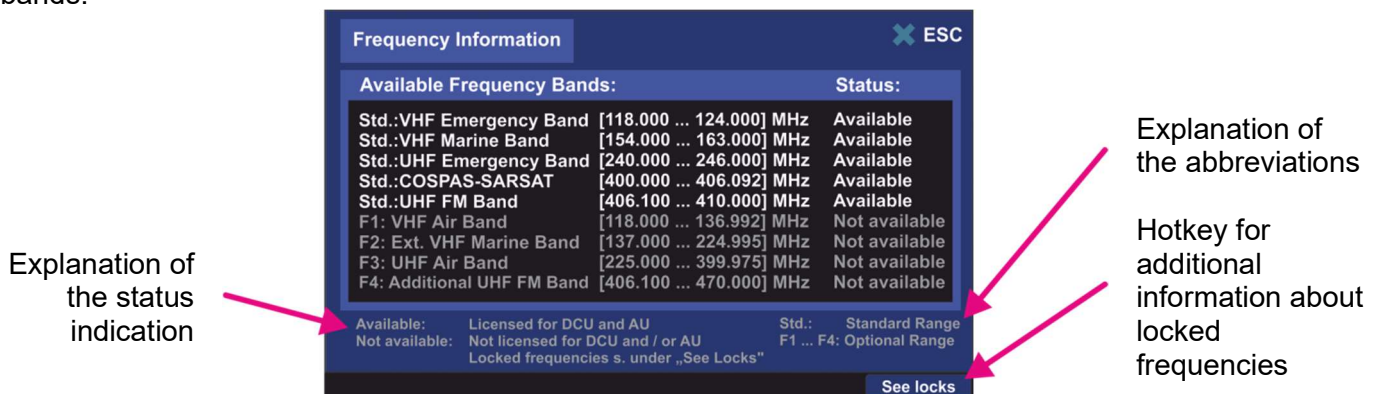


Figure 82. Frequency information dialog

- The frequency bands that are marked with „Std.“ are basic frequency ranges. These frequencies are always licensed in the standard version of RT-500-M and thus always appear as “Available”.
- The frequency ranges designated with “F1 .. F4” are optional 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 Elektronik GmbH).
- However, it is possible to lock 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.
- Locking of frequencies is the responsibility of the administrator.
The operator can only view the frequencies which have been locked by the administrator.

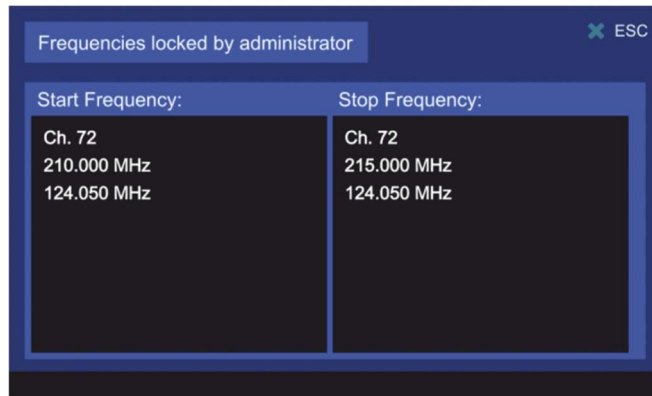


Figure 83. Locked frequencies. Operator view

Locked frequencies can be viewed in the embedded separate dialog, which is available over the hotkey “See locks” (s. Figure 82).

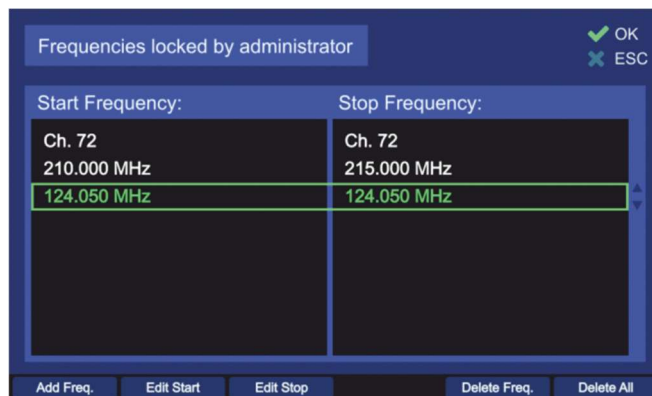


Figure 84. Locked frequencies. Administrator view

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 84 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”. 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”.

7.4.1.9 System Info Dialog

This dialog provides important information about the status (revision) of the used system components (s. Figure 85). This information may be helpful in service or remote support cases.

To view the system information press the hotkey “System Info” and skip between the items with “Up” and “Down” arrow buttons of the DCU keyboard.

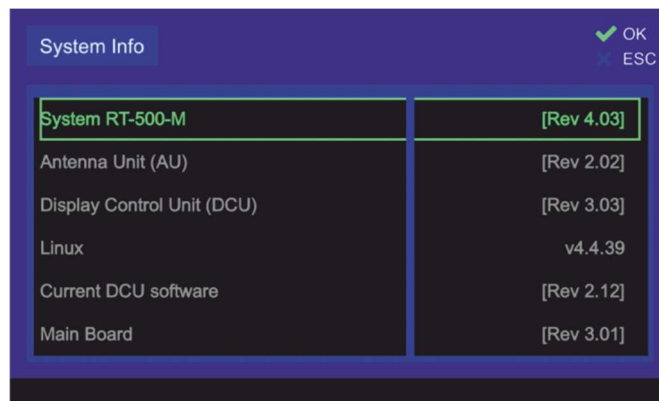


Figure 85. "System Info" dialog

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 86).

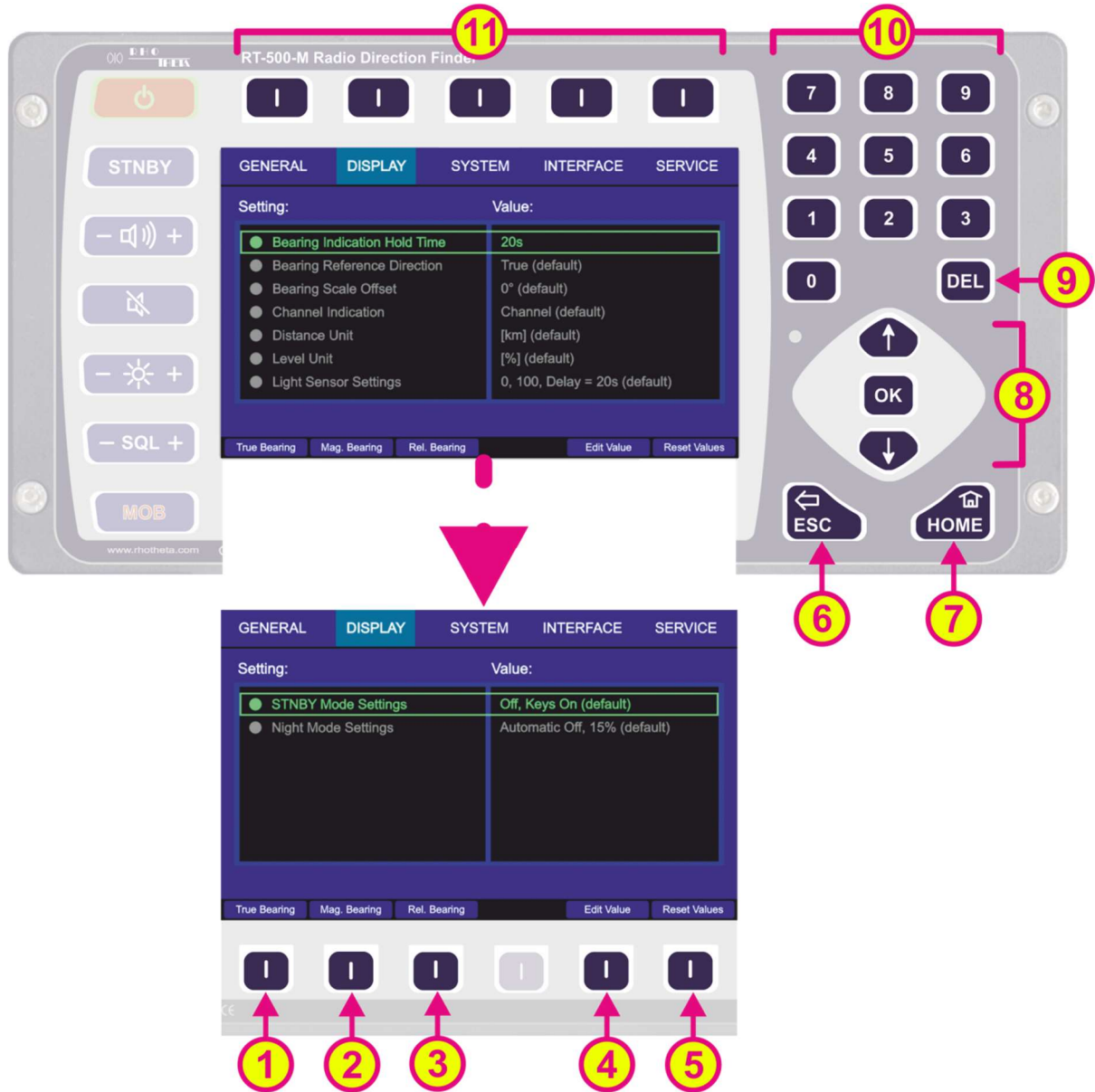


Figure 86. Setup page. Display settings

Indication on Setup Page, Display Settings

Pos.	Element	Meaning / Description
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”).



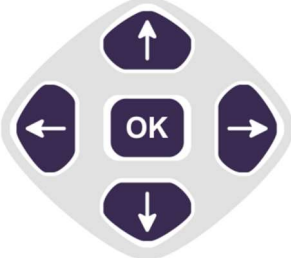


3	"Rel. Bearing"	Sets the bearing reference direction to "RELATIVE" without opening the corresponding dialog (s. Table 5. Bearing reference directions").
4	"Edit Value"	Depending on currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions in subsequent chapters).
5	"Reset Values"	Resets all values to the default settings (s. 13.4). The default values themselves cannot be changed by the user (RHOTHETA specification).
6		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 endpoint.
7		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		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) is 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.

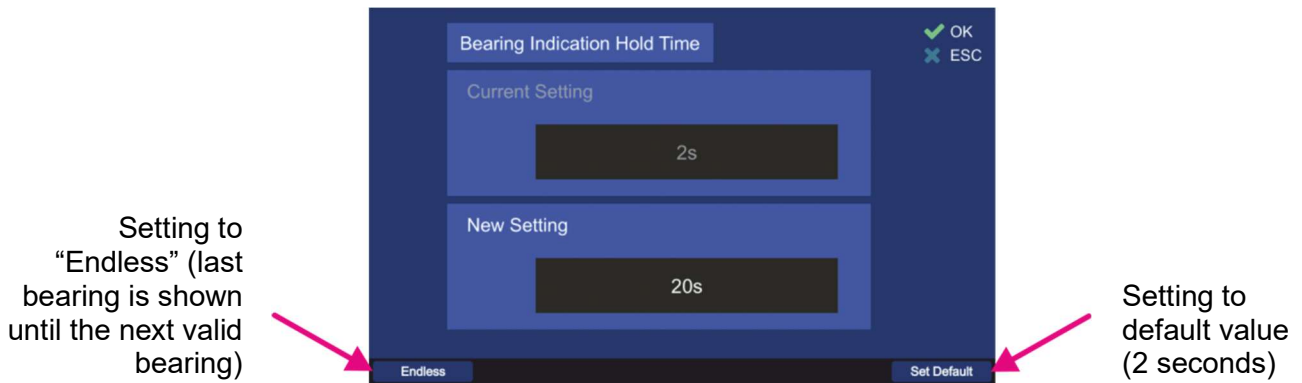


Figure 87. Editing the bearing indication hold time

- The new value for the bearing hold time can be entered in the input field “New Setting”, using the numeric keys of the keypad.
- 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.
- To set the bearing hold time to the default value (2 s), press the hotkey “Set Default”.
- 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.

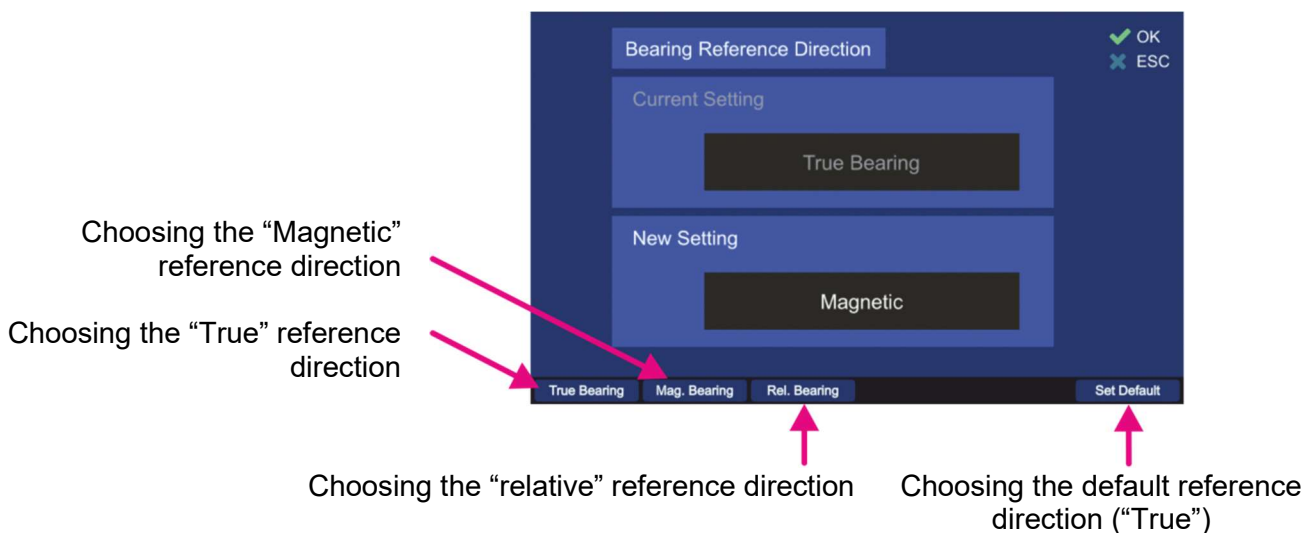


Figure 88. Bearing reference direction dialog

- 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.
- 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.

- Press the hotkey “Rel. Bearing” to set the bearing reference direction relative to the heading of the vessel.

Note

If the “Rel. Bearing” reference direction is chosen and the compass data is available, then the heading (value in the triangle on the top of the bearing rose) will change its value according to the compass data.

- Press “Set Default” to use the default value (true north direction, only if compass data is available).
- To save the changed value, press “OK”.
- 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 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.

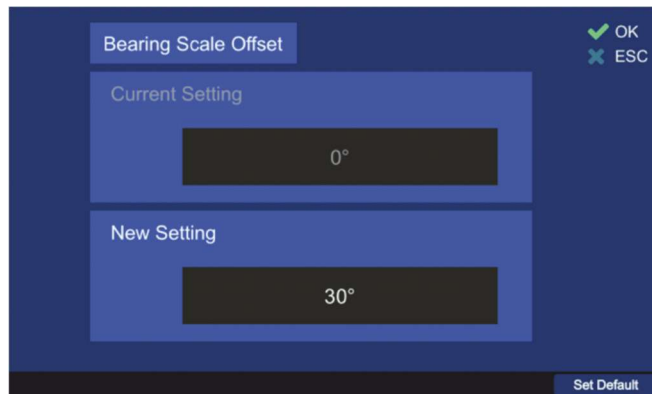


Figure 89. Bearing scale offset editing dialog

- 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.
- Press the hotkey “Set Default” to set the default value for the bearing scale offset (0°).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the previous value.

7.4.2.4 Channel Indication

It is possible to configure the indication of frequency/channel, which is then shown on the “Bearing” page, in the left upper corner of the display (s. Figure 90).

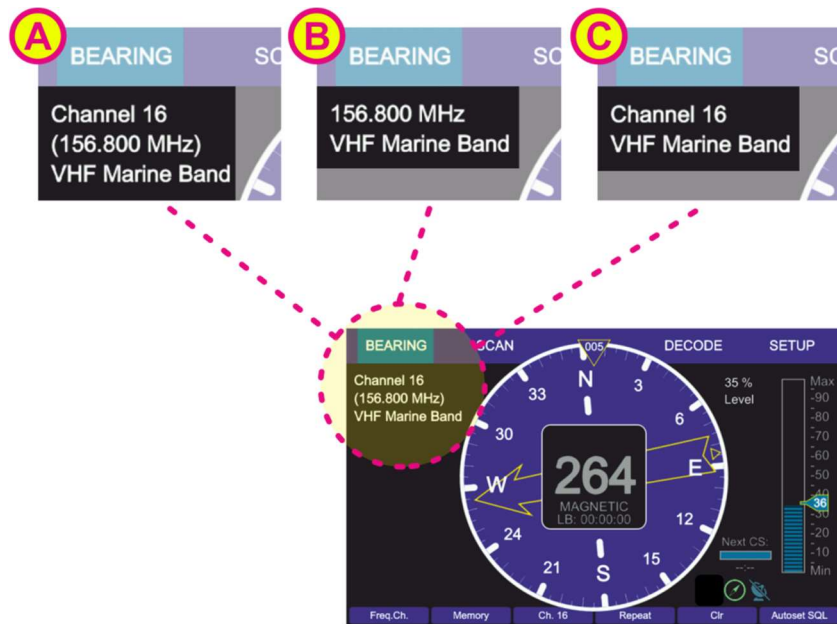


Figure 90. Types of the frequency/channel indication

To change the type of frequency/channel indication, press “Edit Value” or “OK” while the line “Channel Indication” is marked. The corresponding dialog will open (s. Figure 91).

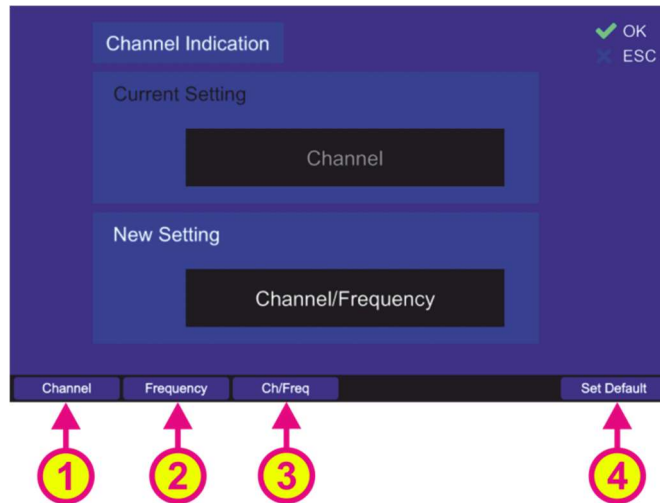


Figure 91. "Channel Indication" dialog

- Choose the desired type of frequency/channel indication pressing one of the hotkeys:
 - “Channel” (s. Figure 91, position 1): the corresponding appearance on the “Bearing” page will be as shown in Figure 90, field C.
 - “Frequency” (s. Figure 91, position 2): the corresponding appearance on the “Bearing” page will be as shown in Figure 90, field B.
 - “Ch/Freq” (s. Figure 91, position 3): the corresponding appearance on the “Bearing” page will be as shown in Figure 90, field A.
- Press the hotkey “Set Default” to set the default value for frequency/channel indication (“Channel”).

- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the previous value.

7.4.2.5 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.

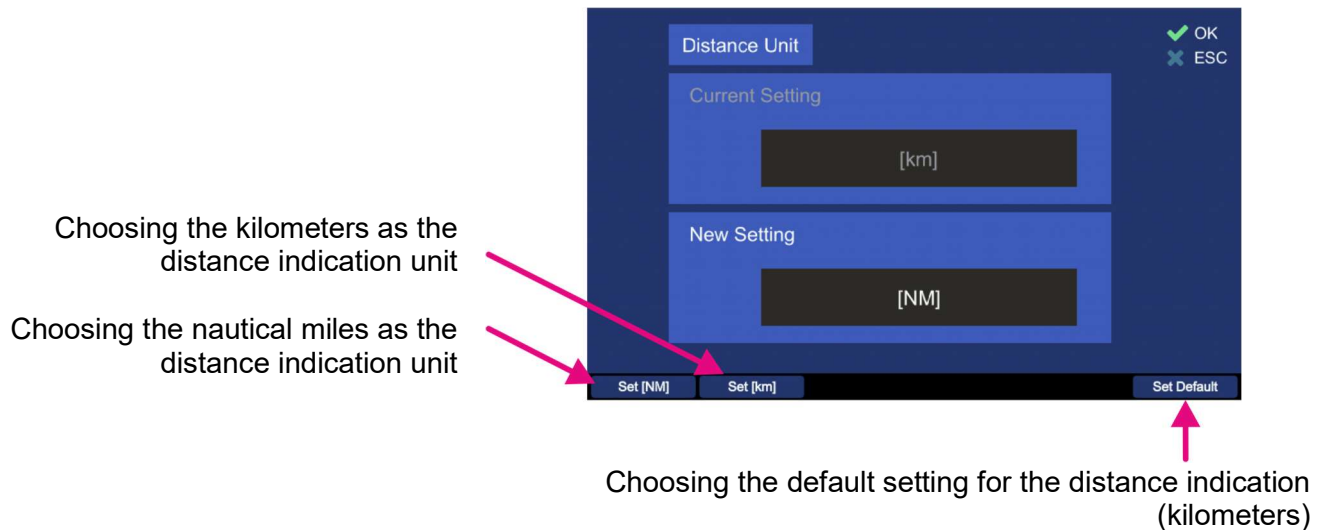


Figure 92. Changing the distance unit

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

7.4.2.6 Level Unit

Indicating of levels (like signal level, or squelch level) can be either in “[%]” or in “[dBm]”.

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.

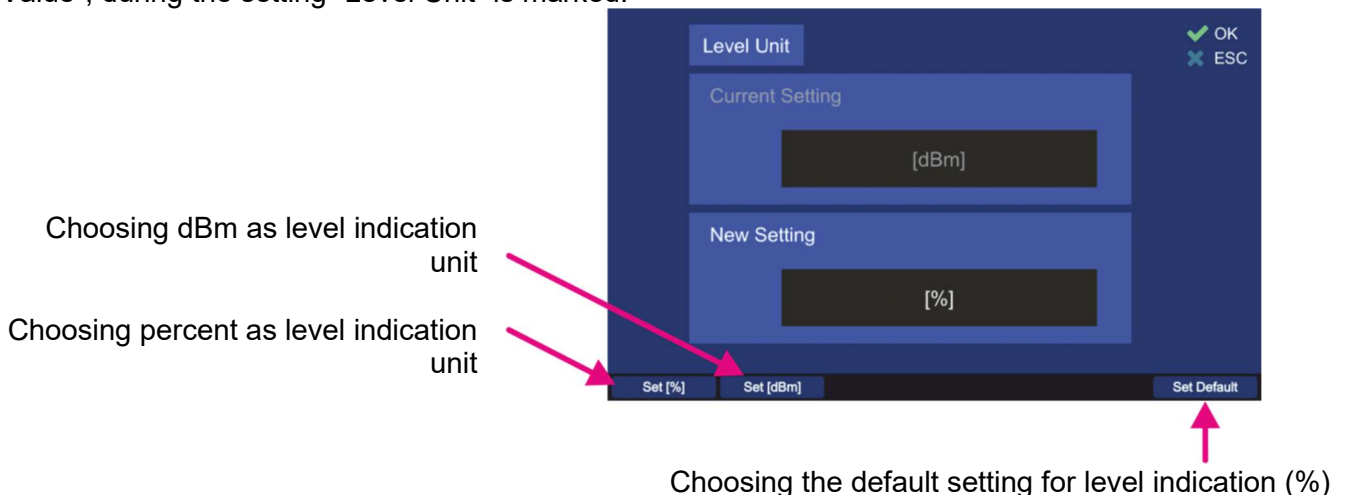


Figure 93. Changing the level unit

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

7.4.2.7 Light Sensor Settings

The light sensor is used in the DCU to adjust the brightness of the display, legends and “Keys” (s. 7.5.4) 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 opens.

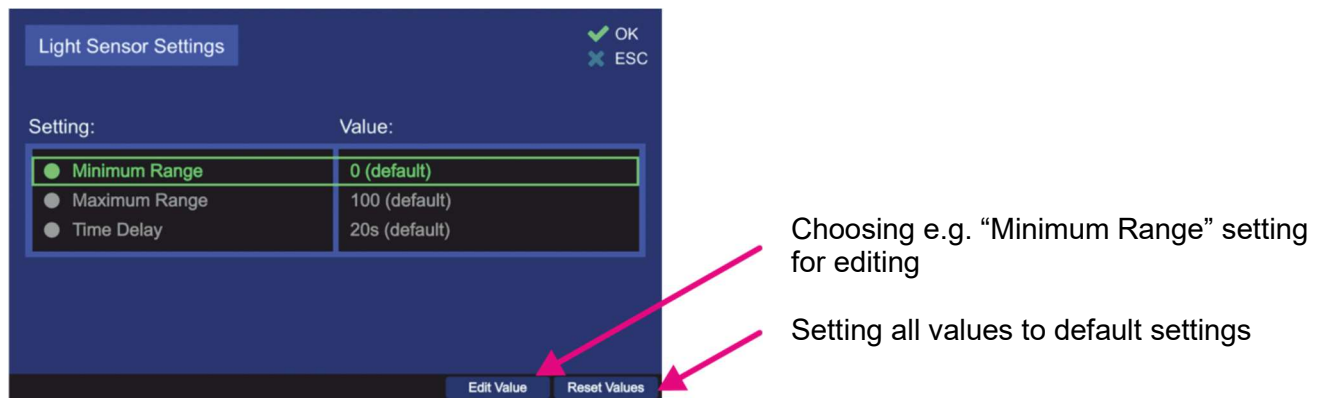


Figure 94. Light sensor settings

With the minimum / maximum range settings one can influence the spacing of changing the brightness of display, legends or “Keys”.

- Other than with other dialogs of the “Display” menu, editing of the values is only available over the “Edit Value” hotkey (pressing “OK” is valued as accepting of the present values and will lead out of the dialog).
- Leaving the top level dialog (s. Figure 94) 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.

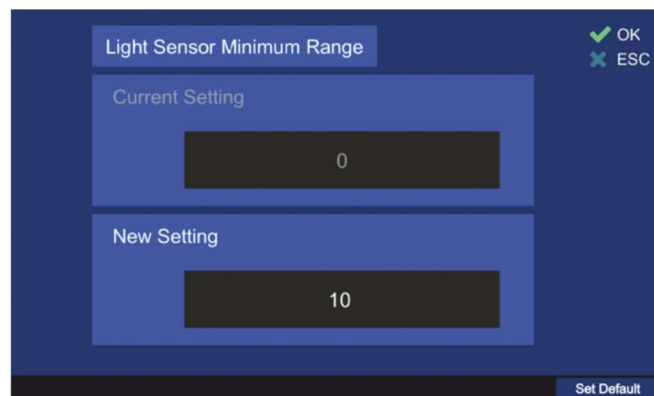


Figure 95. Changing the minimum range value of the light sensor

- 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.
- Use the “Set Default” hotkey to reset the value to the default setting.
- 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”.

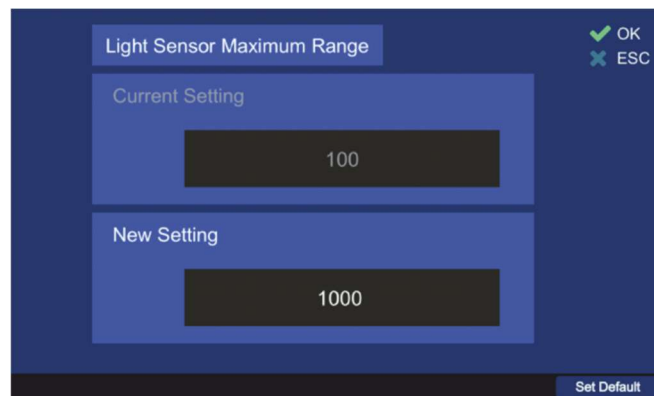


Figure 96. Changing the maximum range value of the light sensor

- 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.
- Use the “Set Default” hotkey to reset the value to the default setting.
- 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.

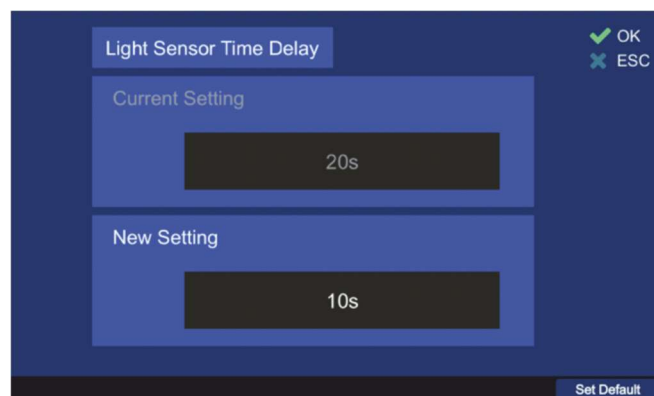


Figure 97. Changing the time delay value for the light sensor

- 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.
- Use the “Set Default” hotkey to reset the value to the default setting.
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the previous setting.

7.4.2.8 Standby Mode Settings

This menu point defines the display brightness and key illumination during the standby mode.

To change the standby settings, press the “Edit Value” hotkey, while “Standby Brightness” is marked. Following dialog appears (s. Figure 98).

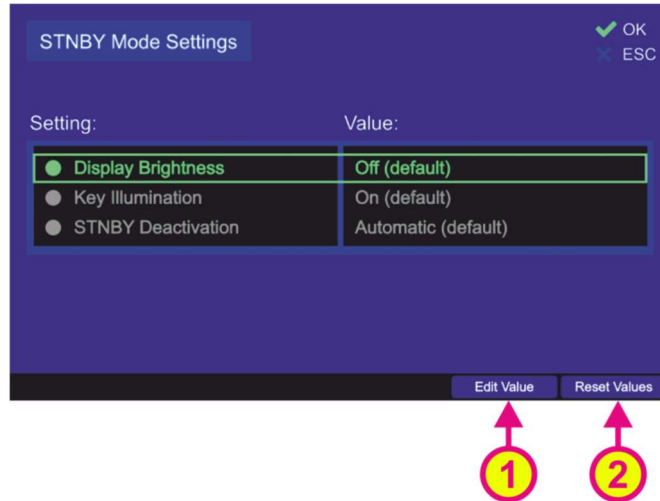


Figure 98. Standby mode settings dialog

Note

If you press "OK" in this view, the current settings will be interpreted as the ones to be saved, which will cause the dialog to close, saving these values.

In order to change the single settings always use the “Edit Value” hotkey (s. Figure 98, position 1).

Note

Pressing the “Reset Values” hotkey resets all settings that are displayed in this view to their default values. If the “OK” button is used then to leave the dialog, the default values will be saved.

Display Brightness

This setting defines, which brightness value the display will take in the standby mode.

To change this value press the “Edit Value” hotkey, while “Display Brightness” is marked.

Following dialog opens (s. Figure 99).

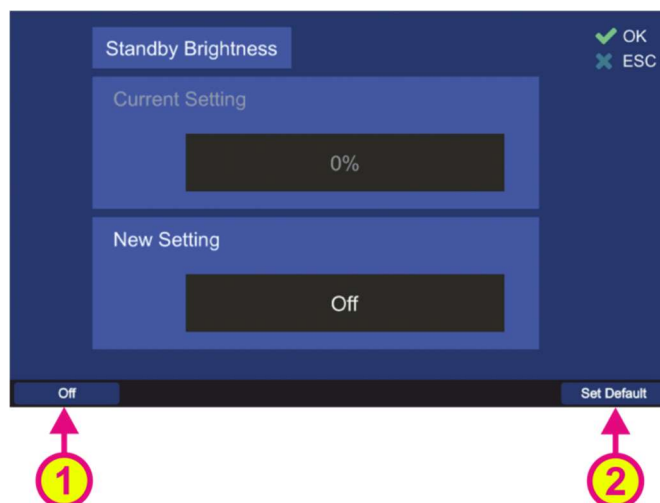


Figure 99. Adjusting the standby brightness

- 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 99, 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.
- Use the “Set Default” hotkey (s. Figure 99, position 2) to reset the value to the default setting (Off).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the previous setting.

Key Illumination

This setting defines the behavior of the keys (colored illumination of the function keys “Power”, “Mute” and “Standby”) in standby mode.

- If “Off” is set, the key illumination is turned off after the button “Standby” is pressed.
- If the setting “On” is chosen, the illumination of the keys stays at the brightness value, which was previously defined (s. 7.5.4).
- With the setting “Flashing” the keys blink in the standby mode.

To change this setting value press the “Edit Value” hotkey, while “Display Brightness” is marked. Following dialog opens (s. Figure 100).

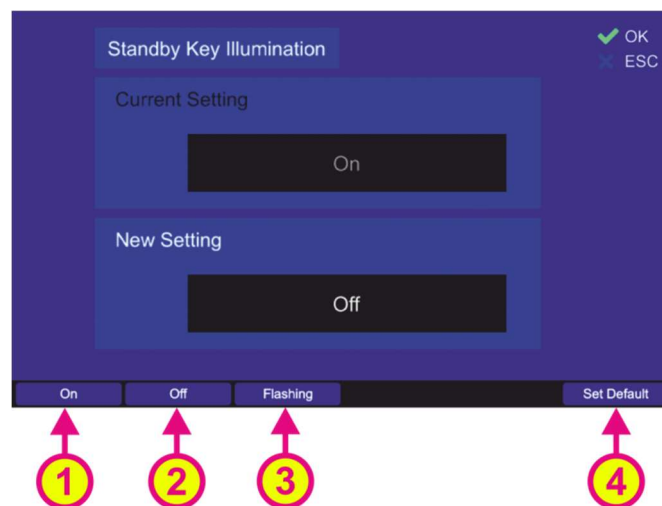


Figure 100. Changing the standby key illumination setting

- Choose the “On”, “Off” or “Flashing” hotkey to set the desired variant of the key illumination (s. Figure 100, positions 1, 2 or 3).
- Use the “Set Default” hotkey (s. Figure 100, position 4) to reset the value to the default setting (Off).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the previous setting.

STNBY Deactivation

This setting defines, which event can return the RT-500-M device from the standby mode to the normal operation.

- If “Automatic” is set, the device will get back to the normal operation by the occurrence of an event, e.g. reception of a valid signal (s. 7.5.1).
- If “User” is set, the standby mode can only be deactivated manually by pressing any key (except the On/Off (“Power”) button).

Note

To completely turn off the DCU's illumination in the "Dark Mode", the settings "Display Brightness" and "Key Illumination" must be set to "Off". This means that the DCU remains dark even if a signal is received.

The communication with the DCU in this mode can be maintained over NMEA or LAN interfaces (using NMEA data protocol), if desired.

Note

If the "Dark Mode" is activated while either the main bearing frequency is an emergency frequency or a scan with any emergency frequency is active, the occurrence of the corresponding signal will be indicated by the acoustic alarm even in the "Dark Mode".

To switch off the alarm in this case, the device must first be returned to the normal operation, or a corresponding NMEA sentence ("ALARMCFM", for more information s. "NMEA-Protocol Description RT-500-M") can be sent out over the NMEA interface to confirm the alarm.

Note

Do not use the "Power" button in order to return the DCU from the "Standby Mode" into normal operation!

Pressing the "Power" button for about 2 seconds leads to switching off the DCU and after restarting the device, it works in the normal operation mode (with normal display brightness).

To change the "STNBY Deactivation" value, press the "Edit Value" hotkey, while "STNBY Deactivation" is marked.

Following dialog opens (s. Figure 101. Changing the standby deactivation setting Figure 101).

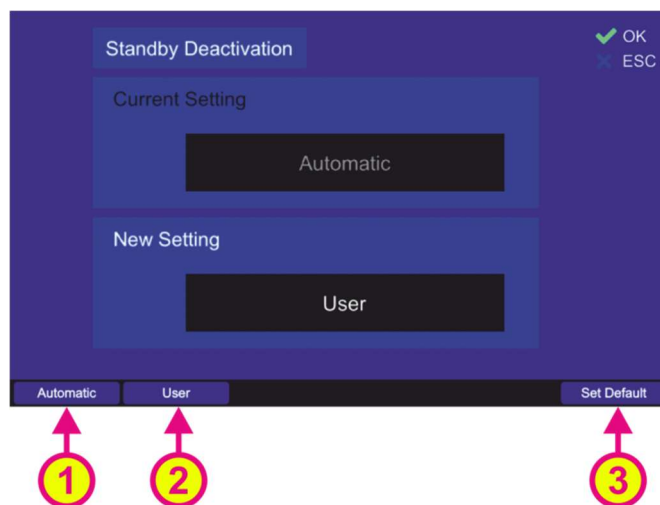


Figure 101. Changing the standby deactivation setting

- Press the hotkey "Automatic" (s. Figure 101, position 1) in order to enable the automatic standby mode deactivation.
- Press the "User" hotkey in order to deactivate the standby mode manually.
- Use the "Set Default" hotkey to change to the default setting ("Automatic").

If the "STNBY Deactivation" setting is changed to "User", leaving the "Standby Mode Settings" dialog by pressing "OK" will generate a warning (s. Figure 102) in order to indicate the only manual deactivation of the standby mode from then on.

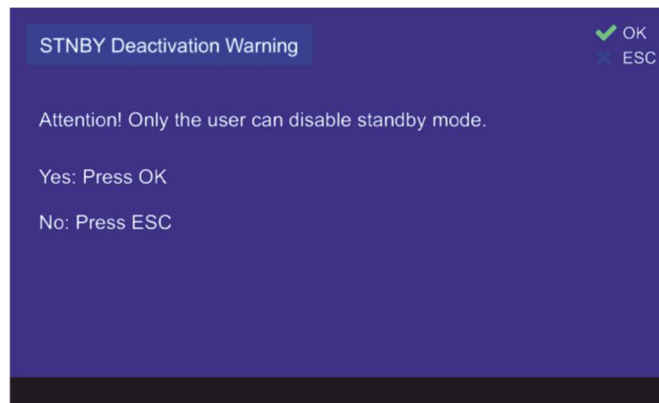


Figure 102. Dark mode activation warning

If this variant of “Dark Mode” is activated, the “STNBY Mode Settings” line on the “Display” page will show the current settings of the “Display Brightness” and “Key Illumination” (s. Figure 103). The result on the “Display” page after pressing “OK” will be as shown in the Figure 103.

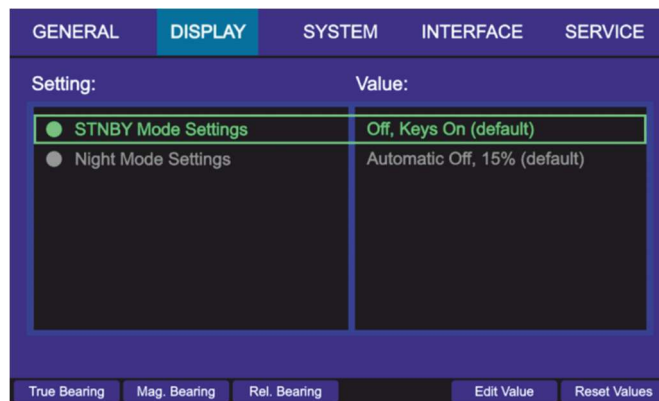


Figure 103. Manual deactivation of the standby mode is turned on

If the DCU’s illumination is completely turned off for the “Dark Mode”,

- “Display Brightness” and “Key Illumination” are set to “Off” and
- “STNBY Deactivation is set to “User”,

leaving the “Standby Mode Settings” dialog by pressing “OK” will generate a “Dark Mode” warning (s. Figure 104) in order to indicate that all the device illumination is going to be disabled and only manual deactivation of the standby mode will be possible.

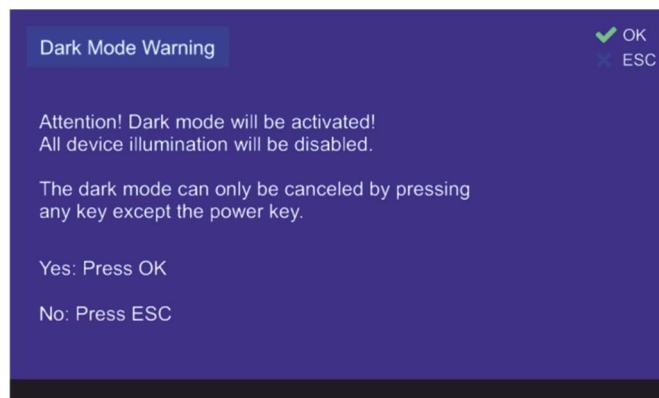


Figure 104. Activation of the dark mode with disabled illumination

If this warning is accepted by pressing “OK”, the activation of the “Dark Mode” is also indicated on the “Display” page as follows (s. Figure 105).

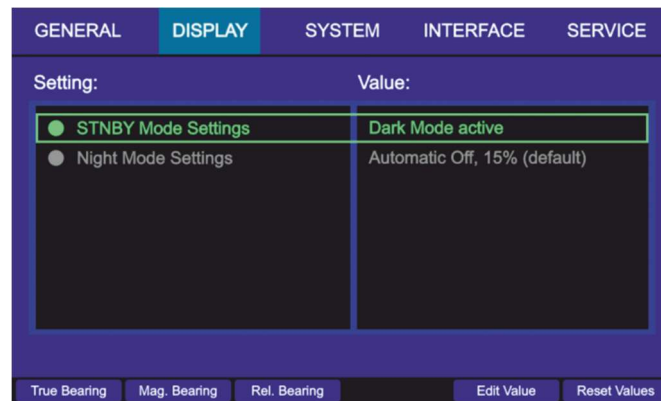


Figure 105. Dark mode indication on the "Display" page

7.4.2.9 Night Mode Settings

The night mode settings allow the adjustment of the night mode behavior.

To change these settings, press the hotkey "Edit Value", while the line "Night Mode Settings" is marked (s. Figure 106, position 1).

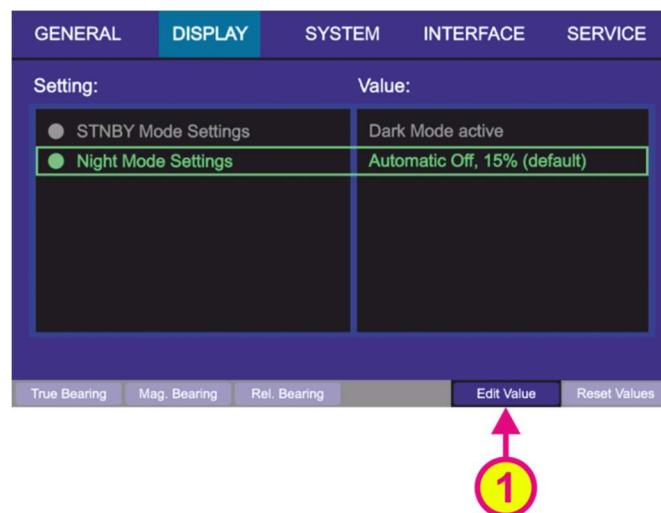


Figure 106. Selecting the night mode settings

The following dialog opens (s. Figure 107).

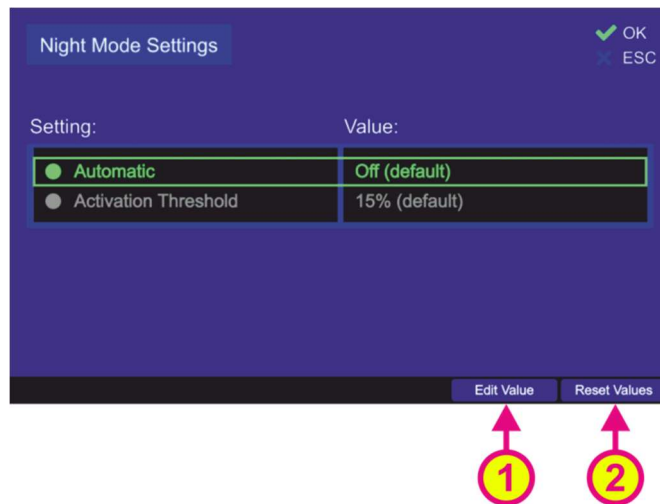


Figure 107. "Night Mode Settings" dialog

Note

If you press "OK" in this view, the current settings will be interpreted as the ones to be saved, which will cause the dialog to close again, saving these values.

In order to change the single settings always use the "Edit Value" hotkey.

Automatic

Defines, whether or not to automatically activate the night mode.

If the automatic activation is turned on, the night mode is activated after 30 seconds when a certain threshold for ambient brightness (measured by the light sensor) is reached.

This threshold can be defined with the "Activation Threshold" setting (s. below).

The display automatically returns to "Day" mode after 30 seconds when the ambient brightness is above the threshold.

To set the behavior of the night mode to default, press the "Reset Values" hotkey (s. Figure 107, position 2).

To turn the auto-activation of the night mode on/off, press the hotkey "Edit Value", while "Automatic" is marked (s. Figure 107, position 1).

Following dialog appears (s. Figure 108).

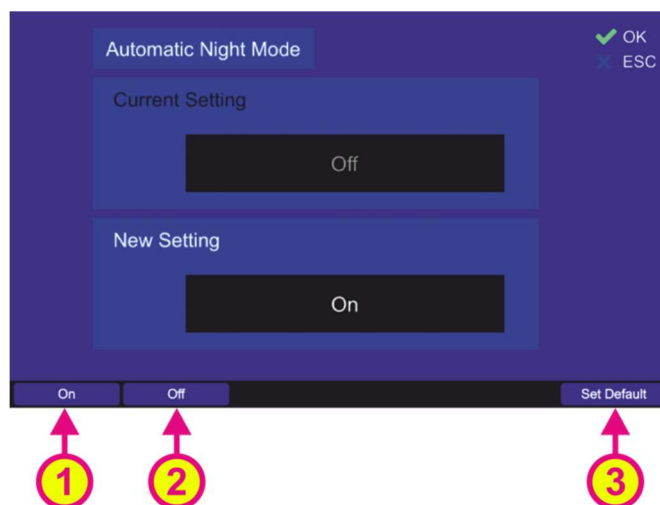


Figure 108. Turning on/off the automatic activation of night mode

- Press the hotkey "On" (s. Figure 108, position 1) in order to enable the automatic night mode activation (at the ambient brightness level adjusted in the "Activation Threshold" setting).

- Use the “Off” hotkey to disable the automatic activation of the night mode. In this case, switching between night and day modes is only possible manually in the “Adjust Brightness” dialog (s. 7.5.4).
- Use the “Set Default” hotkey to reset the value to the default value (“Off”).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without saving the change.

Activation Threshold

This setting can be used to define the ambient brightness level (measured by the light sensor) at which the night mode is triggered, if the “Automatic” activation is enabled (s. previous setting).

The display will change back to “Day” mode automatically after reaching:

ambient brightness value = “Activation Threshold” value [%] + 10 [%] (light sensor hysteresis).

To change the threshold value, press the hotkey “Edit Value”, while “Activation Threshold” is marked.

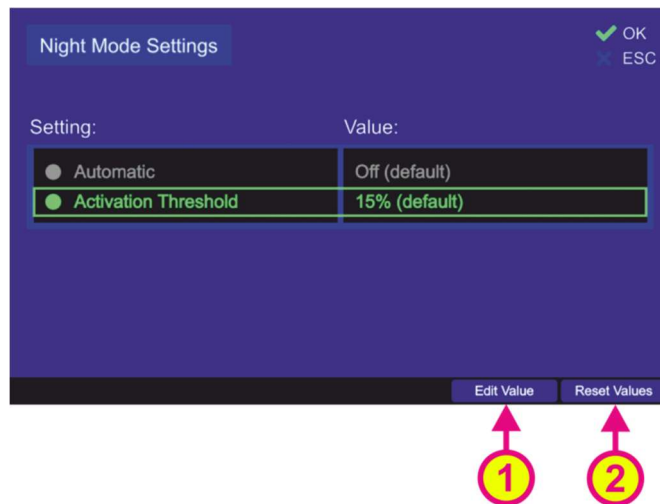


Figure 109. Selecting the „Activation Threshold“ for editing the value

Following dialog appears (s. Figure 110).

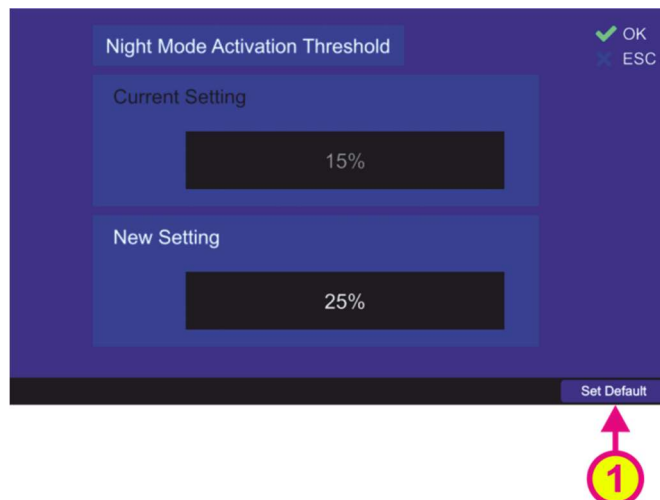


Figure 110. Changing the value for the night mode activation threshold

- Enter the new value for the night mode activation threshold in the “New Setting” input field, using the numeric buttons of the DCU keypad.

- Use the “Set Default” hotkey (s. Figure 110, position 2) to reset the value to the default value (15%).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the current 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 to switch to the next page with the next settings.

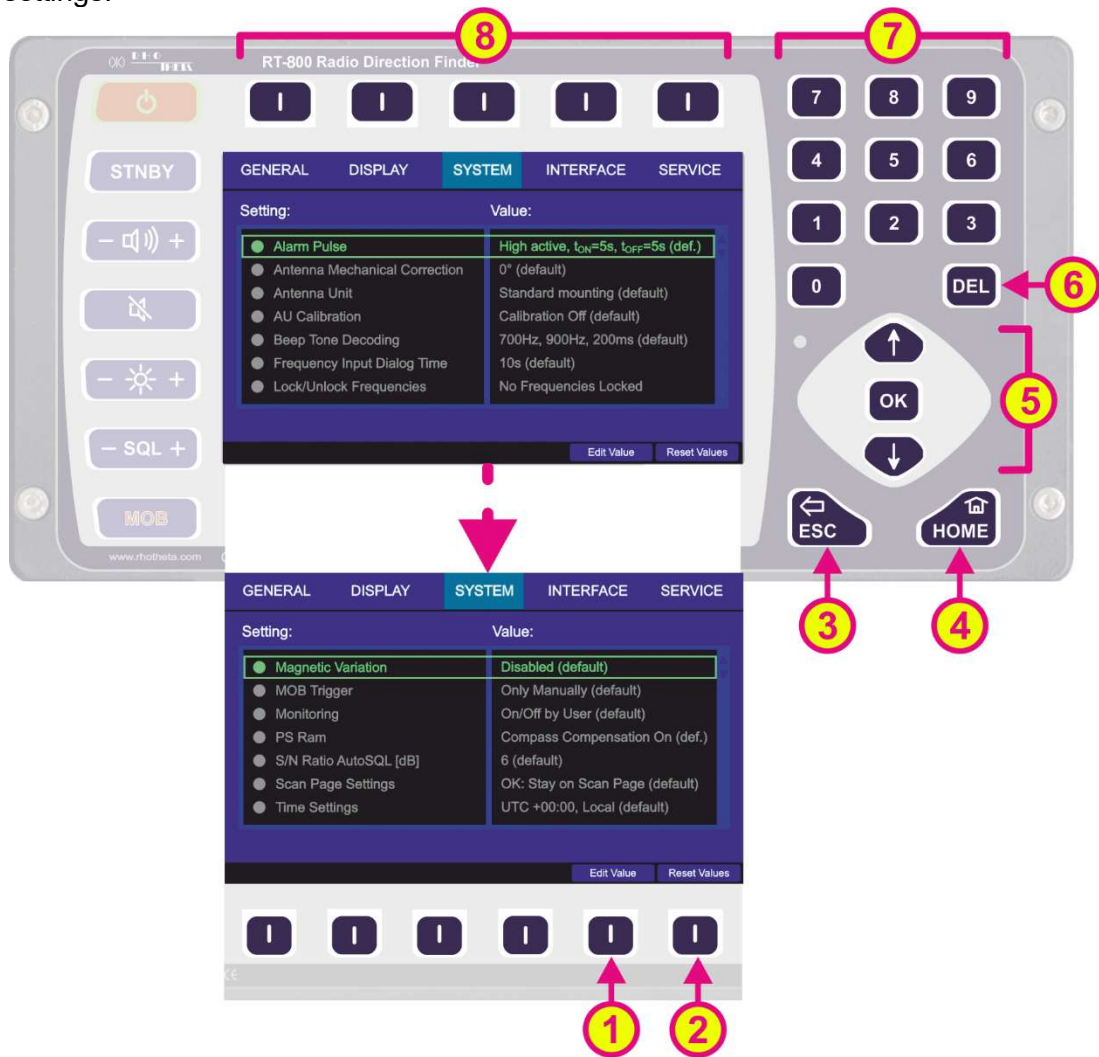


Figure 111. Setup page. System settings.

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 in the subsequent chapters).
2	“Reset Values”	Resets all values to the default settings (s. 13.4). The default values themselves cannot be changed by the user





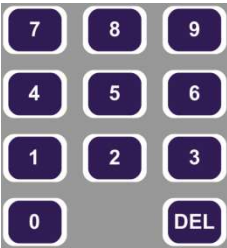
		(RHOTHETA specification).
3		When there is a dialog opened, pressing this button will close the dialog without adopting new values. When there is no dialog opened, pressing this button will go back to the last activated page. The "Bearing" page is the end point.
4		Pressing this button always leads to the "Bearing" page. Even an opened dialog will be closed, without adopting the changed values.
5		"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		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 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 112).

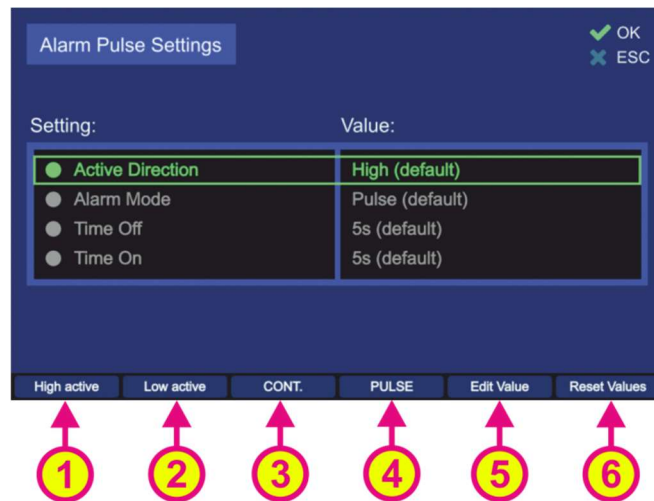


Figure 112. Alarm pulse settings

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 112, numbers 1, 2 and 5), whereat using the first two hotkeys will change the value without opening the separate dialog.

- 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 113.

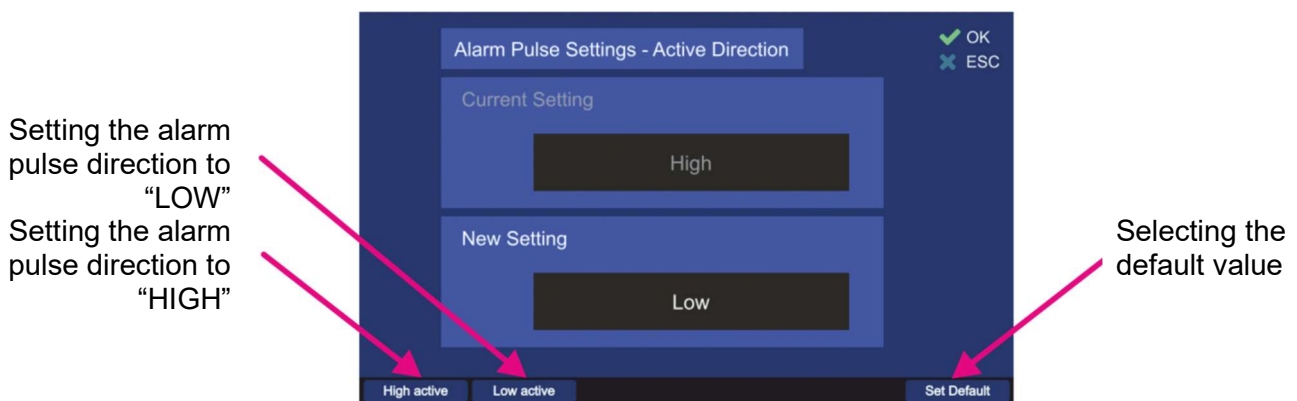


Figure 113. Active direction dialog

- 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.
- Pressing the "Low 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.
- 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 112, numbers 3, 4 and 5), whereat using the first two hotkeys will change the value without opening the separate dialog.

- 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 114.

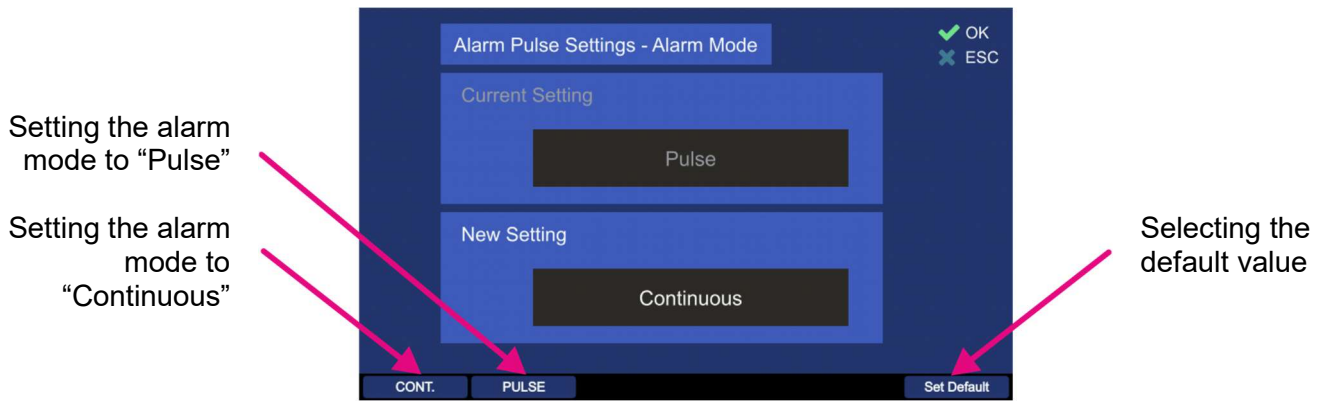


Figure 114. Alarm mode dialog

- 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.
- 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".
- 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".

- To change the "Time Off"- time, press the hotkey "Edit Value" (s. Figure 112, 5). The related dialog will open (s. Figure 115).

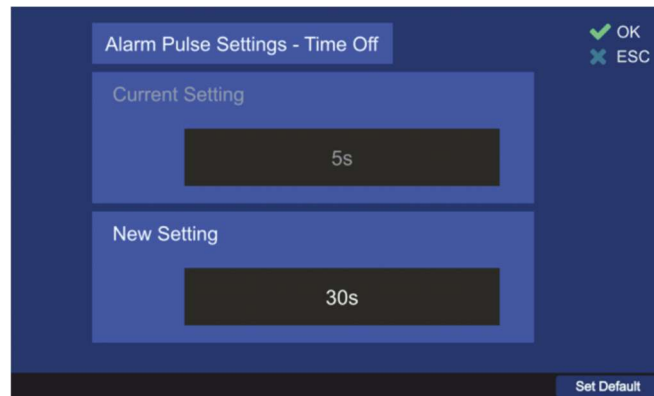


Figure 115. Time off Dialog

- Use the number keys of the DCU keypad to enter the new value for the "Time Off" setting.
- Press the hotkey "Set Default" to use the default value of 5 s.
- 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.

- To change the "Time On"- time, press the hotkey "Edit Value". The related dialog will open (s. Figure 116).

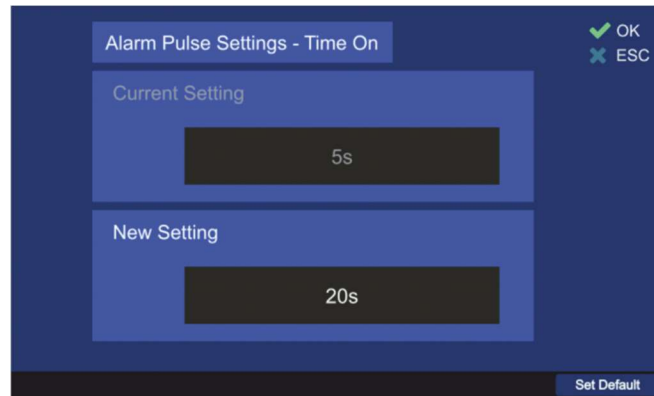


Figure 116. Time on Dialog

- Use the number keys of the DCU keypad to enter the new value for the “Time On” setting.
- Press the hotkey “Set Default” to use the default value of 5 s.
- 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.

- 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.

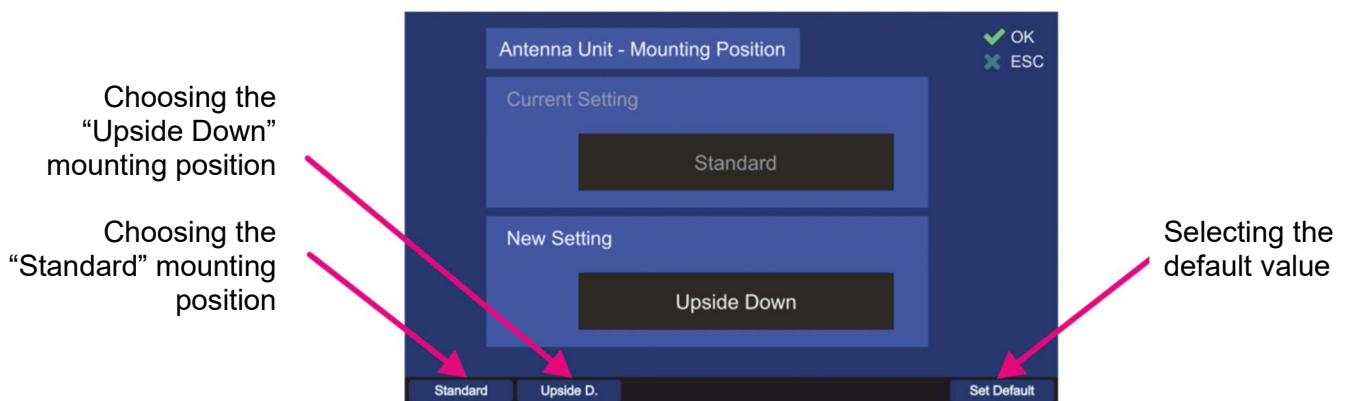


Figure 117. Antenna unit (mounting position) dialog

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

7.4.3.3 Antenna Mechanical Correction

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°).

- By pressing the “OK button or the hotkey “Edit Value”, while the setting “Antenna Mechanical Correction” is marked by the green frame, the following dialog is opened.

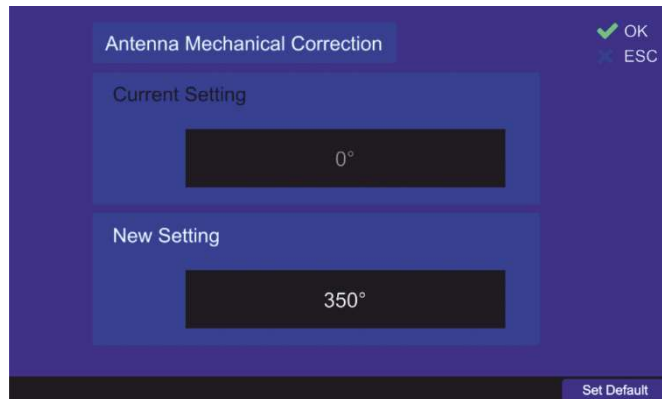


Figure 118. Antenna mechanical correction dialog

- Use the number keys of the DCU keypad to enter the new value for the “Antenna Mechanical Correction”.
- Press the hotkey “Set Default” to use the default value of 0°.
- 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 not used.

Note

This function is reserved for special use cases only (it is not needed for the most use cases of RT-500-M).

- 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.

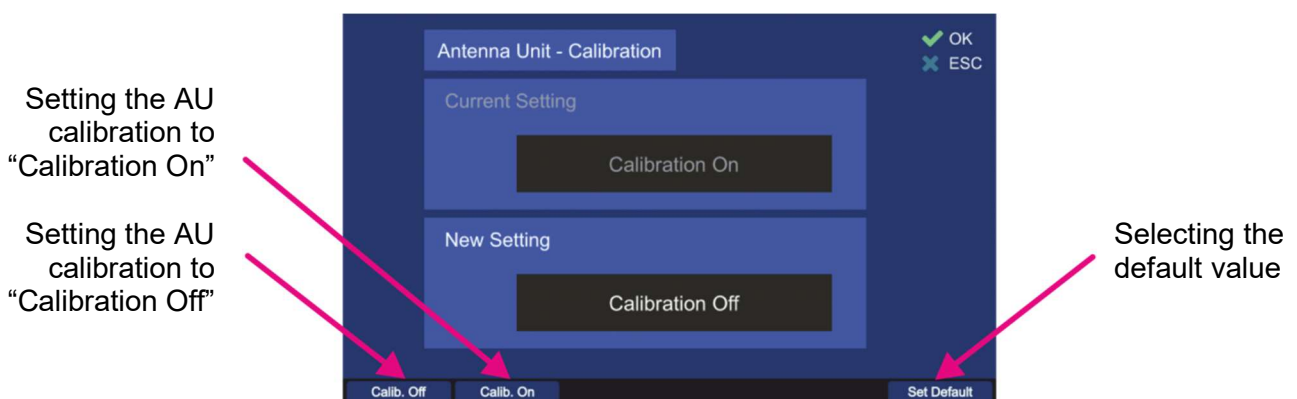


Figure 119. AU calibration on/off dialog

- Including the AU calibration values into the bearing calculation is done by pressing the hotkey “Calib. On”.
- To disable using the internal calibration values of the AU choose the hotkey “Calib. Off”.
- Press the hotkey “Set Default” to use the default value (“Calibration Off”).

- 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 “Fast Channel Scan” (licensed option) is unlocked (for further information please see 7.2.3.3).

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 120).

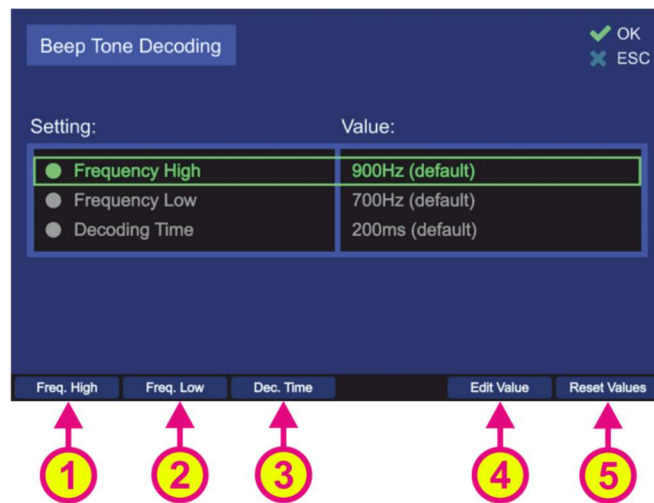


Figure 120. Beep tone decoding settings

All values can be set to the default values, using the hotkey “Reset Values” (s. Figure 120, 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 120, positions 1 and 4), both of these hotkeys will open the same dialog.

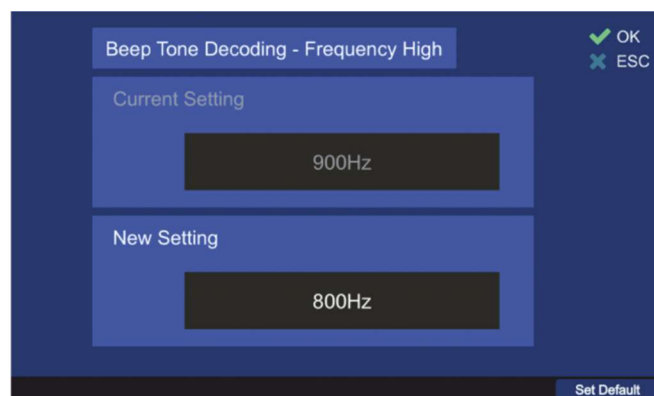


Figure 121. Dialog for the upper frequency (Beep Tone Decoding)

- Type the new value for the upper frequency into the “New Setting” field, using the DCU number keys.
- Press the hotkey “Set Default” to use the default value (900 Hz).
- 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 120, positions 2 and 4), both of these hotkeys will open the same dialog.

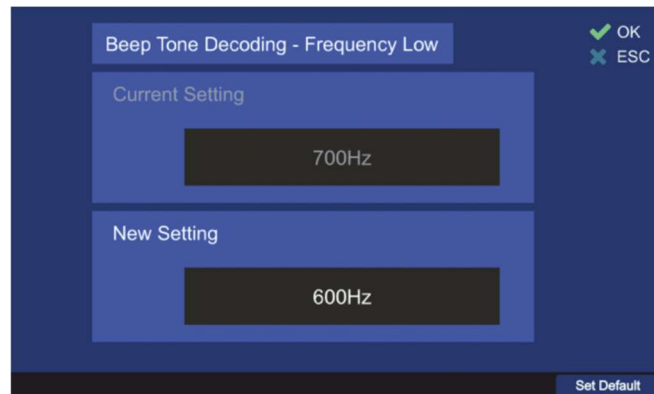


Figure 122. Dialog for the lower frequency (Beep Tone Decoding)

- Type the new value for the lower frequency into the “New Setting” field, using the DCU number keys.
- Press the hotkey “Set Default” to use the default value (700 Hz).
- 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 120, positions 3 and 4), both of these hotkeys will open the same dialog.

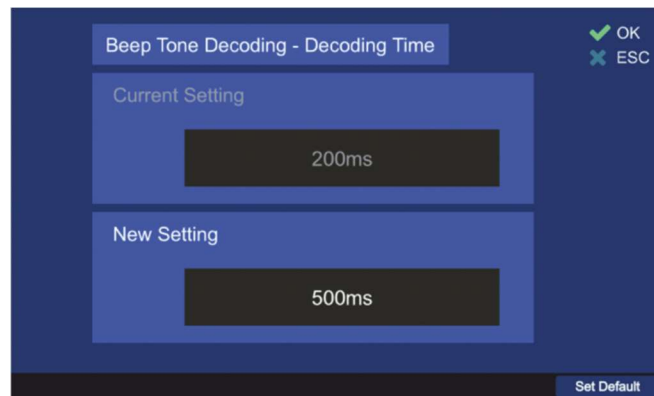


Figure 123. Decoding time dialog

- Type the new value for the decoding time into the “New Setting” field, using the DCU number keys.
- Press the hotkey “Set Default” to use the default value (200 ms).
- 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.

- 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 124. Frequency input hold time dialog

- Type the new value for the frequency input hold time into the “New Setting” field, using the DCU number keys.
- Press the hotkey “Set Default” to use the default value (10 s).
- 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 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).

- 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 125). This view will contain only one hotkey “Add Freq.” if entered for the first time, when no frequency is locked yet.

Figure 125. Locked frequencies list. Administrator view

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

7.4.3.8 Magnetic Variation

This setting allows the entering of the magnetic variation angle, if it is known for the current location. Depending on what type of compass is connected to the direction finder, the magnetic variation is used (or not) for the calculation of the true or magnetic bearing.

Note

If GPS is connected, the magnetic variation value from the GPS data is used (the manually entered value of magnetic variation is ignored).

Note

The magnetic variation angle varies depending on the position on the Earth's surface. For larger changes in distance, the value entered here should be reviewed and corrected if necessary.

- By pressing the “OK button or “Edit Value” hotkey, while the setting “Magnetic Variation” is marked, the following dialog is opened.

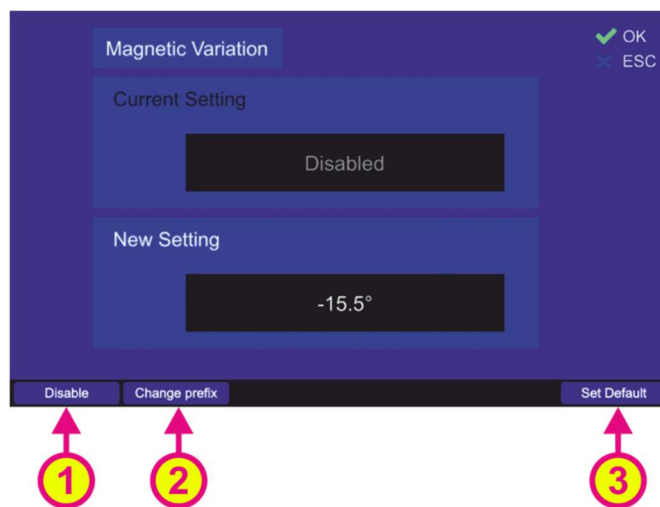


Figure 126. Input of the magnetic variation value.

- Type the new value into the “New Setting” field, using the DCU number keys. The entry format is a value with one position after decimal point. For entering e.g. “5.5” press the key “5” twice, the decimal point and the degrees sign is set automatically.
- Pressing the “Disable” hotkey (s. Figure 126, position 1) deactivates using of the magnetic variation and deletes its current value.
- To change the sign of the degree value, press the “Change prefix” hotkey (s. Figure 126, position 2).
- Press the hotkey “Set Default” (s. Figure 126, position 3) to use the default value (“Disabled”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.3.9 MOB Trigger

This setting defines the event for starting the MOB mode.

Note

The MOB function works only if GPS data is available.

If there is no GPS data available, pressing the MOB button will generate a warning in the middle of the display (s. Figure 127). This warning is displayed regardless of which page is currently used.

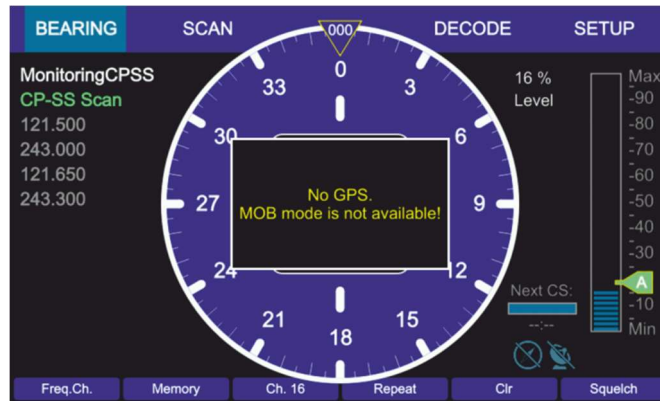


Figure 127. No GPS warning at pressing "MOB" button

Basically, the MOB mode can be triggered by two 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 8, 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.

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 128).

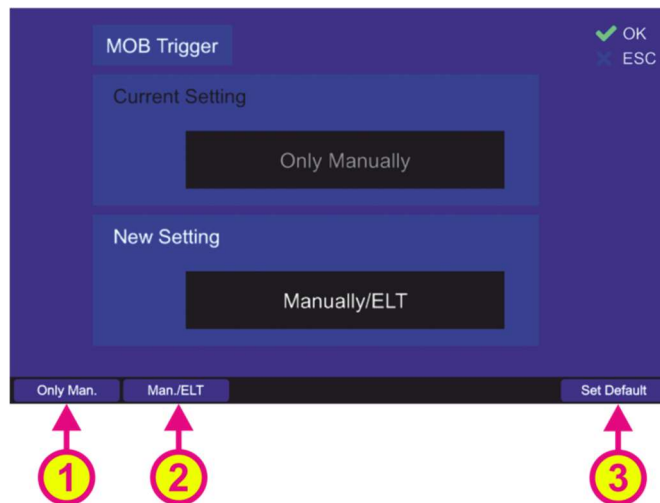


Figure 128. MOB trigger dialog

- Choose the new setting using one of hotkeys (s. Figure 128, positions 1 or 2), 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.

- Press the hotkey "Set Default" (s. Figure 128, position 3), to use the default value ("Only Manually").
- Confirm the setting with "OK" or leave the dialog without adopting the new value by pressing "ESC".

7.4.3.10 Monitoring

This setting determines how the “Monitoring” function will be handled.

There are two possible settings in this menu (s. Figure 129).

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

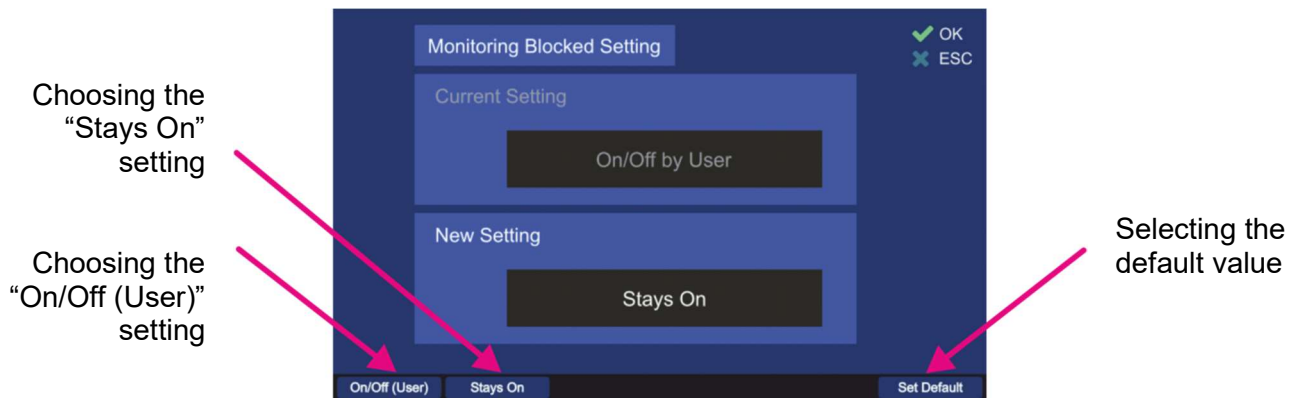


Figure 129. Monitoring handling settings

- Choose the new setting using one of the hotkeys (s. Figure 129), 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.
- Press the hotkey “Set Default” to use the default value (“On/Off by User”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.3.11 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”.

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

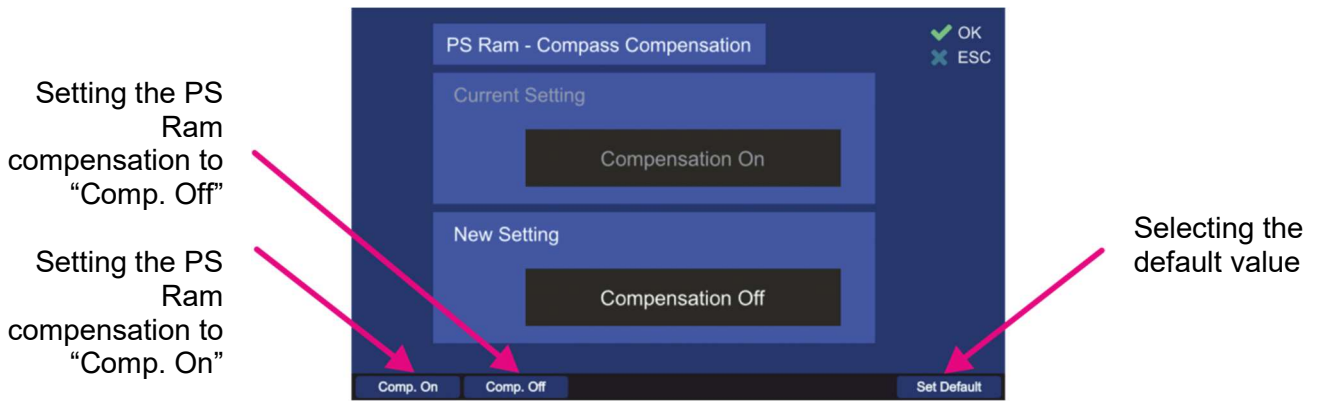


Figure 130. PS Ram compensation dialog

- Choose the new setting using one of the hotkeys (s. Figure 130), 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.
- Press the hotkey “Set Default” to use the default value (“Comp. On”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.3.12 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.

- 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 131).

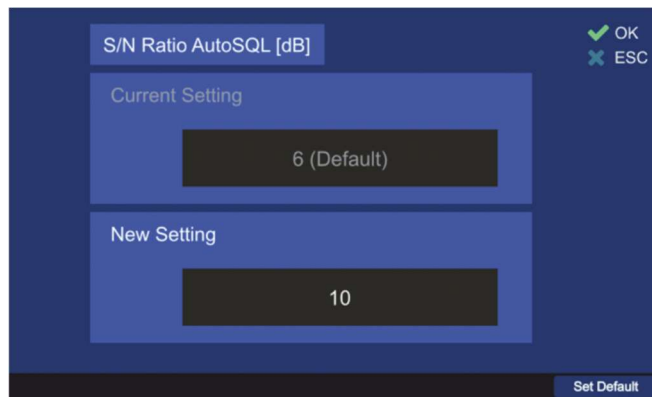


Figure 131. S/N Ratio for auto squelch function

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

7.4.3.13 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.

- By pressing the “OK button or hotkey “Edit Value”, while the setting “Scan Page Settings” is marked, the following dialog is opened (s. Figure 132).

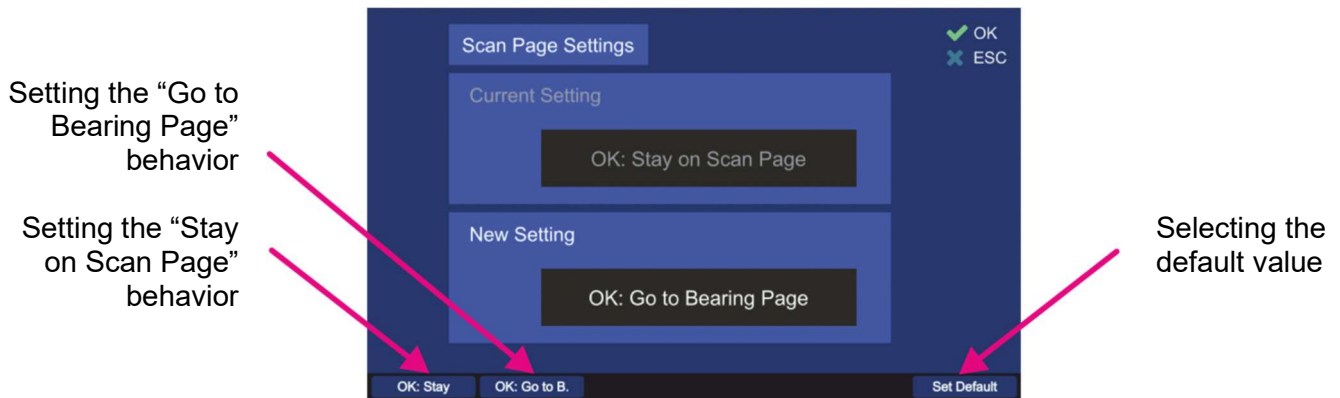


Figure 132. Scan page settings dialog

- Choose the new setting using one of the hotkeys (s. Figure 132), 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).
- Press the hotkey “Set Default” to use the default value (“OK: Stay on Scan Page”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.3.14 Time Settings

This setting allows to select between the local and UTC time for operating the DF-system. Any time-related indication in the DCU will be shown depending on this setting.

Note

To keep track of time when the device is turned off, a real time clock powered by battery cell (CR2032 Lithium Cell 3V (solid soldered)) is built in the DCU. Discharging of the battery will result in losing track of time. Battery replacement every 10 years is recommended. The exchange of the Lithium battery cell should be performed only by RHOTHETA Elektronik GmbH or an authorized maintenance facility.

To change this setting press the hotkey “Edit Value” while the “Time Settings” line is marked (s. Figure 133, position 1).

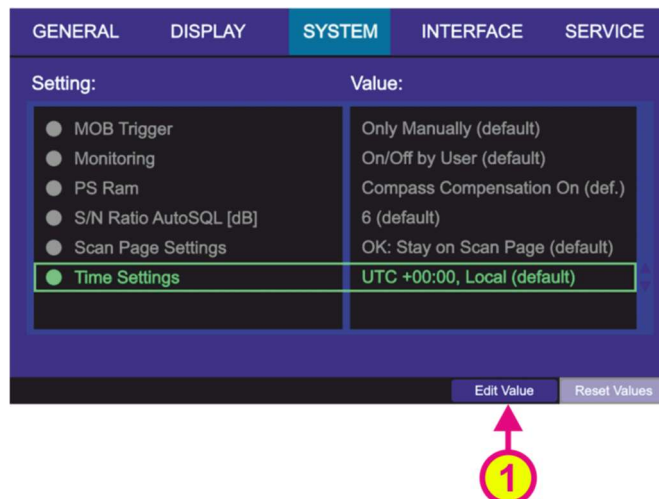


Figure 133. Selecting the time settings

The following dialog appears (s. Figure 134).

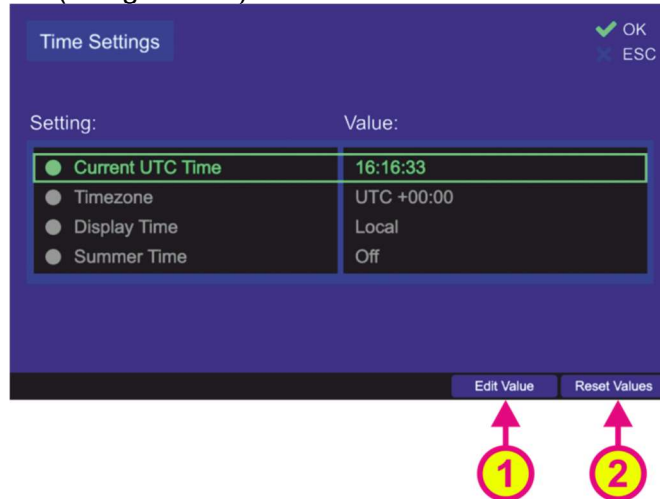


Figure 134. Time settings dialog

Note

If you press "OK" in this view, the current settings will be interpreted as the ones to be saved, which will cause the dialog to close again, saving these values.
In order to change the single settings always use the "Edit Value" hotkey.

To set the time settings to default, press the "Reset Values" hotkey (s. Figure 134, position 2).

Current UTC Time

This setting allows to adjust the UTC time value.

To change the UTC time value, press the hotkey "Edit Value", while "Current UTC Time" is marked (s. Figure 134, position 1).

Following dialog appears (s. Figure 135).

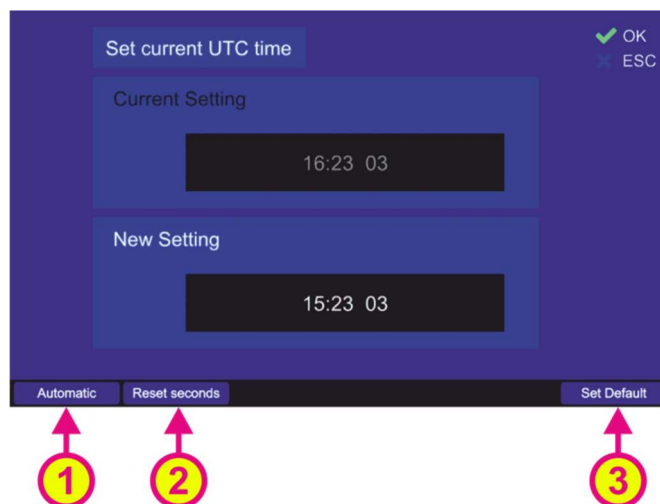


Figure 135. Changing the UTC time

- Enter the new value for the UTC time in the "New Setting" input field, using the numeric buttons of the DCU keypad ("hh:mm").
- Use the "Automatic" hotkey (s. Figure 135, position 1) to adopt the GPS time value (only if GPS data is available).

- By default the current seconds value is inherited to the new setting. To reset the seconds value to "00", press the "Reset seconds" hotkey (s. Figure 135, position 2).
- Use the "Set Default" hotkey (s. Figure 135, position 3) to reset the value to the default value (internal time of the DCU real time clock).

Note

The default time setting can differ from the actual UTC time.

- Confirm the changed value with "OK" or press "ESC" to leave the dialog without changing the current setting.

Timezone

With this setting the time zone of the local time can be selected.

To change the time zone value, press the hotkey "Edit Value", while "Timezone" is marked (s. Figure 136, position 1).

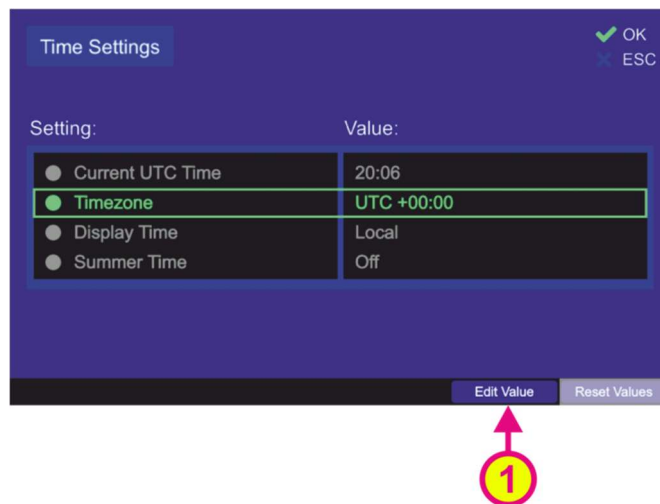


Figure 136. Selecting time zone setting

Following dialog appears.

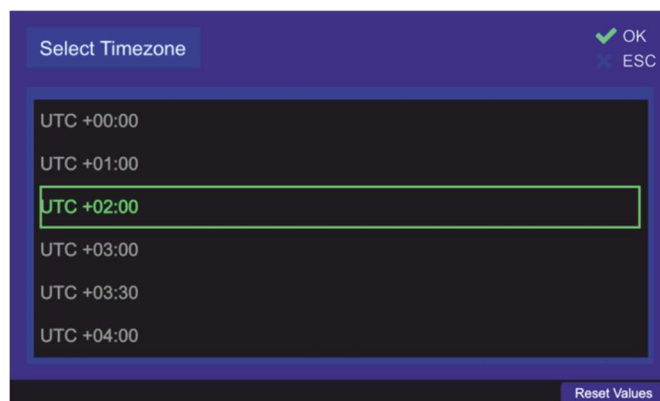


Figure 137. "Select Timezone" dialog

- Choose the proper time difference (local time) to the UTC time using the drop down dialog (s. Figure 137).
- Use the "Reset Values" hotkey to reset the value to the default value (UTC +00:00).

- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the current setting.

Display Time

With this setting it is possible to select whether the “UTC” or “Local” time should be used to display all time related indications in the DCU.

To change the display time value, press the hotkey “Edit Value”, while “Display Time” is marked (s. Figure 138, position 1).

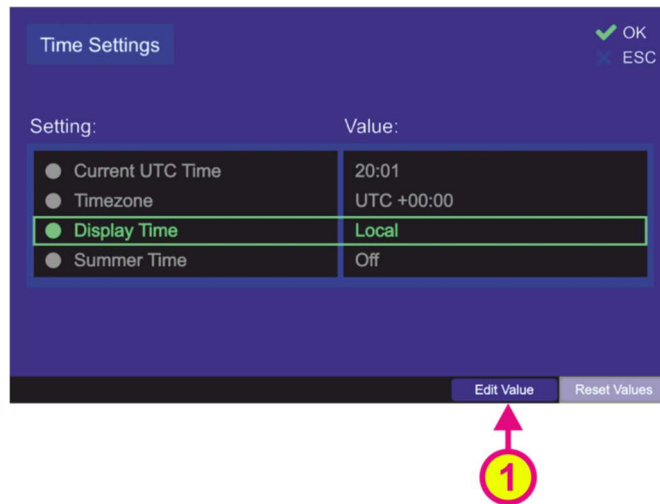


Figure 138. Selecting the "Display Time" setting

Following dialog appears.

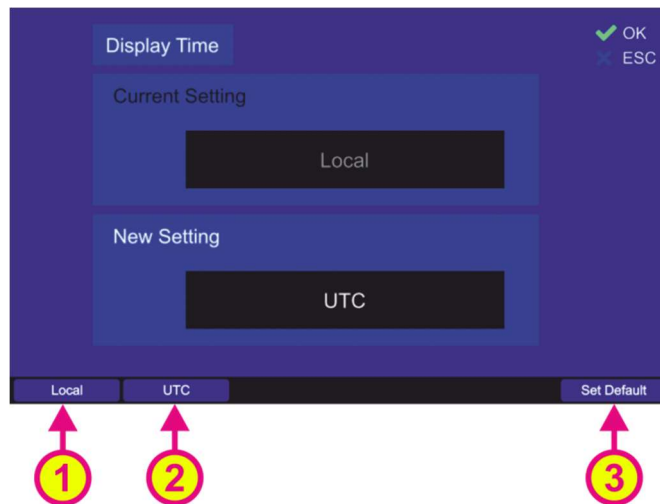


Figure 139. Changing the "Display Time" setting

- Choose the “Local” or “UTC” hotkey to set the desired variant of the time indication (s. Figure 139, positions 1 or 2).
- Use the “Set Default” hotkey (s. Figure 139, position 3) to reset the value to the default value (Local).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the current setting.

Summer Time

With this setting it is possible to select whether the summer time should be used to display all time related indications in the DCU.

Summer time means a time shift of +01:00 and is relevant for countries or parts of countries that are participating in daylight saving time.

To change the summer time value, press the hotkey “Edit Value”, while “Summer Time” is marked (s. Figure 140, position 1).

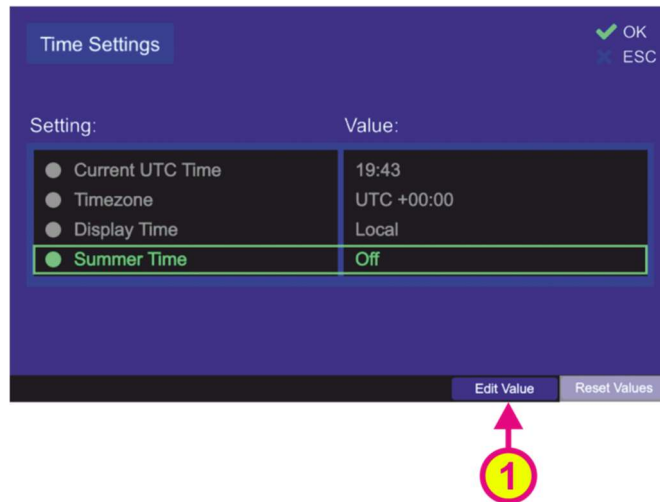


Figure 140. Selecting summer time setting

Following dialog appears.

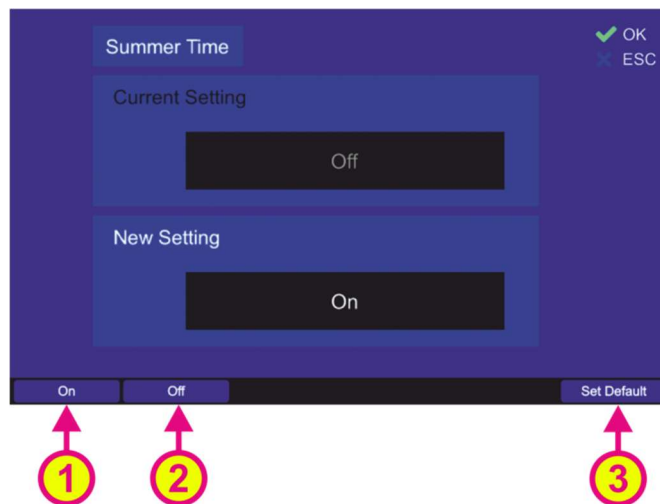


Figure 141. Changing summer time setting

- Choose the “On” or “Off” hotkey to set the desired variant of the time indication (s. Figure 141, positions 1 or 2).
- Use the “Set Default” hotkey (s. Figure 141, position 3) to reset the value to the default value (Off).
- Confirm the changed value with “OK” or press “ESC” to leave the dialog without changing the current setting.

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.

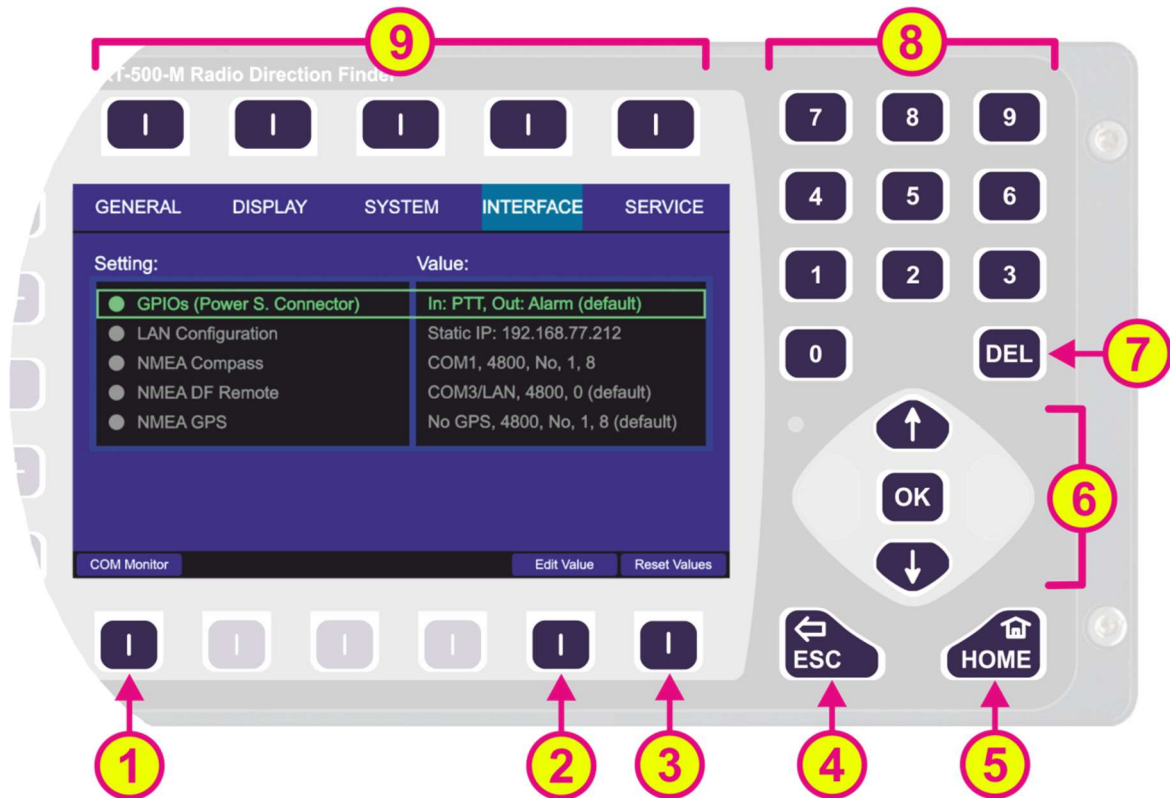



Figure 142. Setup page. Interface settings

Indication on Setup Page, Interface Settings

Pos.	Element	Meaning / Description
1	“COM Monitor”	Using this hotkey opens the dialog for monitoring the data that is currently being sent out or received via connected NMEA communication ports (s. 7.4.4.1). Only the data exchange that is currently happening is shown there, i.e. if the dialog is closed and opened again, the previously shown data is lost.
2	“Edit Value”	Depending on currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below).
3	“Reset Values”	Resets all values to the default settings (s. 13.4). The default values themselves cannot be changed by the user (RHOTHETA specification).
4		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 endpoint.


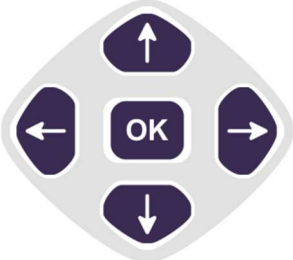

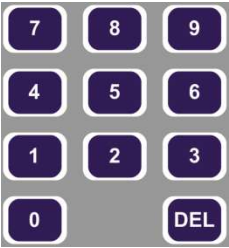
5		Pressing this button always leads to the Bearing Page. Even an opened dialog will be closed, without adopting the changed values.
6		“Up” and “Down” arrows are used to move between the display settings. “Right and “left” arrows have no function inside the interface settings” page. With the “OK” button confirming of values or opening the interface settings dialogs is accomplished.
7		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.
8		Numeric keys are used to enter the numerical characters inside the dialogs. On the top level of the page they have no function.
9	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 COM Monitor

The data exchange at the currently connected NMEA communication ports is visualized in this dialog. Only the data exchange that is currently happening is shown (corresponding communication ports must be connected correctly), i.e. if the dialog is closed and opened again, the previously shown data is lost.

No settings can be made via this dialog. It is for information only.

- To open the dialog for COM monitoring press the “COM Monitor” hotkey. Following dialog opens (s. Figure 143).

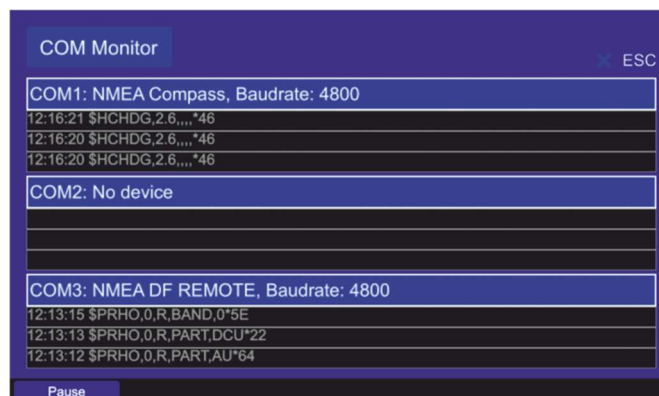


Figure 143. COM monitoring dialog

- The data is shown in real time, i.e. it is changing if the data is constantly changing. In order to freeze the display, press the “Pause” hotkey.
- To close the dialog, press the “ESC” button.

7.4.4.2 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.

Additionally, by choosing the combination “COMx¹ / LAN”, the NMEA sentences will be also sent via the LAN connection (s. Figure 144, 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).

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

- Press the button “OK” or hotkey “Edit Value”, while the setting “NMEA DF Remote” is marked (s. Figure 142).
Following sub-menu will appear (s. Figure 144).

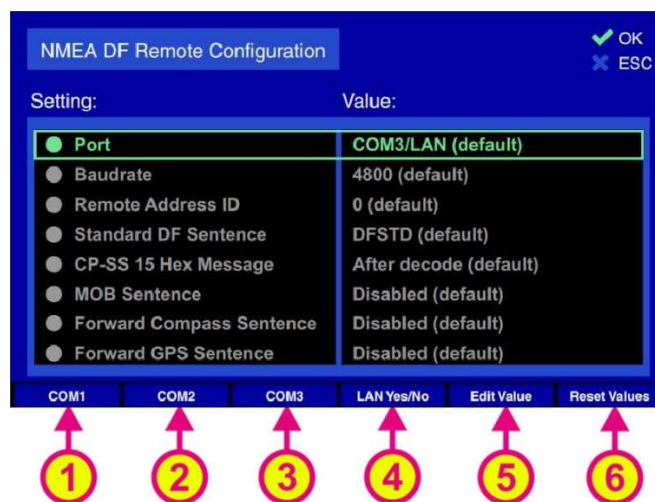


Figure 144. NMEA DF remote control configuration

The NMEA DF remote configuration is accomplished by the following settings:

- Port
- Baudrate
- Remote Address ID
- Standard DF Sentence
- CP-SS 15 Hex Message
- MOB Sentence
- Forward Compass Sentence
- Forward GPS Sentence

Pressing the hotkey “Reset Values” (s. Figure 144, position 6) 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”.

¹ “X” stands for the number of the interface

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.

- For changing the communication port, press either the hotkey “COMx” (s. Figure 144, positions 1, 2 and 3) or the hotkey “Edit Value” while the menu item “Port” is marked (s. Figure 144, position 5).
 - 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.
 - Pressing the hotkey “LAN Yes/No” (s. Figure 144, position 4) will turn on the additional communication over LAN (pressing this hotkey again will turn the LAN communication off, see also 7.4.4.3).
- If COMx and LAN are set for remote control, the priority between both is time-based.

Example:

- ➔ Command for squelch comes via LAN.
- ➔ Command 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.
- Pressing the hotkey “Edit Value” while “Port” is marked, opens the following sub-dialog (s. Figure 145).

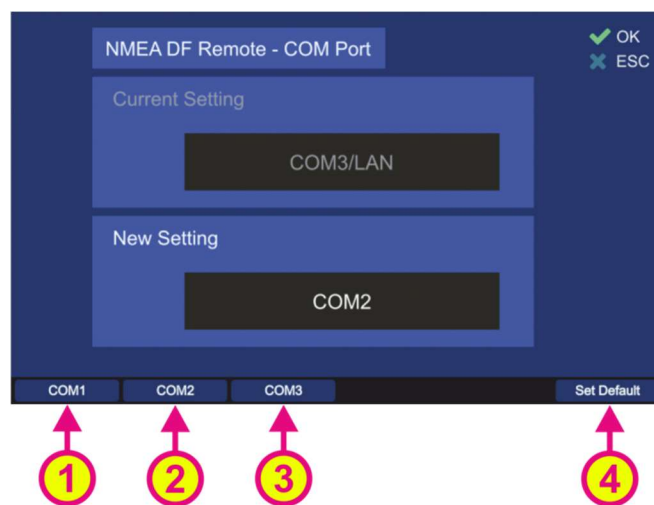


Figure 145. Remote communication port configuration

- Selecting “COMx” (s. Figure 145, 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 144, position 4).

- Press the hotkey “Set Default” to use the default value (COM3/LAN).
- 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 4800. The baud rate can be changed using this menu item.

For further information please see the document “NMEA-Protocol Description RT-500-M”.

- To change the baud rate, press the hotkey “Edit Value” while the menu item “Baudrate” is marked (s. Figure 144). The corresponding sub-dialog will be opened (s. Figure 146).



Figure 146. Remote control baud rate configuration

- Choose the new baud rate value in the drop-down menu.
- Press the hotkey “Reset Values” to use the default value of “4800”.
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

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). For further explanation please refer to the document “NMEA-Protocol Description RT-500-M”.

Note

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

The address ID can take values between 0 and 99.

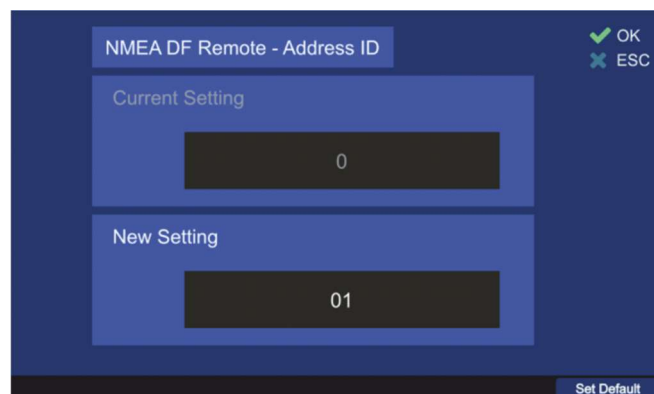


Figure 147. Remote control address ID configuration

- Use the number keys of the DCU keypad to enter the new value for the “Address ID”.
- Press the hotkey “Set Default” to use the default value of “0”.

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

Standard DF Sentence

Defines the NMEA output sentence of the direction finder.

The default DF output sentence of the NMEA interface is DFSTD. The standard DF output sentence can be changed using this menu item to DFVTS or DFBRG.

For further information please see the document “NMEA-Protocol Description RT-500-M”.

CP-SS 15 Hex Message

This setting defines, when the COSPAS-SARSAT 15 hex message will be sent over the NMEA interface.

The standard setting is after decoding, which means that the CP-SS 15 hex message will be sent over the NMEA bus immediately after receiving and decoding the COSPAS-SARSAT message.

The "After decoding" setting can be changed to an "On NMEA Request" setting using this menu item. The “On NMEA Request” setting implies that the COSPAS-SARSAT message, after being received and decoded by the direction finder, must be requested with a special command through the NMEA interface.

For additional details regarding the COSPAS-SARSAT data sentence, please refer to the document titled “NMEA-Protocol Description RT-500-M”.

MOB Sentence

This setting enables the transmission of the MOB (Man Overboard) message through the NMEA interface of the direction finder when the MOB function is activated on the device.

For additional details regarding the MOB data sentence, please refer to the document titled “NMEA-Protocol Description RT-500-M”.

Forward Compass Sentence

This setting enables the forwarding of compass data through the NMEA interface of the direction finder. The compass data is received from a compass connected to the DCU via a COM interface.

Forward GPS Sentence

This setting enables the forwarding of GPS data (only xxRMC) through the NMEA interface of the direction finder. The GPS data are received from a GPS device connected to the DCU via a COM interface.

7.4.4.3 LAN Configuration

The RT-500-M DCU can be connected to the Local Area Network of the vessel as well as the netmask and gateway for remote control can be configured.

To perform the network configuration of the DCU use the menu item “LAN Configuration”.

- Press the button “OK” or hotkey “Edit Value”, while the setting “LAN Configuration” is marked (s. Figure 142).

Following sub-menu will appear (s. Figure 148).

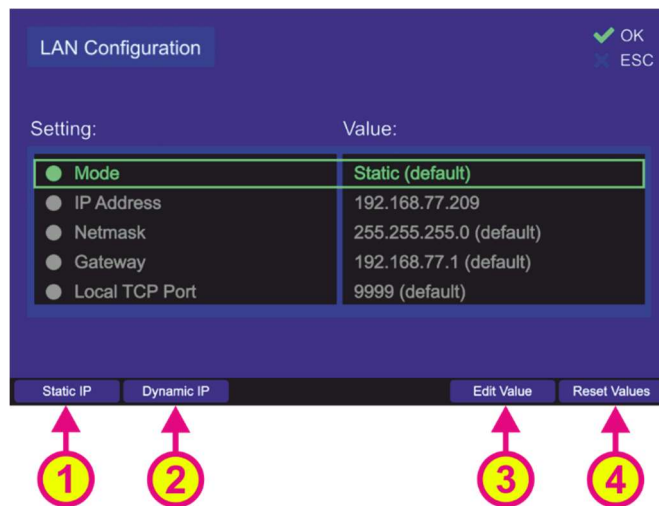


Figure 148. LAN configuration menu

Following settings can be configured:

- Mode of the IP address assignment
- IP address
- Netmask
- Gateway
- Local TCP Port

Pressing the hotkey “Reset Values” (s. Figure 148, position 4) will set all menu items to the default values.

The default setting after the first booting of the system is:

Mode: **Static IP**
 IP Address: **192.168.77.208**
 TCP Port for remote control: **9999**
 Netmask: **255.255.255.0**
 Gateway: **192.168.77.1**

Note

A maximum of eight users can be simultaneously connected to the DCU via network.

Mode

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.

- IP address assignment can be changed directly using the hotkeys “Static IP” and “Dynamic IP” (positions 1 and 2, s. Figure 148), 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 148, position 3) while this menu point is marked, the following dialog opens (s. Figure 149).

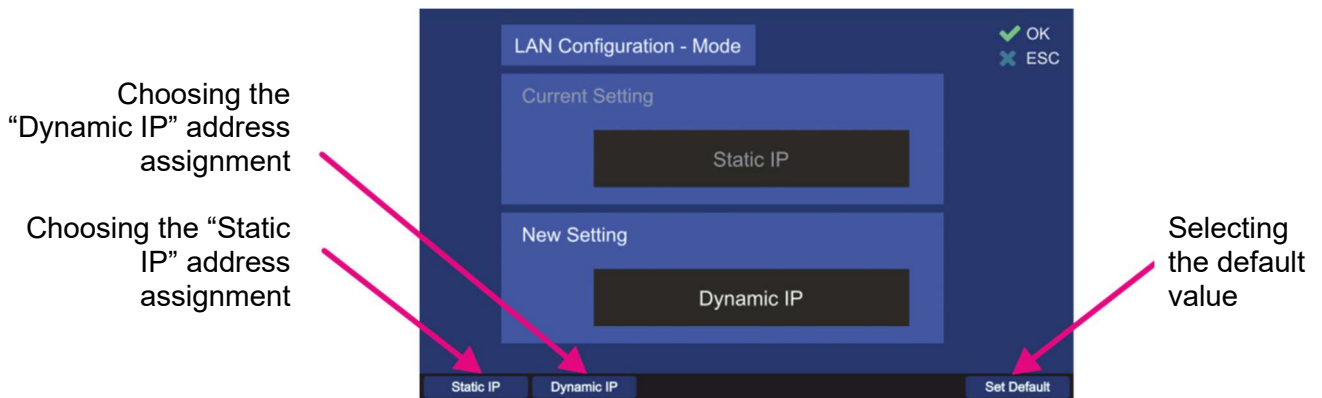


Figure 149. Changing the mode of the IP address assignment

- Choose the new setting using one of the hotkeys (s. Figure 149), which will then appear in the “New Setting” field.
- Press the hotkey “Set Default” to use the default value (“Static IP”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

IP Address

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

- For changing the IP address press the hotkey “Edit Value” while this menu point is marked (s. Figure 148, position 3). Following dialog opens (s. Figure 150).

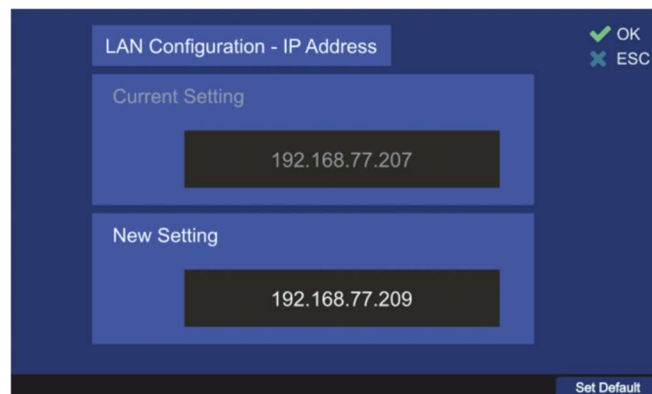


Figure 150. Setting the new IP address

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

Netmask

The default value for the netmask can be changed if necessary.

- For changing the netmask press the hotkey “Edit Value” while this menu point is marked (s. Figure 148, position 3).
Following dialog opens (s. Figure 151).

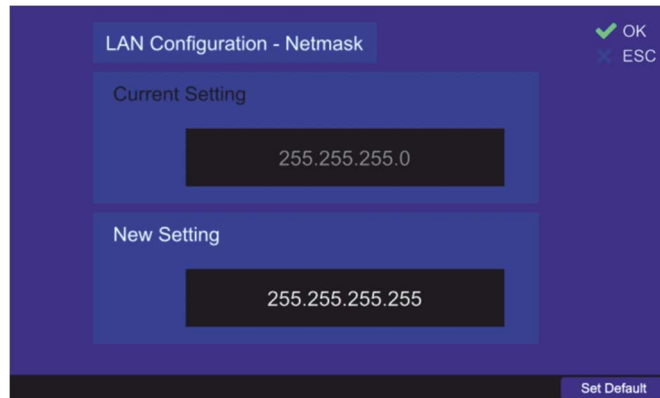


Figure 151. Changing the netmask value

- Use the number keys of the DCU keypad to enter the new value for the “Netmask” setting.
- Press the hotkey “Set Default” to use the default value “255.255.255.0”.
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

Gateway

The default value for the gateway can be changed if necessary.

- For changing the gateway press the hotkey “Edit Value” while this menu point is marked (s. Figure 148, position 3).
Following dialog opens (s. Figure 152).

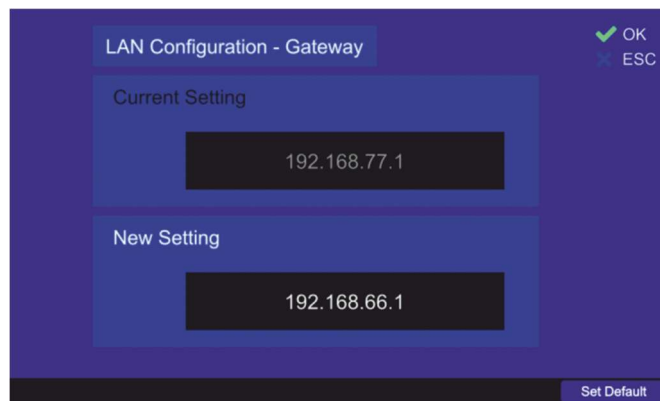


Figure 152. Changing the gateway value

- Use the number keys of the DCU keypad to enter the new value for the “Gateway” setting.
- Press the hotkey “Set Default” to use the default value “192.168.77.1”.
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

Note

After changing any setting in the “LAN Configuration” dialog, always confirm the changed settings with “OK” on the top level (second time).

- After confirming the changed settings on the top level of the dialog, a dialog for restart the system is opened (s. Figure 153).

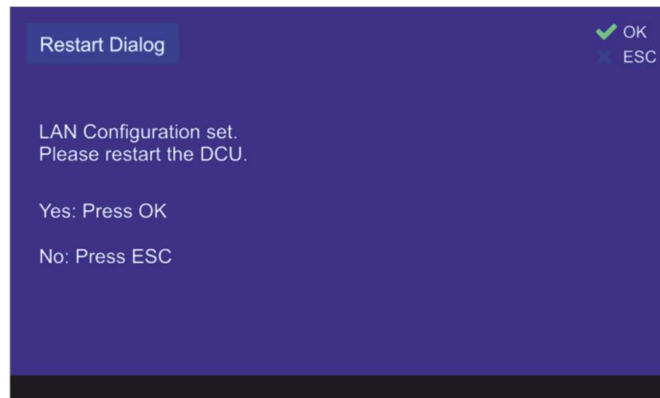


Figure 153. Restart dialog

Caution

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

Local TCP Port

The default value for the local TCP port can be changed if necessary.

- For changing the port press the hotkey “Edit Value” while this menu point is marked (s. Figure 148, position 3).
Following dialog opens (s. Figure 154).

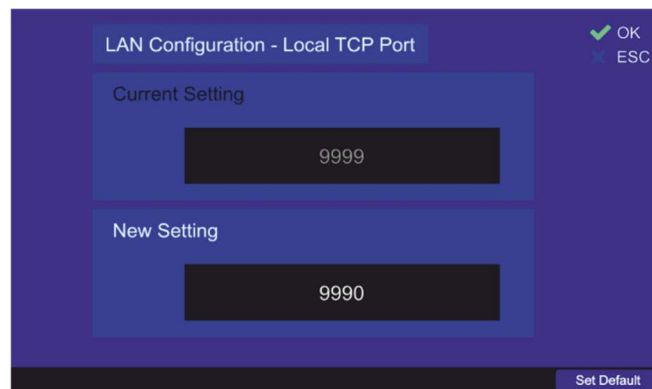


Figure 154. Changing the TCP port

- Use the number keys of the DCU keypad to enter the new value for the “Local TCP Port” setting.
- Press the hotkey “Set Default” to use the default value “9999”.
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

Note

After changing any setting in the “LAN Configuration” dialog, always confirm the changed settings with “OK” on the top level (second time).

- After confirming the changed settings on the top level of the dialog, a dialog for restart the system is opened (s. Figure 153).

7.4.4.4 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.

- Press the button “OK” or hotkey “Edit Value”, while the setting “NMEA Compass” is marked. Following sub-menu will appear (s. Figure 155).

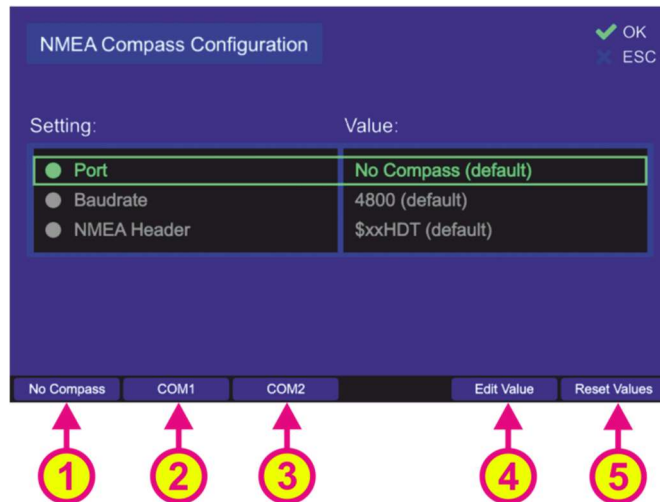


Figure 155. Compass configuration settings

There are three settings necessary to configure the NMEA compass connection:

- Port
- Baudrate
- NMEA header

Pressing the hotkey “Reset Values” (s. Figure 155, 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.

- The communication port can be changed by pressing one of the visible hotkeys, e.g.: “No Compass”, “COM1” or “COM2” (s. Figure 155, positions 1, 2 or 3), or the hotkey “Edit Value” while menu item “Port” is marked (s. Figure 155, position 4). Using the hotkeys 1, 2 or 3 on the top level dialog “NMEA Compass Configuration” (s. Figure 155), the value of the “Port” setting can be changed without opening the corresponding dialog.
- Pressing the hotkey “Edit Value” the following sub-dialog will be opened (s. Figure 156).

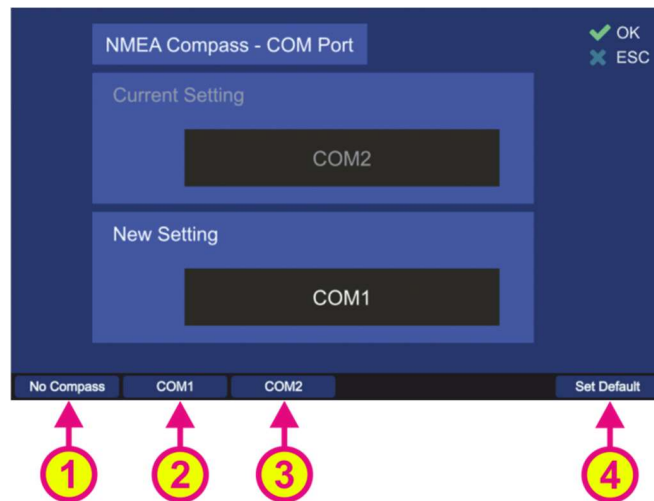


Figure 156. Compass connector setting

- Choose the new setting using one of the hotkeys (s. Figure 156), which will then appear in the “New Setting” field.
Selecting “COM1” or “COM2” (s. Figure 156, positions 2 and 3) configures the corresponding communication port as the input port for the external compass data. By choosing “No compass” setting (s. Figure 156, 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 (“No Compass”).
- 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 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”.

- To change the baud rate, press the hotkey “Edit Value” while the menu item “Baudrate” is marked (s. Figure 155). The corresponding sub-dialog will be opened (s. Figure 157).



Figure 157. Compass baud rate setting

- Choose the new baud rate value in the drop-down menu.
- Press the hotkey “Reset Values” to use the default value of “4800”.

- 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.

- In order to change the NMEA header setting, press the hotkey “Edit Value” while the menu item “NMEA Header” is marked (s. Figure 155). The corresponding sub-dialog will be opened (s. Figure 158).

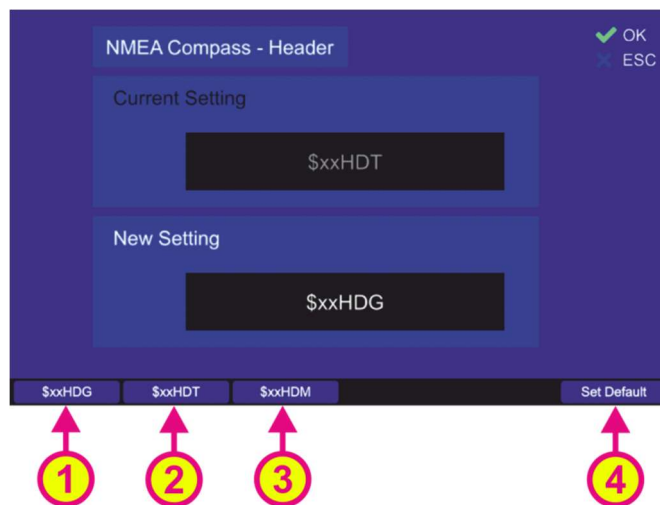


Figure 158. Compass header setting

- Choose the new setting using one of the hotkeys (s. Figure 158), which will then appear in the “New Setting” field:
 1. Selecting the “\$xxHDG” (heading, deviation and variation) header (position 1).
 2. Selecting the “\$xxHDT” (true heading) header (position 2).
 3. Selecting the “\$xxHDM” (magnetic heading) header (position 3).
- Press the hotkey “Set Default” (s. Figure 158, position 4) to use the default value (“\$xxHDT”).
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.4.5 NMEA GPS

The RT-500-M DCU is able to read external GPS data via a defined NMEA protocol. RT-500-M supports only the following GPS input sentences:

- GNRMC
- GPRMC
- GPGGA
- GPDTM

Note

The “--RMC” sentence has priority over the “--GGA” sentence.

Connect the external GPS device to one of the NMEA interfaces of the DCU. The GPS data format can be configured in this menu.

- Press the button “OK” or hotkey “Edit Value”, while the setting “NMEA GPS” is marked (s. Figure 142).
Following sub-menu will appear (s. Figure 159).

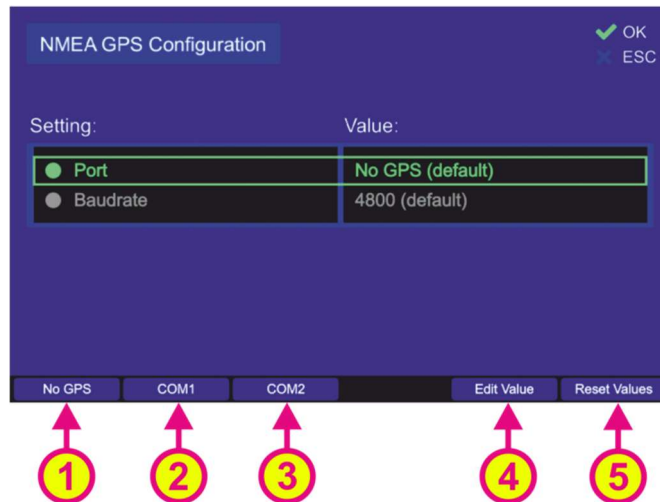


Figure 159. NMEA GPS configuration settings

The NMEA GPS configuration is accomplished by the following settings:

- Port
- Baudrate
- Pressing the hotkey “Reset Values” (s. Figure 159, 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 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 160. NMEA GPS communication port settings

- By selecting “No GPS” (s. Figure 160, position 1) the external GPS data will be ignored.
- Selecting “COMx¹” (s. Figure 160, 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.
- Press the hotkey “Set Default” (s. Figure 160, position 4) to use the default value (No GPS).
- 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”.

- To change the baud rate, press the hotkey “Edit Value” while the menu item “Baudrate” is marked (s. Figure 159). The corresponding sub-dialog will be opened (s. Figure 161).

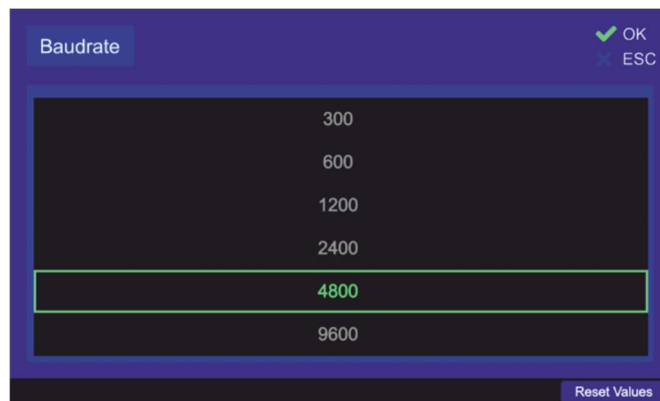


Figure 161. Changing the NMEA GPS baud rate setting

- Choose the new baud rate value in the drop-down menu.
- Press the hotkey “Reset Values” to use the default value of “4800”.
- Confirm the setting with “OK” or leave the dialog without adopting the new value by pressing “ESC”.

7.4.4.6 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.

- In order to define, which signals are to be allocated to the IOs, select the setting “GPIOs (Power S. Connector)” (s. Figure 142) and press “OK” or the hotkey “Edit Value”. The following dialog appears (s. Figure 162. Dialog for setting the GPIOs).

¹ “X” stands for the number of the interface

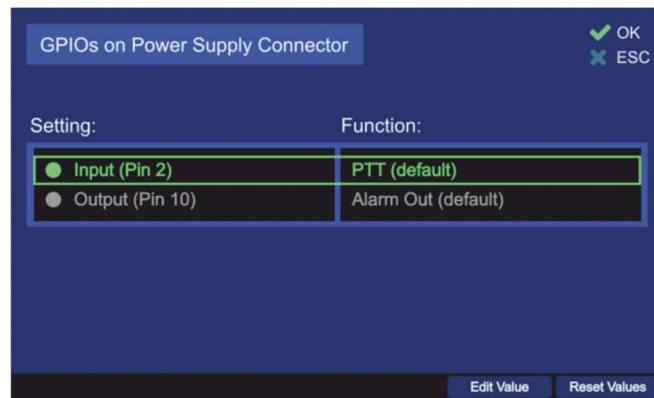


Figure 162. Dialog for setting the GPIOs

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.

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

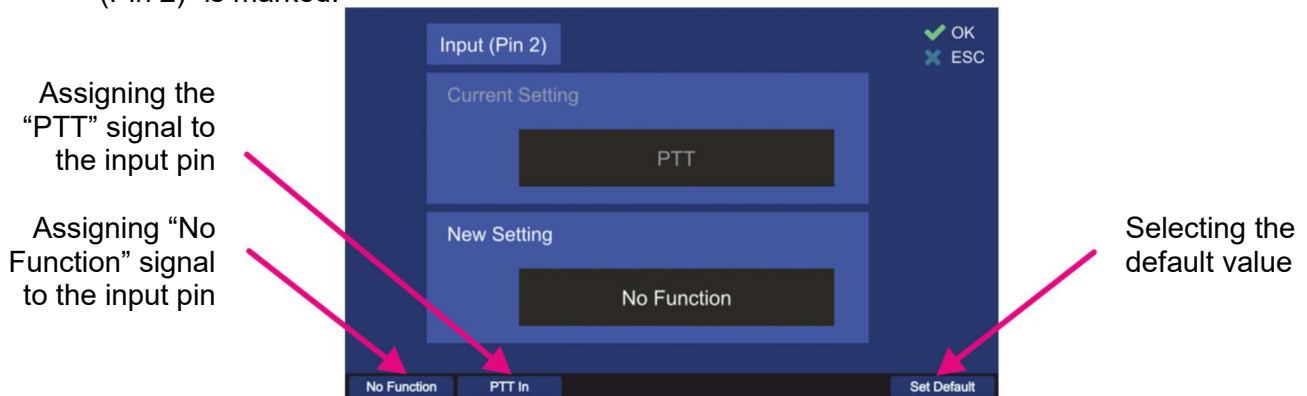


Figure 163. Assigning a function to the input pin

- Choose the new setting using one of the hotkeys (s. Figure 163), which will then appear in the “New Setting” field.
- Press the hotkey “Set Default” to use the default value (“PTT”).
- 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 164, position 2).
2. Squelch Out: Choosing this setting (s. Figure 164, 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 164, 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 164, position 1).
 - To configure the programmable output pin, press the hotkey “Edit Value”, while the setting “Input (Pin 2)” is marked.



Figure 164. Assigning a function to the output pin

- Choose the new setting using one of the hotkeys (s. Figure 164), which will then appear in the “New Setting” field.
- Press the hotkey “Set Default” (s. Figure 164, position 5) to use the default value (“Alarm Out”).
- 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.

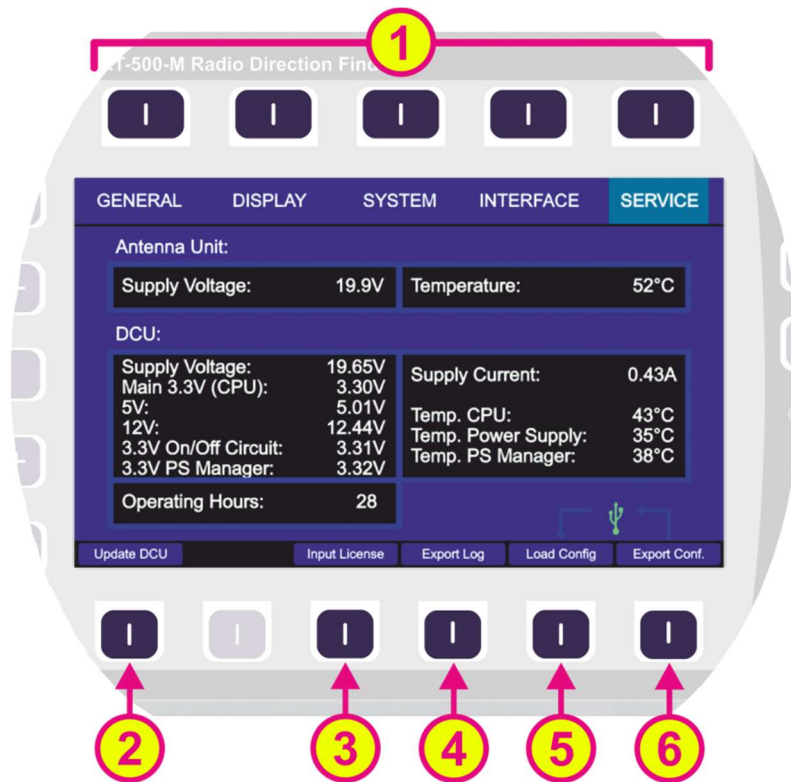


Figure 165. Setup page. Service menu

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.

Note

Depending on the connection set-up (cable length, etc.), the supply voltage/current values can slightly differ from the values that e.g. are adjusted on the power supply devices.

7.4.5.1 Update DCU

Caution

The supply of the device while updating must be stable!

Nothing may be connected/disconnected to/from the device during the update process!

The device must not be moved during the update to avoid power/USB disconnection.

Do not remove the USB flash drive until the update is complete!

The “Update DCU” dialog is opened by pressing the corresponding hotkey when the service menu is opened (s. Figure 165, position 2). To load new software use the USB interface (s. chapter 6.2, Figure 9, 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 166).

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”.

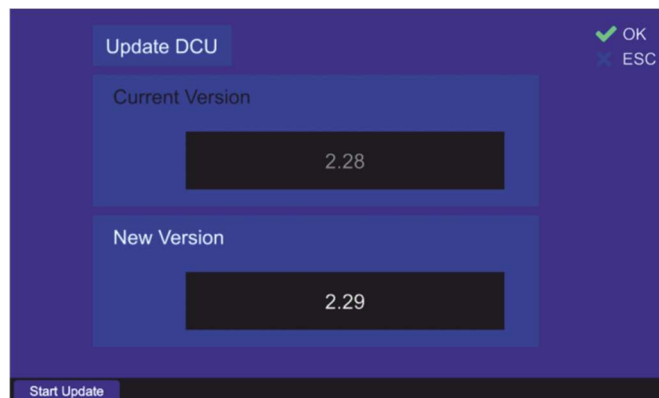


Figure 166. Update DCU dialog, new version available

- Pressing the hotkey “Start Update” will start the update from USB. During the update, the text of the hotkey changes to “Update...” (s. Figure 167) and the warning at the top of the display appears.

Approx. update time is 1 min.

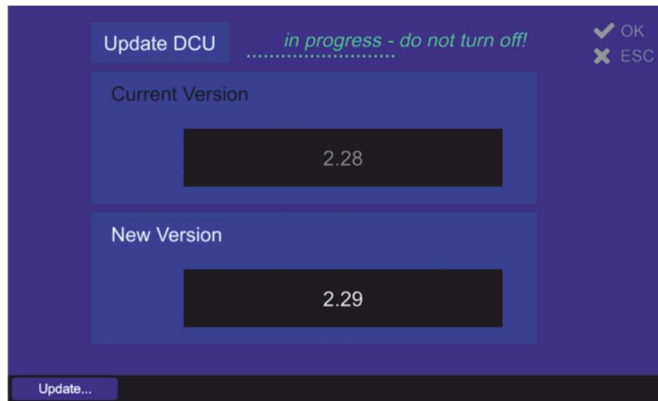


Figure 167. Update DCU in progress

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



Figure 168. Update of the DCU software finished

- Confirm the new software version with „OK“.
- After confirming the new software version, a dialog opens, which requests the restart of the system.

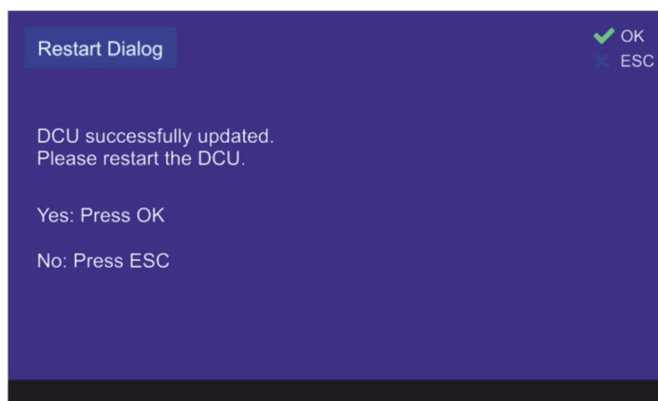


Figure 169. Restart dialog

Caution

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

If after the restart of the DCU the “Input License” dialog appears (s. 7.4.5.2), have the license you received from RHOTHETA ready and enter it here.

The indication of the new software version can be checked under the menu “General” (s. Figure 170).

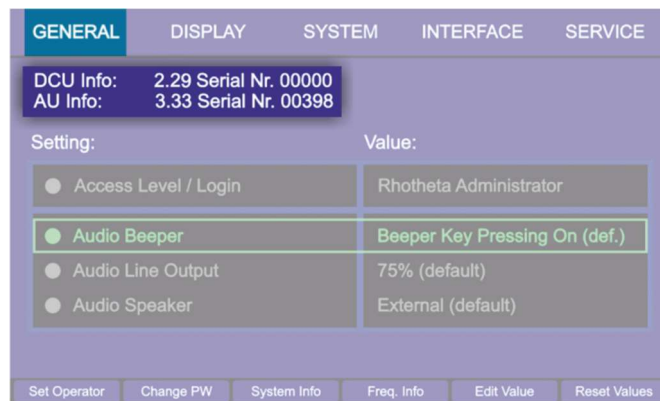


Figure 170. Update DCU control on the "General" page

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 165, position 3).

- You can input the new license either manually or load it from the USB flash drive.
- 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 7.1.2.3 under “Edit Name Sub-Dialog”).
- Use the number keys of the DCU keyboard for input of the numbers.

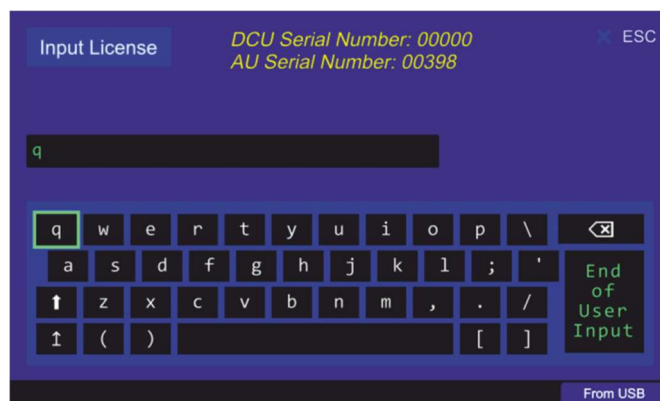


Figure 171. Input license dialog

- 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.
- 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 172).

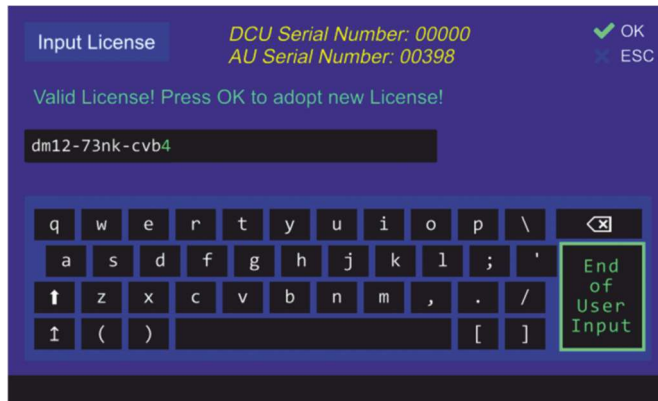


Figure 172. Input of a new license from USB

- After confirming the new valid license with “OK”, a dialog opens, which requests the restart of the system. (s. Figure 173).

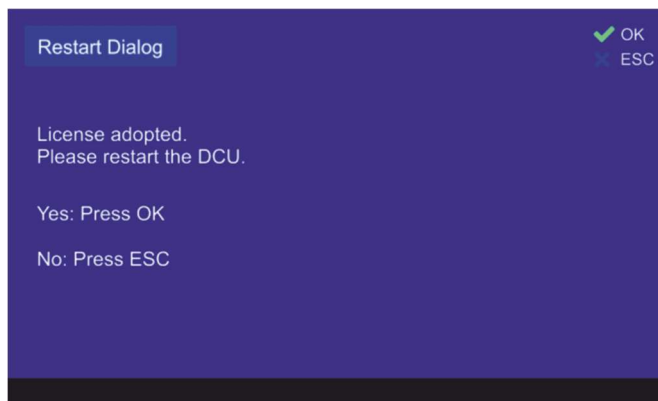


Figure 173. New license adopted

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 165, position 4).

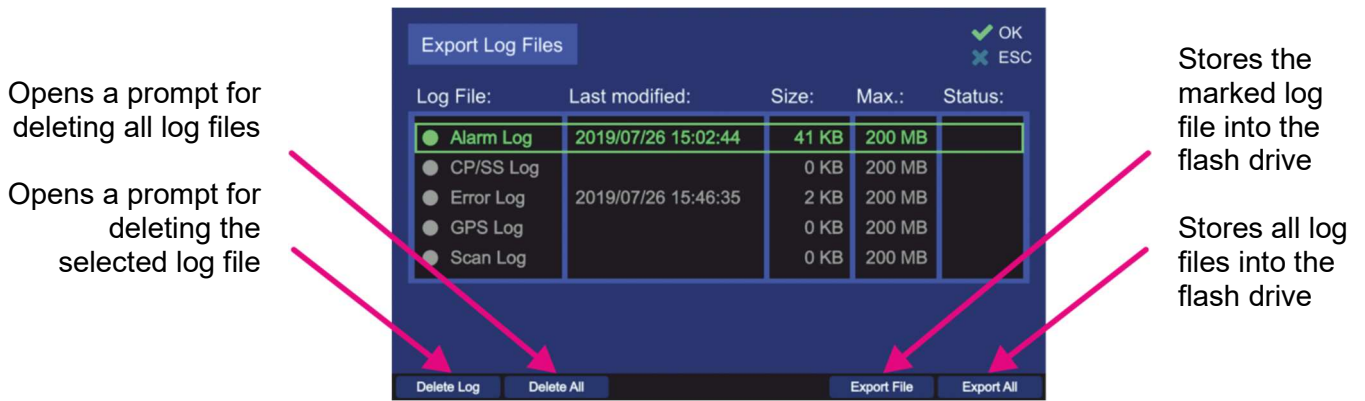


Figure 174. Export Log dialog

- Pressing the hotkey “Delete Log” will open the following window (s. Figure 175). Pressing “OK” will delete the currently marked file. Pressing “ESC” will close the dialog without deleting the log file.

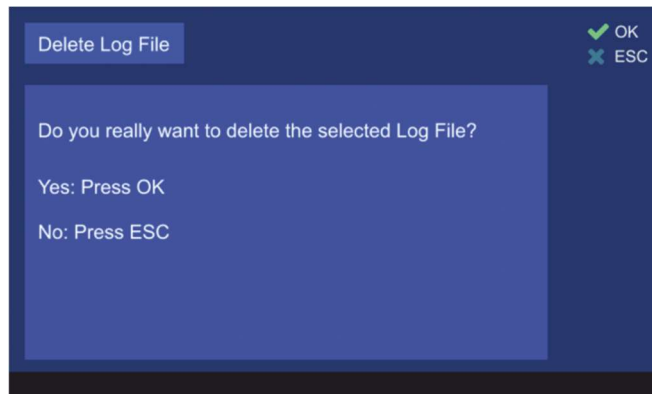


Figure 175. Confirming the deleting of the log file

- Pressing the hotkey “Delete All” will open the prompt dialog for deleting of all log files (s. Figure 176). Pressing “OK” will delete all log files. Pressing “ESC” will close the dialog without deleting the log files.

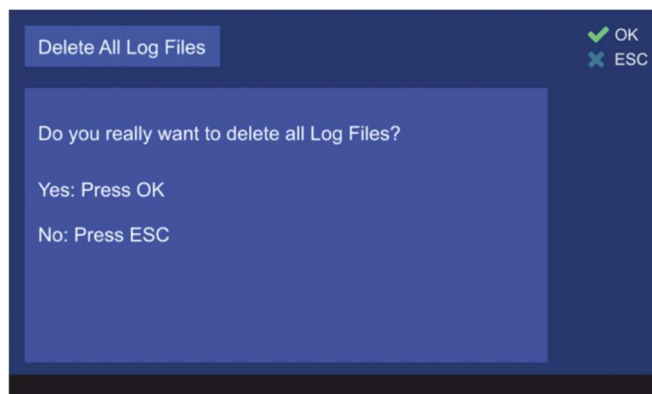


Figure 176. Confirming of deleting of all log files

- 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.

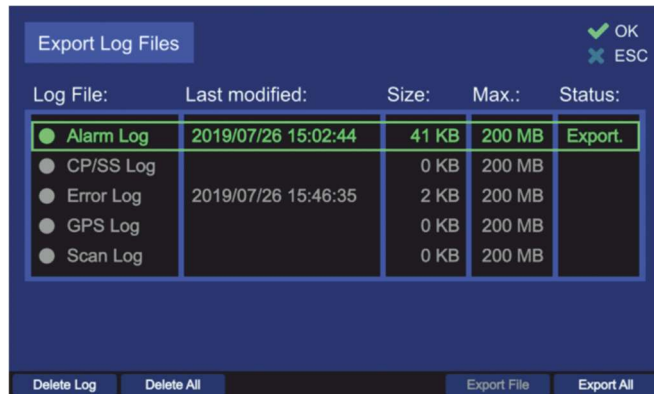


Figure 177. Exporting a log file finished

- 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.

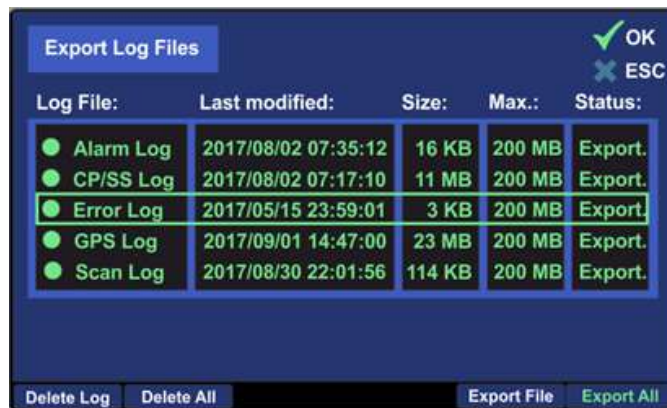


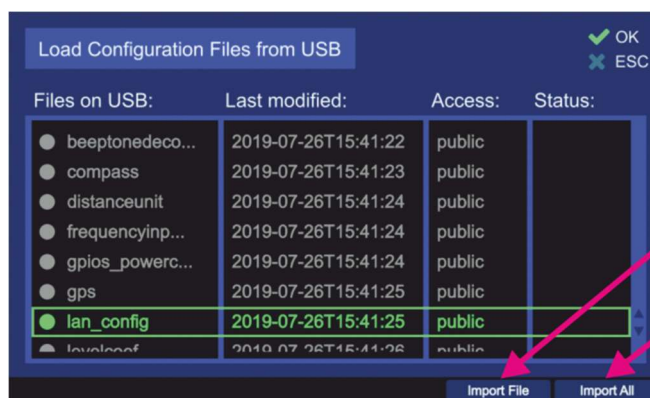
Figure 178. Exporting of all log files is in progress

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 165, position 5) is activated only if the USB flash drive was detected. Pressing this hotkey will open the following sub dialog (s. Figure 179).



Starts importing of the marked configuration file into the DCU

Starts importing of all available configuration files

Figure 179. Importing a log file

- 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 180).

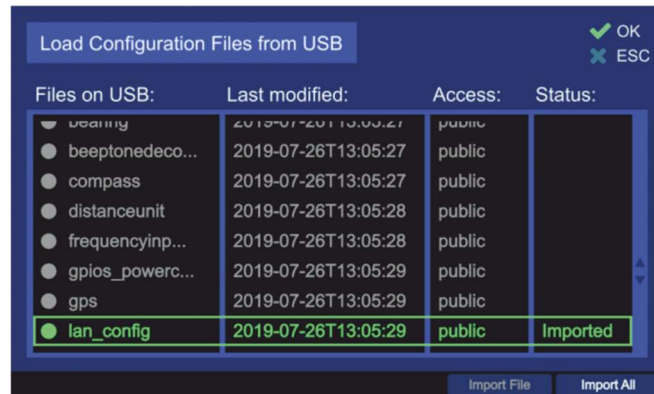


Figure 180. File imported

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

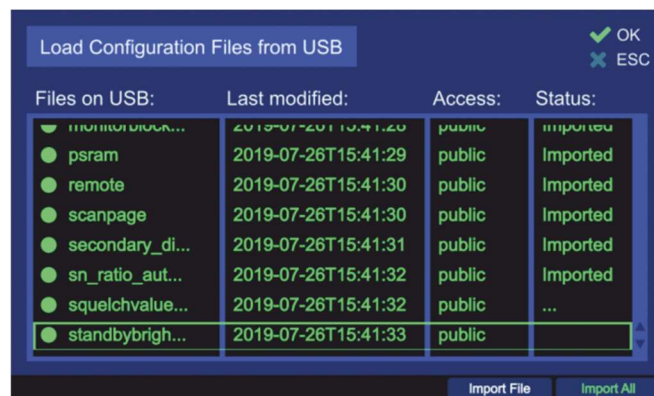


Figure 181. Importing of all files

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 165, position 6) is activated only if the USB flash drive was detected. Pressing this hotkey will open the following sub dialog (s. Figure 182).

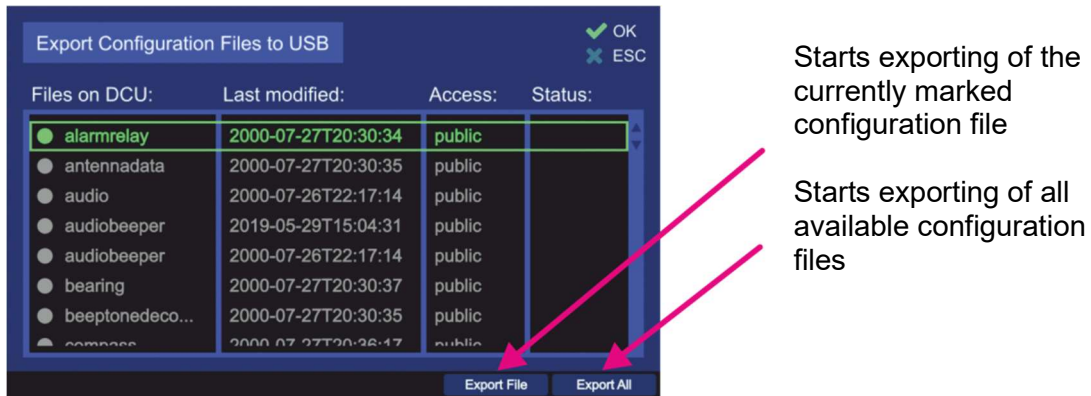


Figure 182. Export configurations dialog

- 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.

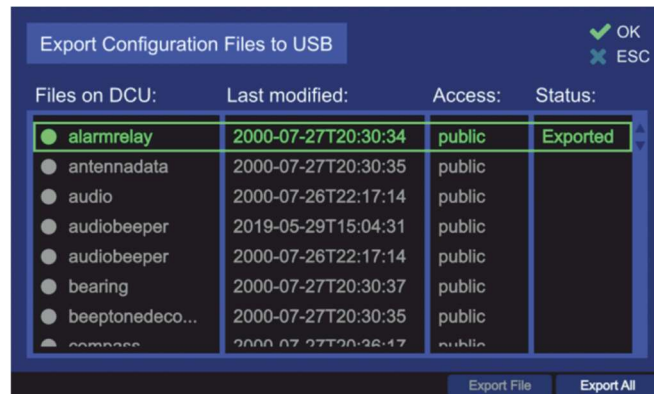


Figure 183. Export of a single file

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.

- Pressing the hotkey “Export All” will start importing all valid (“public”) configuration files to the flash drive.

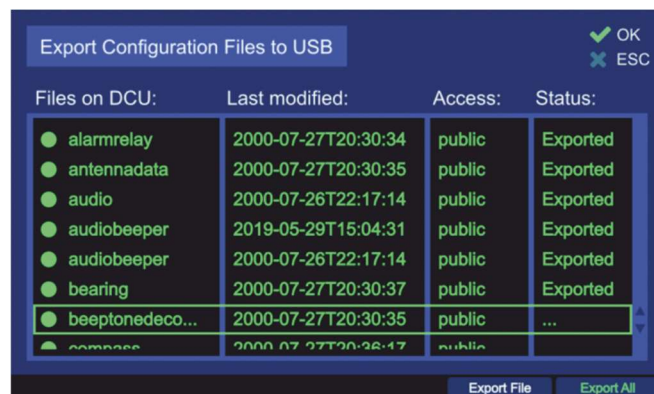



Figure 184. Export of all configuration files

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 Standby Mode

The RT-500-M DCU provides a “Standby” mode.

By pressing the button  (s. Figure 8, position 2), the standby mode is activated, and the button is highlighted in orange. The colored illumination intensity of this button (as well as the “Power” and “Mute” buttons (labeled “Keys”, s. 7.5.4)) can be adjusted in the “Adjust Brightness” dialog (s. 7.5.4).

While in standby, the brightness of the display is driven down to a defined value (configurable in the “Setup” page, s. 7.4.2.8), but the system continues monitoring the corresponding (emergency) frequency, and the keypad stays active.

After the activation of the standby mode the brightness of the legends and “Keys” stays at the previously adjusted value (to turn off the illumination of the legends refer to 7.5.4, to completely turn off the illumination of the “Keys” refer to 7.4.2.8, “STNBY Deactivation”).

Return from Standby:

- Pressing any button as well as the “STNBY” button itself returns the system from standby mode to normal operating mode (the function of the button pressed is not performed at the first press).
- The display is turned on again (by default) when an event occurs, e.g. signal level rises above squelch level, alarm occurs, scan algorithm finds an active frequency or any button (except the “Power” button) is pressed. This behavior can be changed to “Dark Mode” in “Standby Mode Settings” (s. 7.4.2.8).

Note

If the “Dark Mode” is activated while either the main bearing frequency is an emergency frequency or a scan with any emergency frequency is active, the occurrence of the corresponding signal will be indicated by the acoustic alarm even in the “Dark Mode”.


To switch off the alarm, the device must first be returned from the standby mode.

Note

Returning the device from standby mode by pressing the “Power” button does not work!

Especially in the “Dark Mode” the attention must be paid that if this button is pressed continuously for over 2 seconds, the device will be powered off. After turning on again, the device will work in the normal operation mode (not standby mode).

7.5.2 Adjusting the Volume

The volume adjustment button  (s. Figure 8, 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.

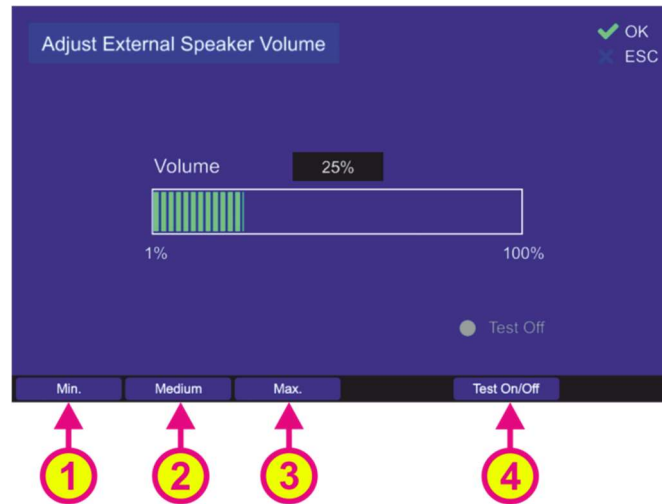



Figure 185 "Adjust External Speaker Volume Dialog"


- Use hotkey "Min." (s. Figure 185, position 1), "Medium" (Figure 185, position 2) and "Max." (Figure 185, position 3) in order to set an appropriate volume.
- Use hotkey "Test On/Off" (Figure 185, position 4) in order to test volume.

To switch the volume on/off quickly, use the mute-button  (s. Figure 8, position 4).

7.5.3 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.

- Pushing the button  “+” or “-” (twin function key, s. Figure 8, position 6): opens the following dialog:

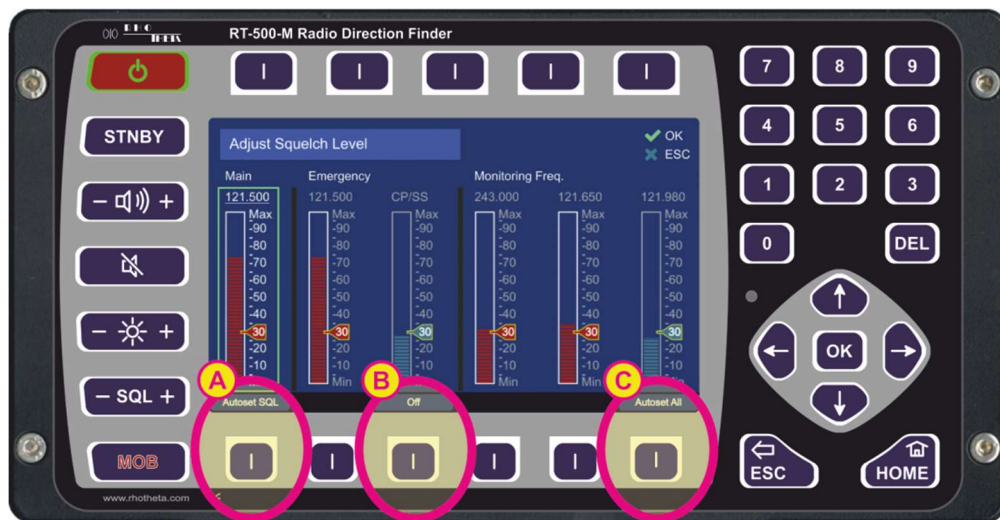






Figure 186. Squelch Dialog

- 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”).



Note

While operating on the noise edge or inside the noise (e.g. in order to find weak signals), the warnings “22” or “23” (s. 13.2) can occur, if the received signal has a positive or negative offset of the currently set bearing frequency. This might be caused by the irregular noise power spectrum distribution.

7.5.4 Dimming and Day/Night Mode

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

The button  (twin function key, s. Figure 8, position 5) has two keys (“-“, “+“) to adjust the brightness of:

- “Display”: backlight of the display
- “Keys”: colored illumination of the three buttons:    , which is turned on, when the corresponding function is active.
- “Legends”: backlight of the keypad legends

Pressing one of these keys (“-“ or “+“) will open a dialog with a brightness indication and already decrease or increase the brightness of the marked item.

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.

The RT -500-M DCU (with software revision higher than [Rev 2.00]) has a “Night” mode available, which facilitates a quick change to the darker color scheme of the display at the push of a button, or automatically, depending on the chosen settings (for night mode settings please see the chapter 7.4.2.9).

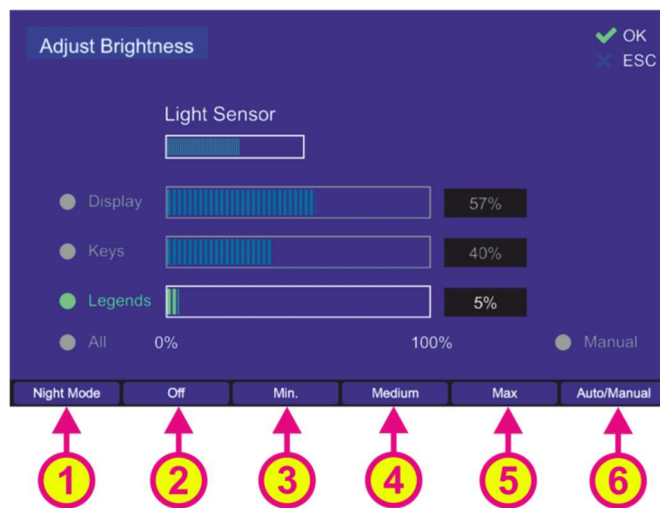


Figure 187 "Adjust Brightness Dialog"

- Use the hotkey “Night Mode” (s. Figure 187, number 1) to switch over to the night mode manually.

After pressing the hotkey “Night Mode” the display changes to the following color scheme (s. Figure 188).



Figure 188. "Adjust Brightness Dialog" in night color scheme

- Use the "Up" and "Down" arrow buttons on the DCU keypad to select between the items to adjust:
 - Display
 - Keys
 - Legends
 - All
- The hotkey "Off" (s. Figure 187, number 2) is only available if "Legends" is selected. Pressing this hotkey deactivates the illumination of the legends.
- Use the hotkey "Min." (s. Figure 187, position 3), "Medium" (s. Figure 187, position 4) and "Max." (s. Figure 187, position 5) in order to set the appropriate luminosity quickly.
- Use "Left" and "Right" arrow buttons of the DCU keypad to increase or decrease brightness of the selected items in one-percent steps.
- Use the hotkey "Auto/Manual" (s. Figure 187, position 6) in order to set the automatic or manual brightness adjustment mode. The currently selected adjustment mode is indicated above this hotkey.
In the "Auto" mode the luminosity of items will be adjusted automatically based on the light-sensor value.

Note

It is possible to change the brightness settings also in the "Auto" mode. Please, pay attention that this will not simply change the current brightness!

If you change the brightness settings in the "Auto" mode, the new values will be coupled to the light-sensor's middle position and taken as the starting point for automatic brightness adjustment. Since the brightness is regulated from light-sensor's zero-point ("Middle") and has maximum 50 percent-points in both directions, the regulation will not behave equably, when the zero-point was displaced from the "Middle" position.

This means that if e.g. the "Display" brightness was set to "+70%" in the "Auto" mode, it will never reach the "0%" at the "Minimum" point of the light sensor (because the "Middle" of the light sensor is now coupled to the 70% brightness value). The darkest value will then be "20%" (and the brightest will still be 100% as the level 120% does not exist).

- Confirm the changed value with "OK" or press "ESC" to leave the dialog without saving the changes.

Note

Always finish the dimming (day/night mode) adjustment with pressing the "OK" button. Otherwise the changes will not be saved.

7.5.5 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 8, 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 189 "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 7.4.3.9).

Note

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

Pressing the MOB button, when no GPS data is available will generate a warning message (for more information s. chapter 7.4.3.9 und Figure 127).

The following figure shows the “Man Over Board” dialog.

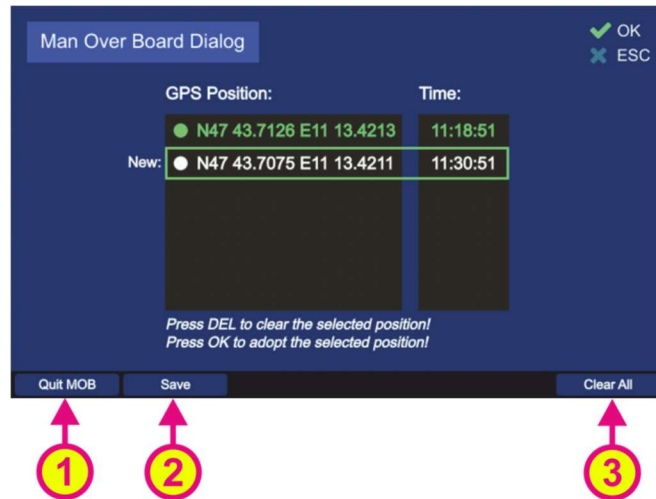


Figure 190. "Man Over Board" dialog

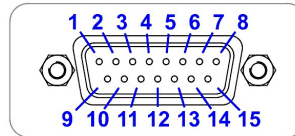
- Press "Quit MOB" (s. Figure 190, position 1) to quit the dialog. This hotkey is used to quit the MOB mode. By pressing this hotkey an extra dialog will appear for additional confirmation.
- Press "Save" (s. Figure 190, position 2) to save the current GPS position. Pressing this hotkey will save the 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.
- 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.
- Press "Clear All" (s. s. Figure 190, 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 the status of the On/Off button. (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} Note The audio exit is a symmetric push-pull amplifier. None of the speaker signals may be connected to the ground!
11	Speaker -	
13	Audio Line Out	Symmetric audio exit Adjustable under Setup/General, 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 output (open collector): - Alarm - Status - Squelch - No function Max. current 200 mA.

Table 16. Power & I/O Connector

8.2 Necessity of a DC/DC-converter

Warning

The voltage supply is not galvanically isolated from the frame.
If desired, e.g. in order to prevent current flow to the ground of the vessel, a DC/DC-converter must be adapted.

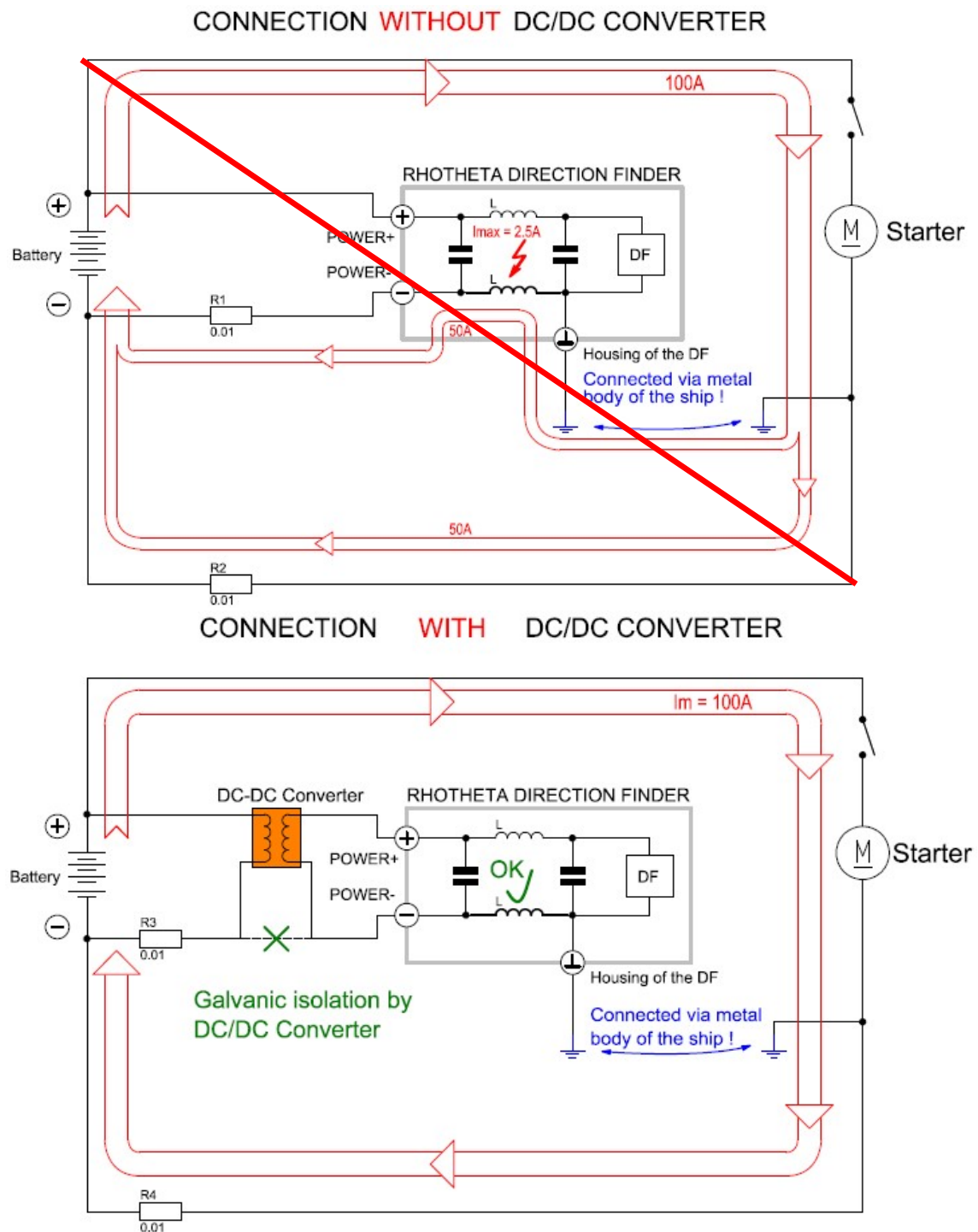
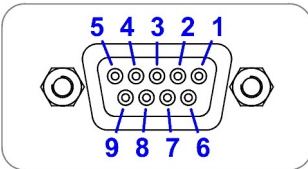


Figure 191. Recommended connection of the DF

8.3 Antenna Unit (Connecting Cable DCU ⇔ AU)

8.3.1 Pinning Antenna Unit Connector

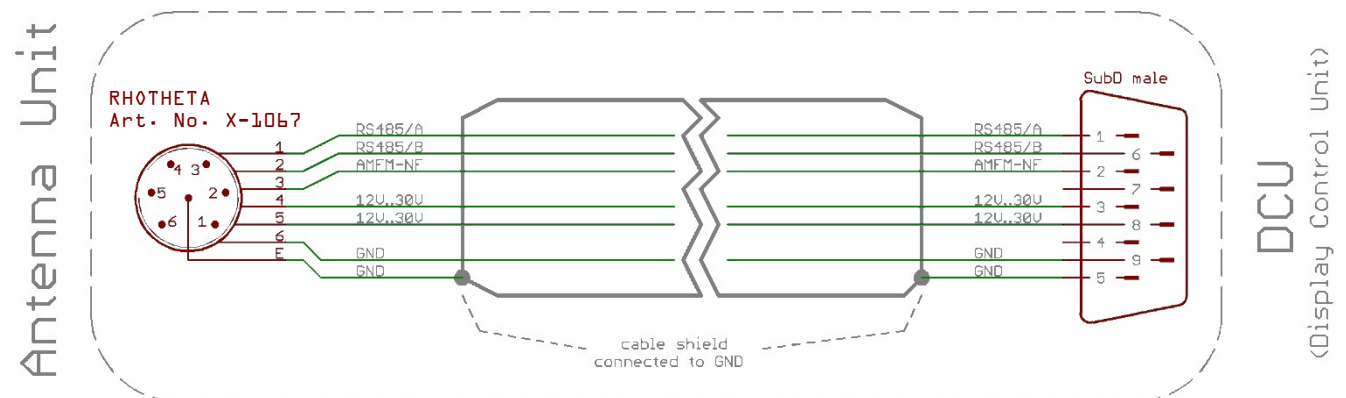
Antenna Unit
(RT-500-M / AU)



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)

Table 17. Pinning of the AU Connector

8.3.2 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 to 100 m: cross-section of conductor min.
6 x 0.50 mm²

Connector type:
SubD 9-poled male

8.4 NMEA COM-Interfaces

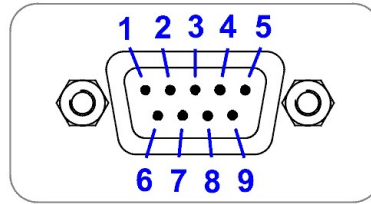
All 3 COM-Interfaces COM1, COM2, and COM3 have the same pinning.

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 / B	Output of serial data with RS422 level
1	RS422 Tx / A	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).

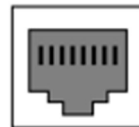
8.5 LAN Interface

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).

1 2 3 4 5 6 7 8



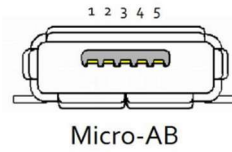
RJ-45
Female

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

8.6 USB Service Interface

The USB 2.0 connector is used only for service purposes.



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

Table 20. Pinning USB

8.7 Ground Connector

The ground connector (s. Figure 9, position 7) 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.

8.8 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 $\pm 45^\circ$ 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.

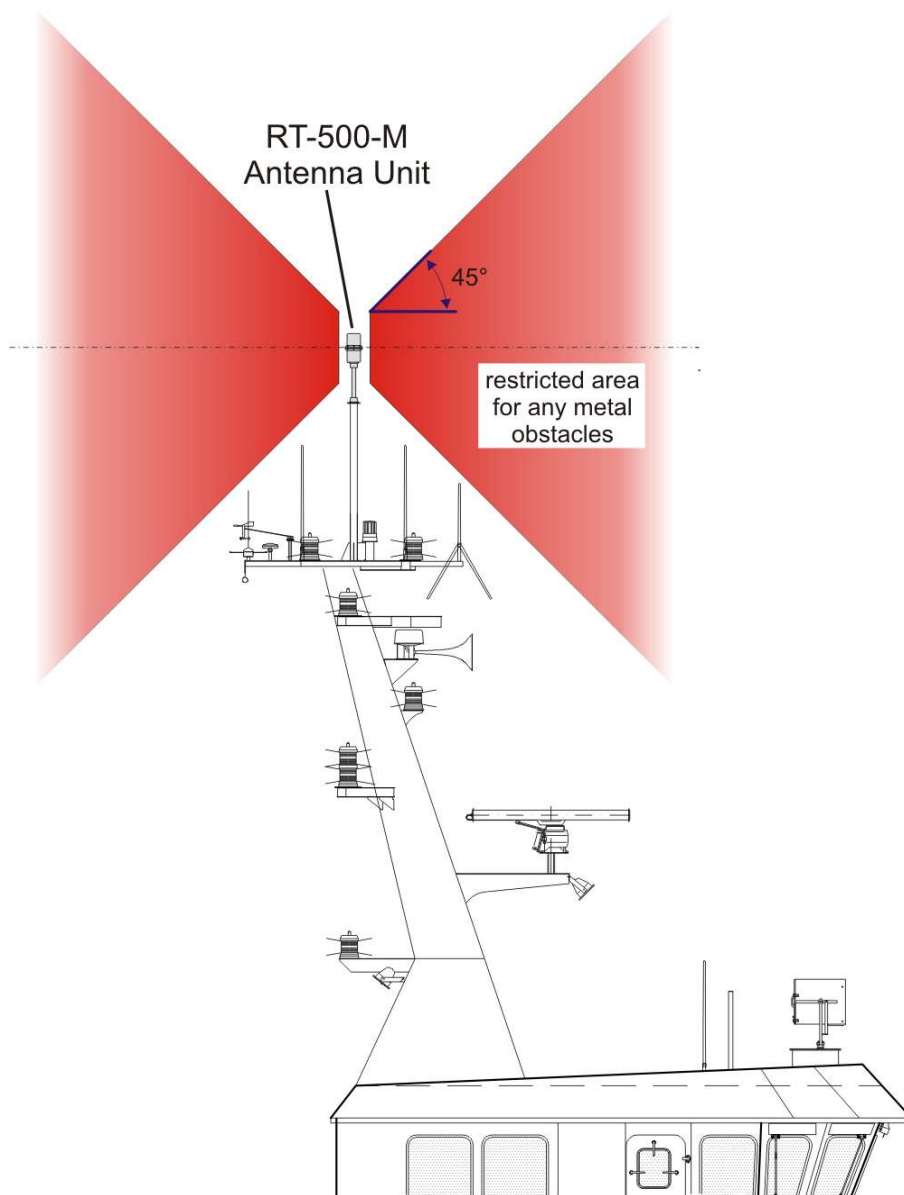


Figure 192. "Example of Optimal DF Antenna Position"

9 Technical Data

9.1 Electrical Characteristics

System Characteristics		
Parameter	Condition	Data
Method of Bearing		Doppler (3 kHz rotation frequency)
Bearing Accuracy		$\leq 5^\circ$ 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 ($\pm 5^\circ$ bearing fluctuation)	VHF Air Band	$\leq 4 \mu\text{V/m}$ / $2.5 \mu\text{V/m}$ typical
	Marine Band	$\leq 3 \mu\text{V/m}$ / $2 \mu\text{V/m}$ typical
	Extended Marine Band above 174 MHz	$\leq 5 \mu\text{V/m}$ / $3 \mu\text{V/m}$ typical
	UHF Air Band	$\leq 6 \mu\text{V/m}$ / $4 \mu\text{V/m}$ typical
	COSPAS-SARSAT	$\leq 6 \mu\text{V/m}$ / $4 \mu\text{V/m}$ typical
	UHF FM-Band	$\leq 6 \mu\text{V/m}$ / $4 \mu\text{V/m}$ 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		<ul style="list-style-type: none"> Scanning of all 19 COSPAS-SARSAT channels Decoding of COSPAS-SARSAT Message: shows beacon ID, GPS position and whole message string (short and long) Displays direction and distance to beacon².
TFT Graphic Display		<ul style="list-style-type: none"> 5" (127 mm), 24 bit RGB 800 x 480 x 3 dots Max. brightness: > 500 cd/ m² (typical 800 cd/m²) Dimming: manual and automatic
Audio	Internal Speaker	1 W, 8 Ohm
	External Speaker	1 W, 8 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 Standby: 7 W
Current Consumption		Max. 1.5 A
Interfaces		<ul style="list-style-type: none"> 3x NMEA 0183 (RS422) 3x RS232 Ethernet LAN (NMEA over LAN) Test port (RS-232) Alarm Relay Output (1 A, 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
Real Time Clock Battery		Battery Type: CR2032 Lithium Cell 3V (solid soldered)

Table 21. 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

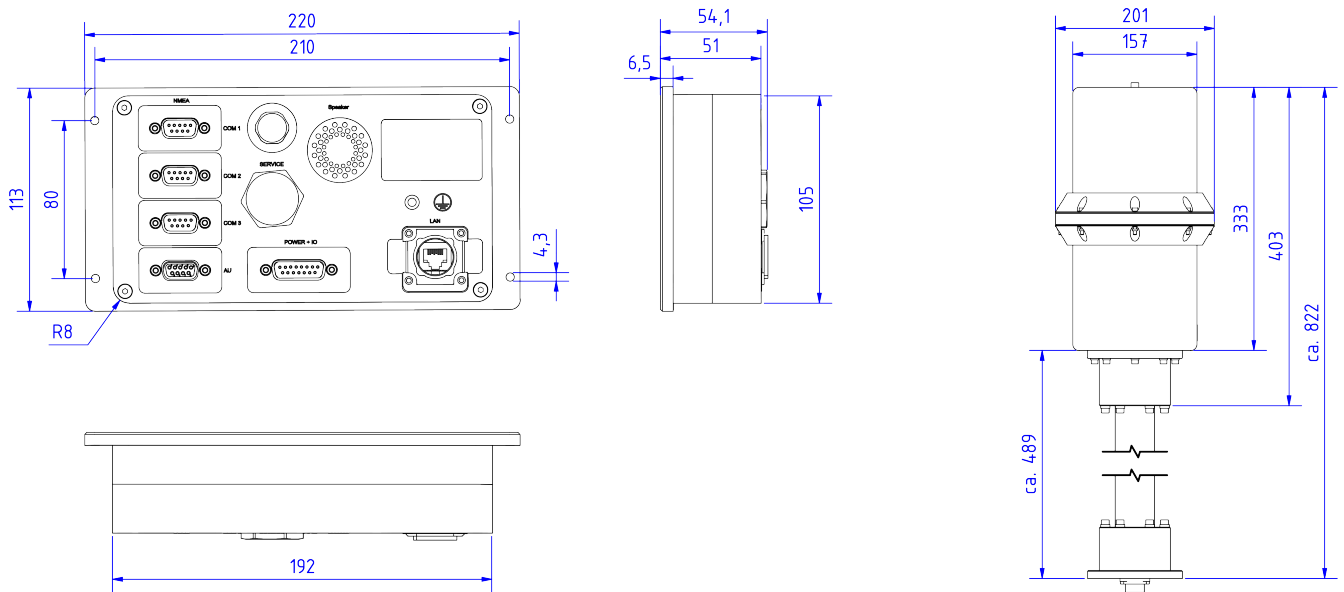


Figure 193. DCU and AU mechanical dimensions

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	-30 °C to +80 °C (-22 °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 22. Mechanical Characteristics

9.2.2 DCU Mounting Cutout

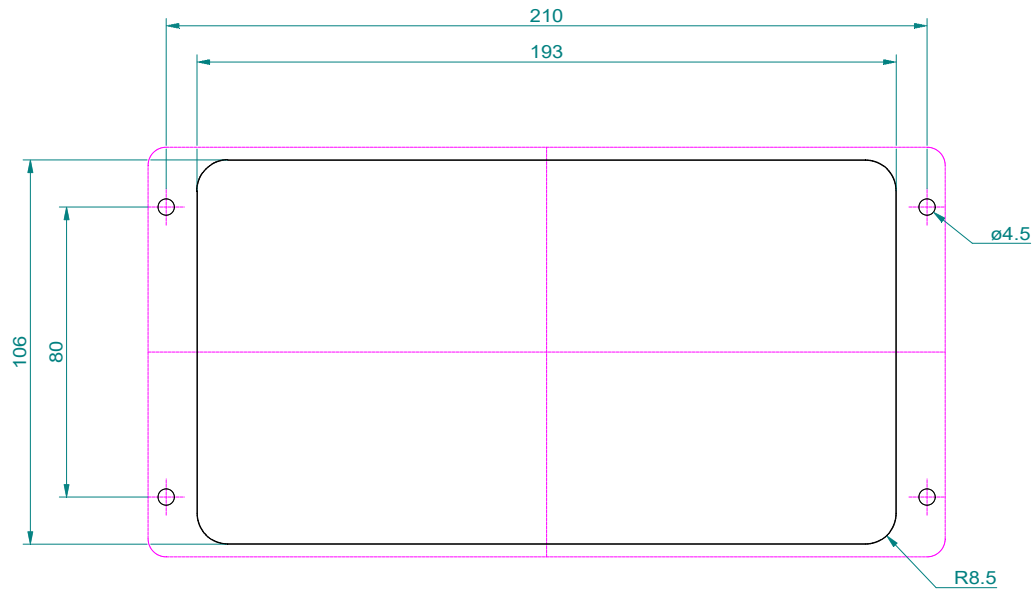


Figure 194. DCU mounting cutout

Measuring units: [mm] millimetres

9.2.3 AU Mast Flange

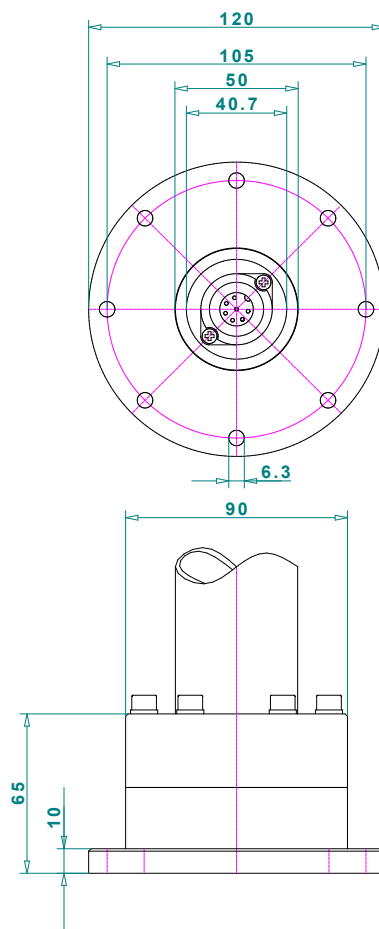


Figure 195. Antenna unit mast flange. Mechanical dimensions.

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/EU) 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

12.1.1 Front foil of the RT-500-M DCU

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.

12.1.2 Battery of the real time clock

To keep track of time when the device is turned off, a real time clock powered by battery cell is built in the DCU. Discharging of the battery will result in losing track of time. The Real time clock battery replacement every 10 years is recommended.

The exchange of the Lithium battery cell should 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

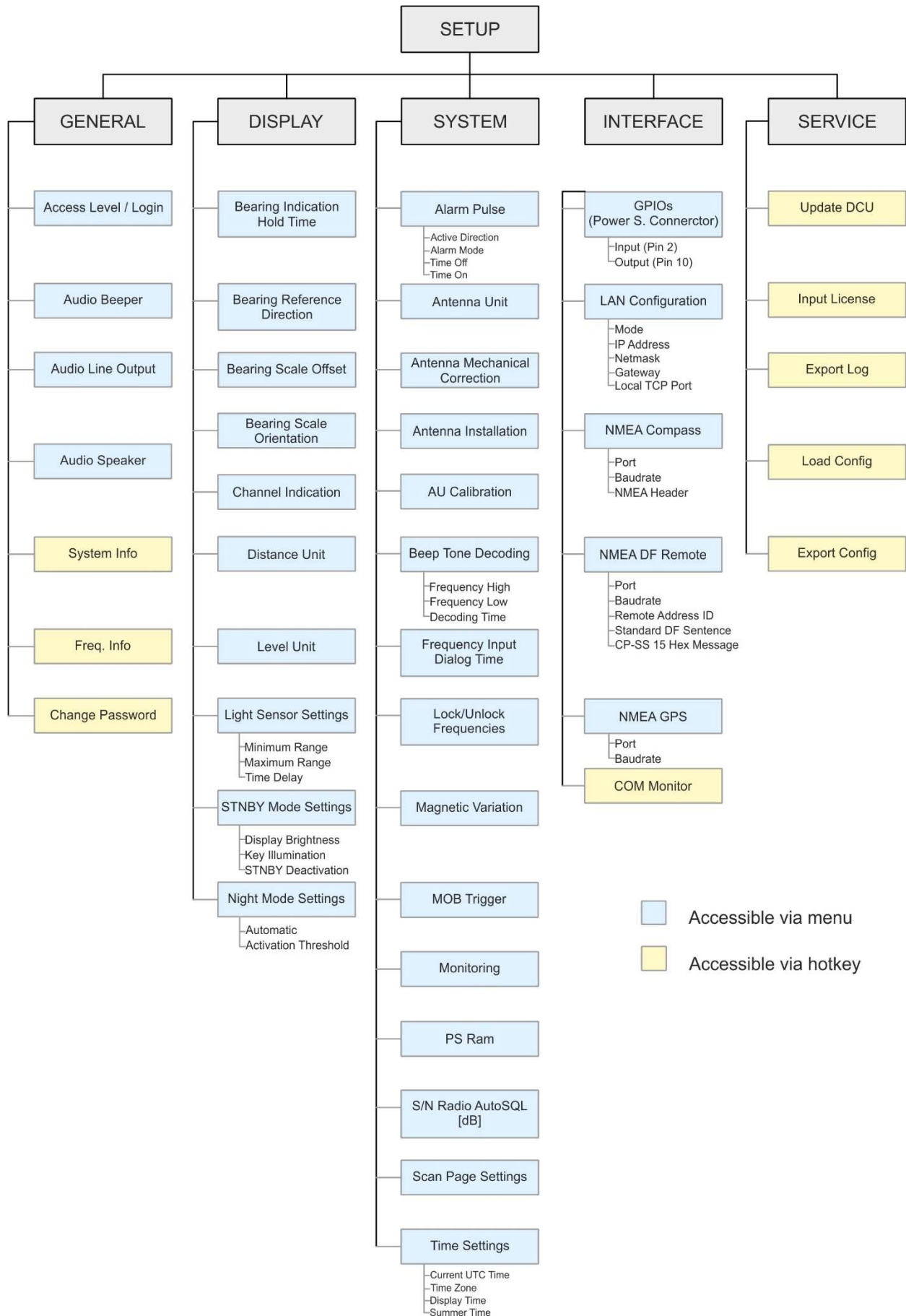
13.1 Error Messages

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 Unit	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
Error 10 AU Unsupported	Antenna Unit	Antenna Unit is incompatible
Error 11 AU Short Circuit! Please connect AU properly and press Clr	Antenna Unit	Incorrect connection of AU (supply short circuit) or very low supply voltage

13.2 Warnings

Warning message	Error location	Cause
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 AU Offset Dev -8 kHz	Received transmitter	Frequency of transmitter too low
Warning 23 AU Offset Dev +8 kHz	Received transmitter	Frequency of transmitter too high
Warning 31 Temperature is too high!	Display Control Unit	Temperature of the DCU too high

13.3 Setup Tree View (Settings)



13.4 Default / User System Configuration Table

This table supports the documentation of the settings (in case that settings have to be changed and possibly have to be restored later).

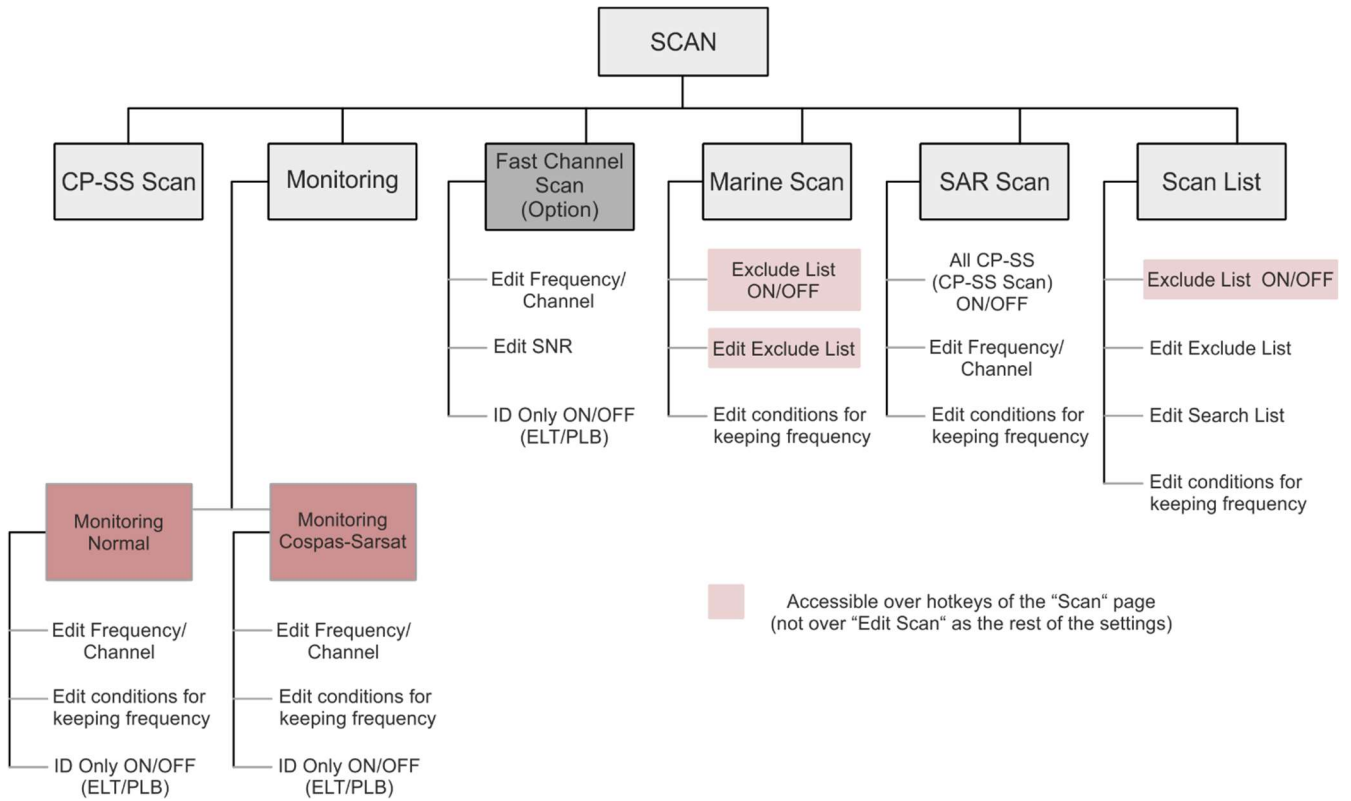
For the same purpose you can also use the "Export Configuration Files" function under "SETUP / SERVICE" (s. 7.4.5.5).

System Configuration		
Setting / Parameter	Default Value	User Value
SETUP -> GENERAL		
Access Level / Login	Administrator	
Audio Beeper	Beeper Key Pressing On	
Audio Line Output	75%	
Audio Speaker	External	
SETUP -> DISPLAY		
Bearing Indication Hold Time	2 sec	
Bearing Reference Direction	True	
Bearing Scale Offset	0°	
Channel Indication	Channel	
Distance Unit	km	
Level Unit	%	
Light Sensor Settings	Minimum Range: 0 Maximum Range: 100 Time Delay: 20 sec	
STNBY Mode Settings	Display Brightness: Off Key Illumination: On STNBY Deactivation: Automatic	
Night Mode Settings	Automatic: Off Activation Threshold: 15%	
SETUP -> SYSTEM		
Alarm Pulse	Active Direction: High Alarm Mode: Pulse Time Off: 5 sec Time On: 5 sec	
Antenna Unit	Standard Mounting	
Antenna Mechanical Correction	0°	
AU Calibration	Calibration Off	

System Configuration		
Setting / Parameter	Default Value	User Value
Beep Tone Decoding	Frequency High: 900 Hz Frequency Low: 700 Hz Decoding Time: 200 ms	
Frequency Input Dialog Time	10 sec	
Lock / Unlock Frequencies	No Frequencies Locked	
Magnetic Variation	Disabled	
MOB Trigger	Only Manually	
Monitoring	On / Off by User	
PS Ram	Compass Compensation On	
S/N Ratio AutoSQL [dB]	6	
Scan Page Settings	OK: Stay on Scan Page	
Time Settings	Current UTC Time: hh:mm:ss Timezone: UTC +00:00 Display Time: Local Summer Time: Off	
SETUP -> INTERFACE		
GPIOs (Power S. Connector)	Input (Pin 2): PTT Output (Pin 10): Alarm Out	
LAN Configuration	Mode: Static IP Address: 192.168.77.208 Netmask: 255.255.255.0 Gateway: 192.168.77.1 TCP Port: 9999	
NMEA Compass	Port: No Compass Baudrate: 4800 NMEA Header: \$xxHDT	
NMEA DF Remote	Port: COM3/LAN Baudrate: 4800 Remote Address ID: 0 CP-SS 15 Hex Msg: After decode MOB Sentence: Disabled Forward Compass Sentence: Disabled Forward GPS Sentence: Disabled	
NMEA GPS	Port: no GPS Baudrate: 4800	

Table 23. System configuration table

13.5 Scan Page Tree View (Settings)



13.6 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		
9	156,400 MHz	
10	156,450 MHz	
11	156,500 MHz	
12	156,550 MHz	
13	156,600 MHz	
14	156,650 MHz	
15	156,700 MHz	
16	156,750 MHz	
17	156,800 MHz	
18	156,850 MHz	
19	156,900 MHz	161,500 MHz
20	156,950 MHz	161,550 MHz
21	157,000 MHz	161,600 MHz
22	157,050 MHz	161,650 MHz
23	157,100 MHz	161,700 MHz
24	157,150 MHz	161,750 MHz
25	157,200 MHz	161,800 MHz
26	157,250 MHz	161,850 MHz
27	157,300 MHz	161,900 MHz
28	157,350 MHz	161,950 MHz
29	157,400 MHz	162,000 MHz
30		
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		
68	156,375 MHz	
69	156,425 MHz	
70	156,475 MHz	
71	156,525 MHz	
72	156,575 MHz	
73	156,625 MHz	
74	156,675 MHz	
75	156,725 MHz	
76	156,775 MHz	
77	156,825 MHz	
78	156,875 MHz	
79		
80	156,925 MHz	161,525 MHz
81	156,975 MHz	161,575 MHz
82	157,025 MHz	161,625 MHz
83	157,075 MHz	161,675 MHz
84	157,125 MHz	161,725 MHz
85	157,175 MHz	161,775 MHz
86	157,225 MHz	161,825 MHz
87	157,275 MHz	161,875 MHz
88	157,325 MHz	161,925 MHz
89	157,375 MHz	161,975 MHz
90	157,425 MHz	162,025 MHz

13.7 Channel Spacing UHF / VHF Air Band

The frequency input has to be performed according to ICAO Annex 10 Volume V clause 4.1.2.4 table 4.1. Please note that it is possible to work on channel spacing: 8.33 as well as 25 kHz. This is necessary because channel spacing 8.33 kHz and 25 kHz exist at the same time. Inside the receiver, the signal filtering is switched in accordance to the selected channel spacing.

The input scheme according to ICAO Annex 10 Volume V clause 4.1.2.4 table 4.1 is illustrated by the following example:

Frequency Setting / -Display [MHz]	Channel Spacing	Bandwidth	Receiving Frequency [MHz]
118,000	25 kHz	wide	118,0000
118,005	8,33 kHz	narrow	118,0000
118,010	8,33 kHz	narrow	118,0083
118,015	8,33 kHz	narrow	118,0167
118,020	Not valid		
118,025	25 kHz	wide	118,0250
118,030	8,33 kHz	narrow	118,0250
118,035	8,33 kHz	narrow	118,0333
118,040	8,33 kHz	narrow	118,0417
118,045	Not valid		
118,050	25 kHz	wide	118,0500
118,055	8,33 kHz	narrow	118,0500
118,060	8,33 kHz	narrow	118,0583
118,065	8,33 kHz	narrow	118,0667
118,070	Not valid		
118,075	25 kHz	wide	118,0750
118,080	8,33 kHz	narrow	118,0750
118,085	8,33 kHz	narrow	118,0833
118,090	8,33 kHz	narrow	118,0917
118,095	Not valid		
118,100	25 kHz	wide	118,1000
118,105	8,33 kHz	narrow	118,1000
•	•	•	•
•	•	•	•
•	•	•	•
xxx,x00	25 kHz	wide	xxx,x000
xxx,x05	8,33 kHz	narrow	xxx,x000
xxx,x10	8,33 kHz	narrow	xxx,x833
xxx,x15	8,33 kHz	narrow	xxx,x167
xxx,x20	Not valid		
xxx,x25	25 kHz	wide	xxx,x250
xxx,x30	8,33 kHz	narrow	xxx,x250
xxx,x35	8,33 kHz	narrow	xxx,x333
xxx,x40	8,3 3kHz	narrow	xxx,x417
xxx,x45	Not valid		
xxx,x50	25 kHz	wide	xxx,x500
xxx,x55	8,33 kHz	narrow	xxx,x500
xxx,x60	8,33 kHz	narrow	xxx,x583
xxx,x65	8,33 kHz	narrow	xxx,x667
xxx,x70	Not valid		
xxx,x75	25 kHz	wide	xxx,x750
xxx,x80	8,33 kHz	narrow	xxx,x750

Frequency Setting / -Display [MHz]	Channel Spacing	Bandwidth	Receiving Frequency [MHz]
xxx,x85	8,33 kHz	narrow	xxx,x833
xxx,x90	8,33 kHz	narrow	xxx,x917
xxx,x95	Not valid		

13.8 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 Positioning 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