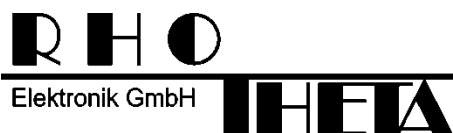


User Manual

RT-500-M



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- *Issue: 2019/10/22 [Rev 1.01]*
- *Document-ID: 12-9-1-0002-3-1-64*
- *Valid for RT-500-M systems with revision [Rev 4.00] or higher*

Note

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

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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.
- Ensure that the connections with information technology equipment, e.g. industrial computers, comply with the IEC 60950-1/EN 60950-1 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 EU Declaration of Conformity

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.rhotheta.com/products/rt_500_m

3.2 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

This equipment 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.

3.3 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.

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 8.7)

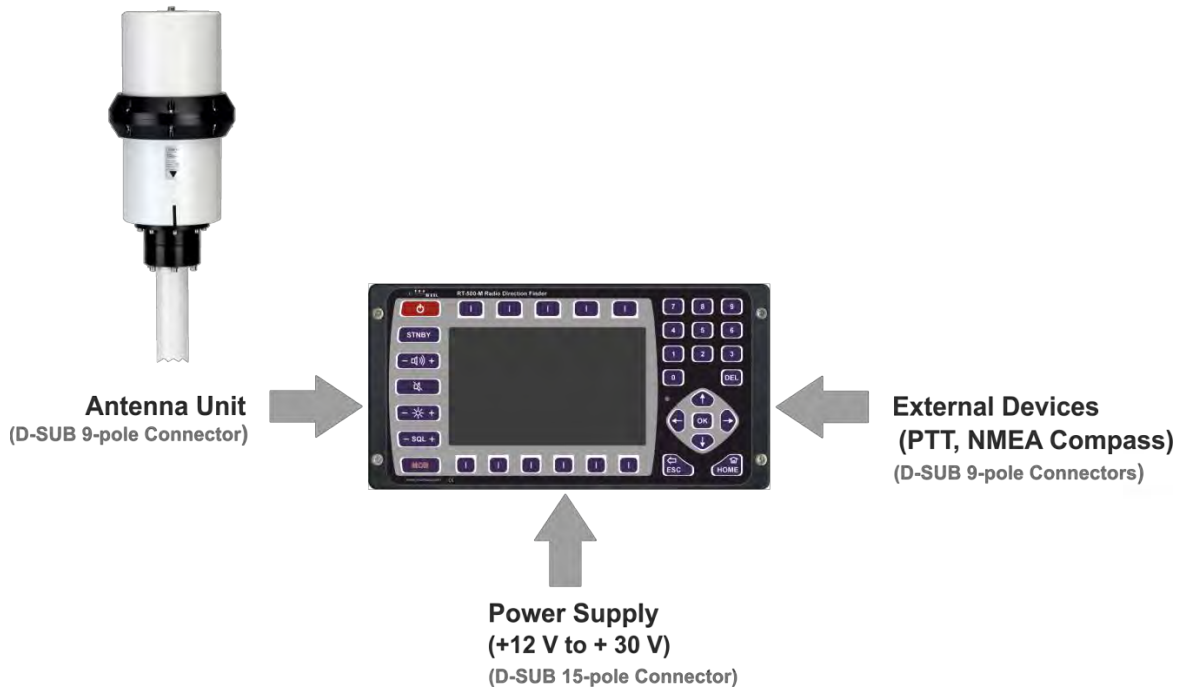



Figure 1. General connection schematic

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 after approximately 20 seconds the bearing page is loaded (s. Figure 2). To turn off the DCU hold the ON/OFF button pressed for about 2-3 seconds.

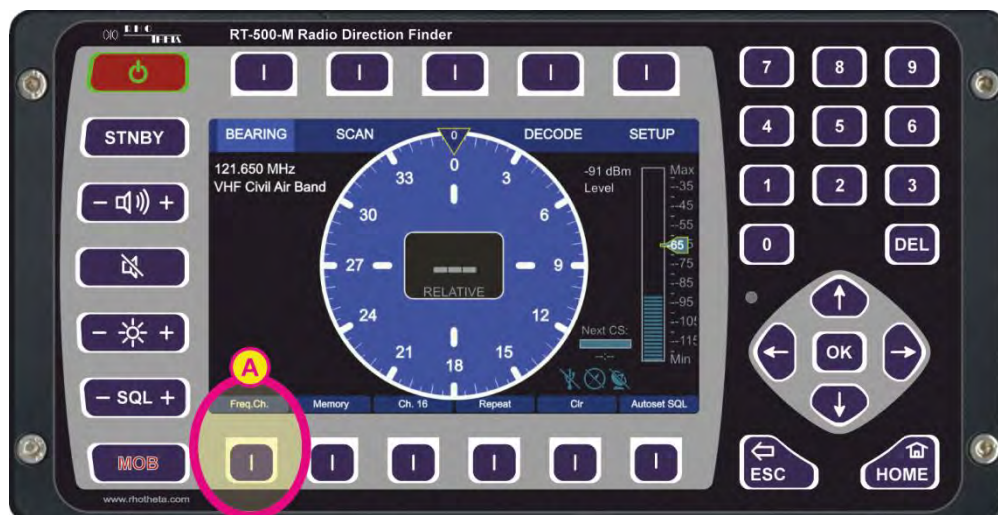


Figure 2. Start page (bearing page)

6. Adjust the needed main bearing frequency (the default frequency after first system start is marine channel 16):
 - o Push the hotkey “Freq.Ch.” (s. field “A”, Figure 2).



Figure 3. Frequency input dialog

- o Type the desired frequency into the lower input field “New Frequency [MHz]” by using the number-keys of the keypad (s. field “B”, Figure 3) and confirm by pressing “OK” (s. field “C”, Figure 3).
The system will accept only inputs within the permitted frequency ranges.
The adjusted frequency will be shown and monitored on the bearing page once the input is correctly completed.



Figure 4. New frequency Input

- o To input a maritime channel number, push the hotkey “Channel” (s. field “D”, Figure 4) and proceed by typing the number and pressing “OK”.
- o To select a desired Cospas-Sarsat frequency (channel ABC – channel RS) from a drop-down menu press the “CP/SS” hotkey (s. field “E”, Figure 4). Confirm the desired frequency with “OK”.

7. 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 5. Squelch level adjustment

- By pressing the “Autoset SQL” hotkey 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 7.5.2.

After all settings the system operates at the entered frequency.

6 Overview

6.1 Front View



Figure 6. 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. 7.4.2.7), 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 the button again will return the system from standby to normal operation mode.
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. 7.5.1).
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.






















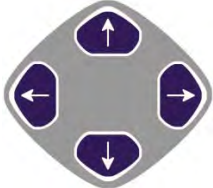

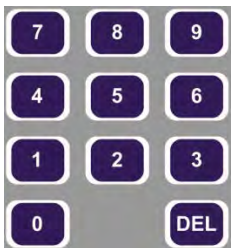


		While the mute function is activated, it is still possible to increase or decrease the volume without producing any sound (using the button for volume adjustment, s.  .
		The brightness adjustment button contains two keys (+ and -). Pressing any of the two keys opens the dialog window for brightness adjustment of the TFT-display backlight, LEDs (colored highlighting of buttons  ,  , and ) and the white illumination of buttons / legends (s. 7.5.3).
		The squelch adjustment button contains two keys (+ and -). Pressing any of the two keys opens the dialog window for adjusting of the squelch level.
		Activates the “Man-Over-Board” dialog, if GPS data is available (s. 7.5.4).
	5" TFT full-color display	Shows the corresponding data content of the current page or dialog.
		Hotkeys for activating variable functions. The assignment of the keys differs depending on the page or dialog.
	Sensor of brightness	Measures the ambient brightness to automatically adjust the brightness of the TFT display and the illumination of LEDs and buttons/legends.
		Returns one step back in a menu or leaves a dialogue or an adjusting field without storing changed parameters.
		Confirms an input or selection. Leaves a dialogue or an adjusting field and stores changed parameters.
		By pressing this button, the system returns to the bearing page from any other page or dialog, without storing changed parameters.
		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).
		Numeric keys for direct numeric input.
		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

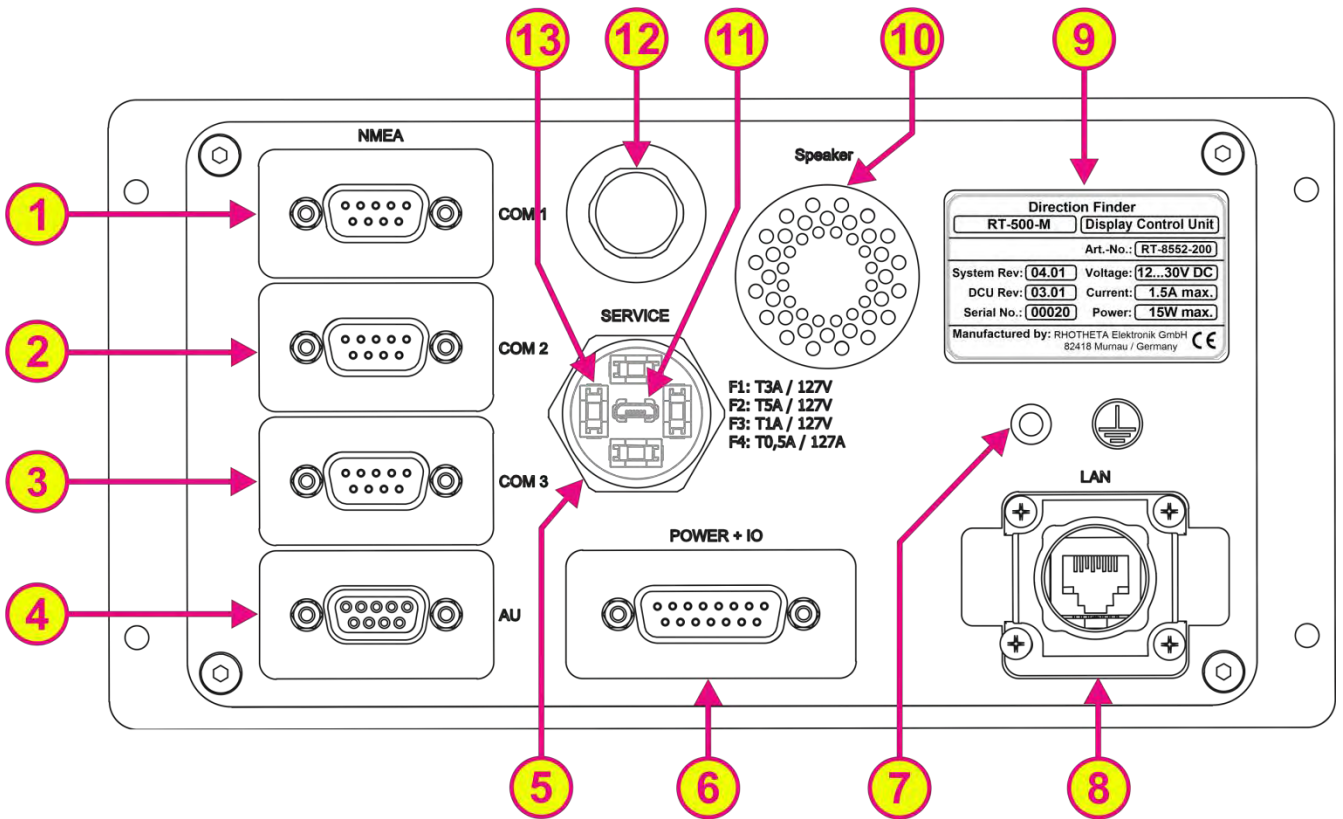


Figure 7. DCU rear view

Interfaces		
Pos.	Element	Function Description
1 2 3	Communication Ports: COM1 COM2 COM3	NMEA 0183 Bus (RS422 / RS232): <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. When connecting to input use either RS232 Rx or RS422 Rx (not both)! For more information s. 8.3.
4	AU	Antenna connector: Connection between DCU and AU via cable. For more information s. 8.2.
5	Screw Cover	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.
6	POWER + IO	Source connector: Connection for power supply Connection for external speaker Connection for self-bearing suppression (SBS / PTT) Connection for audio line out Contacts for alarm relay


		Contacts for squelch out For more information s. 8.1.
7		Ground connector: Connection of the DCU to the ground of the ship. Thread/screw M5 For more information s. 8.6.
8	LAN	LAN connector for network communication For more information s. 8.4.
9	Label	Label with identifying information about the direction finder.
10	Speaker	Waterproof internal speaker
11	USB (Only Service)	USB 2.0 port: Used only for service / manufacturing purposes. For more information s. 8.5.
12	Pressure Compensation Element	Equipped with a Gore-Tex membrane, the pressure compensation element prevents over- and underpressure in the DCU.
13	Fuses	Replaceable fuses: F1: T3A/127V (Littelfuse 154003.T) F2: T5A/127V (Littelfuse 154005.T) F3: T1A/127V (Littelfuse 154001.T) F4: T0.5A/127V (Littelfuse 154.500T) Note It is recommended to use an additional external fuse: T2A

Table 3. Interfaces

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.

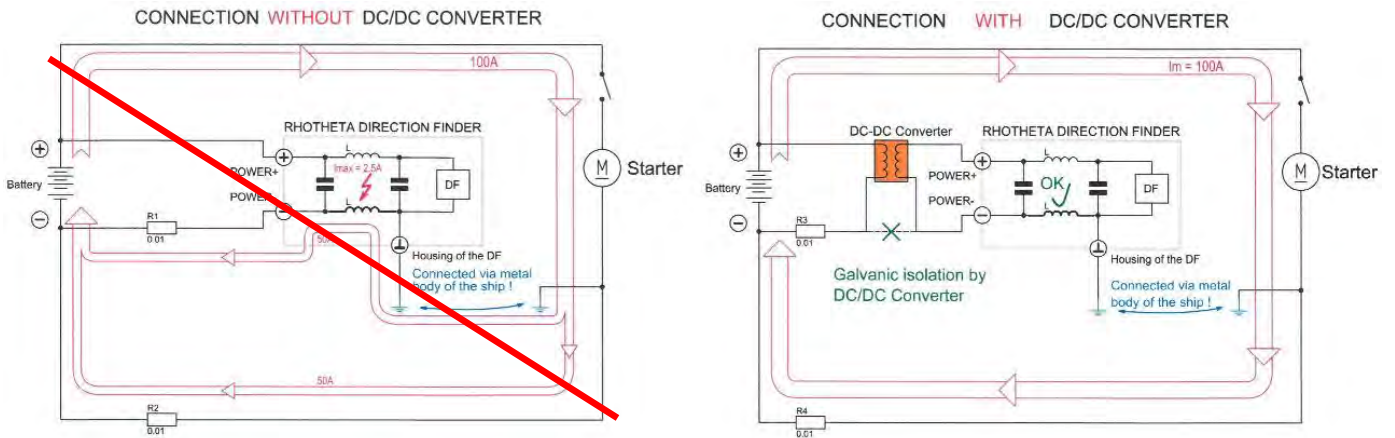


Figure 8. Necessity of DC/DC-converter

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 9. 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 9).

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 9).

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 10).

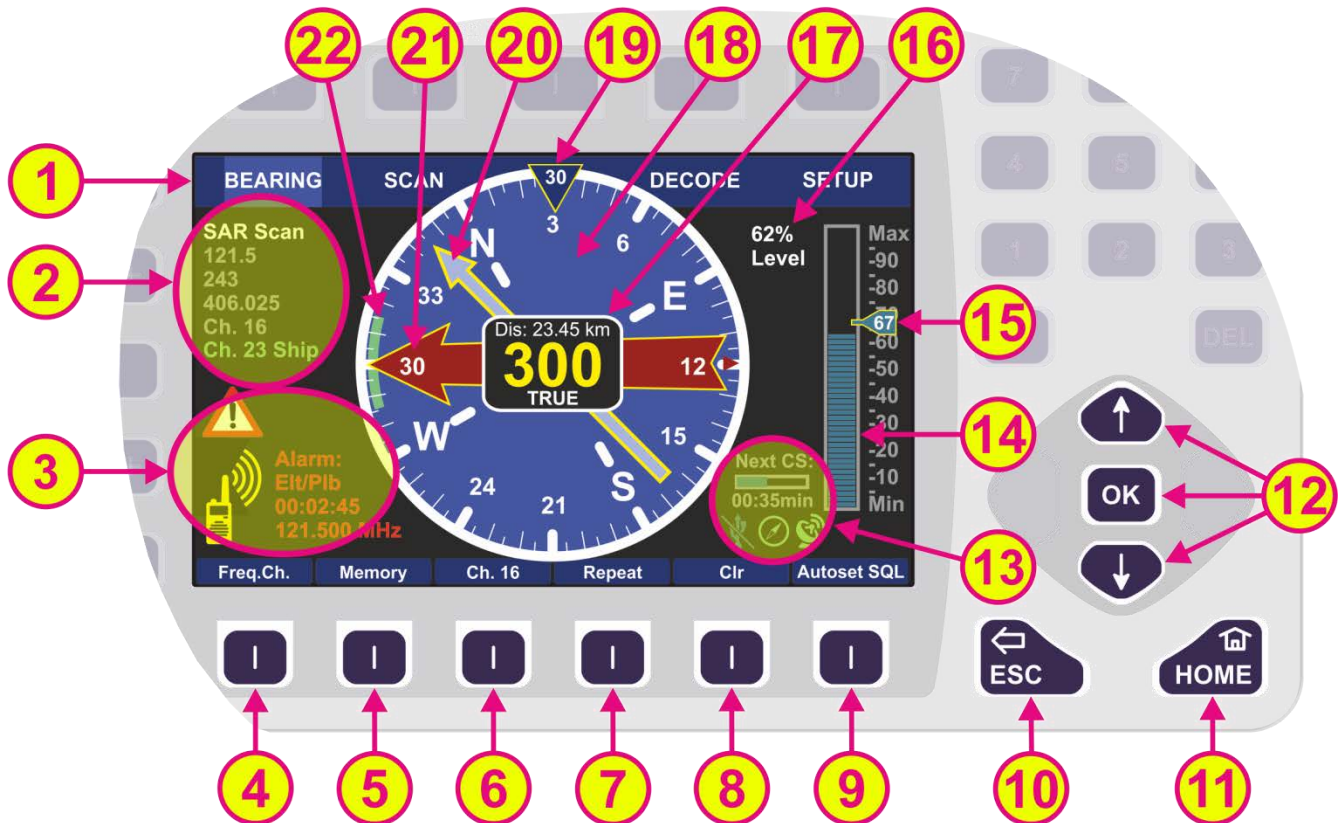
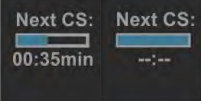
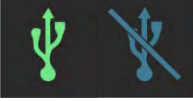


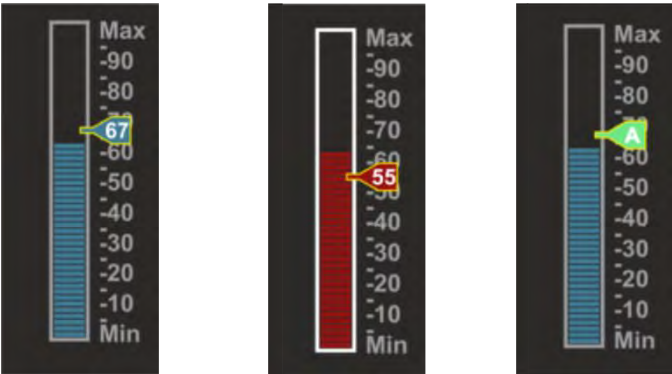











Figure 10. Bearing display

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 “Feq.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 12) shows the time elapsed since the last valid bearing interruption.
8	Clear hotkey	Mutes the acoustic alarm (if such occurred, s. 7.1.2.1). Clears the last valid bearing.
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. 7.5.2). 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. Otherwise if there is no USB connection available, the symbol stays blue and crossed out.</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>
<p>14</p>	<p>Indication of signal level</p>	<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>
<p>15</p>	<p>Indication of squelch level</p>	 <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 numerical value is shown inside the indicator.

		<ul style="list-style-type: none"> ○  No signal is received (squelch level > signal level). By pressing “Autoset SQL” (s. ) the squelch 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. ○  The signal is received (signal level > squelch level). ○  The option “Automatic SQL” is selected (no signal received). ○  The option “Automatic SQL” is selected (signal is received). The squelch 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.
	Digital signal level indication	Signal level of active bearing frequency / channel in [%] or [dBm] (adjustable in the “Setup” page).
	Digital bearing display	Indication of the bearing information: <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 12), if the bearing signal has disappeared. The clock counts the time elapsed since the signal was lost. The indication is in [hh:mm:ss]. ○ Distance from the current GPS position to the stored GPS position is shown in the uppermost line of the digital bearing display. 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. The indication is in [km] or [NM], depending on the configuration in the “Setup” menu or configuration file. ○ 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	If compass information is available, the graphic display of relative bearing value within the compass rose will be shown. Without compass data the relative bearing will be shown in the 360°-display. If the antenna is mounted correctly, the 0°-value corresponds to heading / longitudinal axis of the vessel.
	Heading pointer	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. <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.

		<ul style="list-style-type: none"> ○ 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.
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 (red 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	Maximum deviation of unaveraged single bearing values.

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 10). 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 10).

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 7.5.2.

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 10). 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.

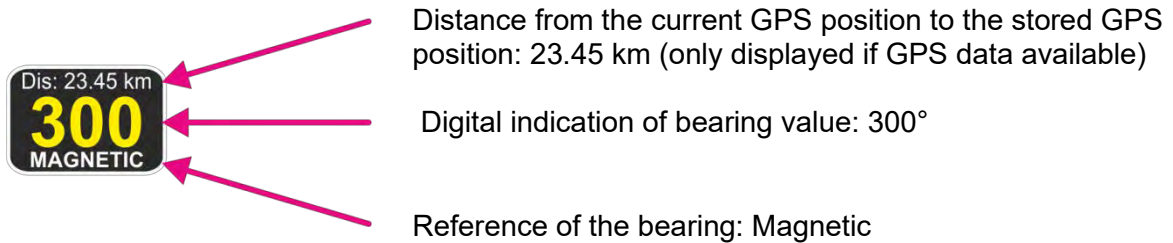


Figure 11. Digital bearing display (active signal reception)

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. 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. 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 12).

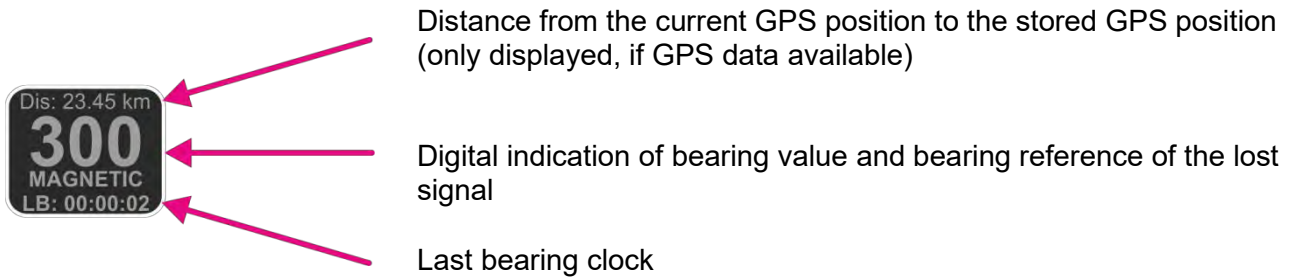


Figure 12. Digital bearing display (signal reception ended 2 seconds ago)

It is possible to show the arrow of the last bearing again by pressing the "Repeat" hotkey (s. position 7 in Figure 10). The arrow will be displayed again for the time period that has been set under "Bearing 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 10). If no emergency signal is received for more than a minute, the alarm will be canceled automatically.

Note

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

Alarms/ Errors/ Warnings		
Indication Example	Meaning	Page
	<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>	

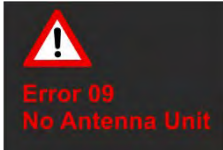

	<p>Error: An error message will be displayed if:</p> <ul style="list-style-type: none"> o one or more operating parameters are out of the admitted limits o the system has recognized a malfunction (in this case the system is not working) <p>The hotkey “Clr” deactivates the acoustic warning.</p>	
	<p>Warning: The system indicates a warning, if:</p> <ul style="list-style-type: none"> o external signals are not available (anymore) o 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 either by pressing the hotkey “Freq.Ch.” (s. Figure 10, position 4) or using the numeric keys while the “Bearing” page is active.

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

- o Frequencies
- o Channels
- o Frequency groups of the Cospas-Sarsat frequencies

The confirmed input of the dialog is displayed and stored, so after pressing the “Freq.Ch.” hotkey again, the dialog opens with the last activated dialog variant (e. g. channel input).


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.

Direct input of frequency/channel using the numeric keys works as follows:

- o by pressing keys “1”, “2”, “3” or “4” in the bearing mode (during bearing of any frequency), the frequency input dialog will be opened automatically, taking the pressed number as the first digit of the frequency input.
- o by pressing number keys “1”, “2”, “6”, “7” or “8” in the bearing mode (during bearing of any maritime channel), the channel/ frequency input dialog will be opened automatically, taking the pressed number as the first digit of the channel input.

Note

The mentioned numbers for the direct input will only work according to the unlocked frequency options of that particular RT-500-M system.

List of Elements	
Element	Function
	<p>Numeric keys for direct input.</p>







	<p>This button deletes all digits in the input dialog for frequencies or channels.</p>
	<p>In the dialog for selecting Cospas-Sarsat frequencies, the “up” and “down” buttons are used to select the desired frequency group.</p>
	<p>In the dialog for frequency or channel input, these buttons are used to navigate inside the input dialog from one digit to another. Pressing the “left” arrow will delete the currently marked digit and skip to the next higher digit left of the deleted one. Pressing the “right” arrow will bring the cursor to the previous position, if the left arrow was pressed.</p>
	<p>If the input of the frequency (or channel) is complete and valid, pressing this button will adopt the values and close the dialog. In the drop-down menu for selecting Cospas-Sarsat frequencies, pressing this button will select the currently marked frequency group.</p>
	<p>Pressing this button will close the dialog without adopting values.</p>
	<p>Pressing this button will close the dialog without adopting the values and open the Bearing Page.</p>
<p>“Frequency”</p>	<p>Opens the dialog for frequency input inside the frequency input dialog.</p>
<p>“Channel”</p>	<p>Opens the dialog for channel input inside the frequency input dialog.</p>
<p>“Ship”</p>	<p>This hotkey appears only for duplex channels (s. Figure 14) in the dialog for channel input. It allows selecting the “Ship” frequency for a duplex channel.</p>
<p>“Coast”</p>	<p>This hotkey appears only for duplex channels (s. Figure 14) in the dialog for channel input. It allows the selecting the “Coast” frequency for a duplex channel.</p>
<p>“CP/SS”</p>	<p>Opens the dialog for selecting Cospas-Sarsat frequency group inside the frequency input dialog.</p>

Table 7. Frequency input dialog. List of elements

Input of Frequencies

The “Frequency/channel input dialog” is divided into a section for the current frequency and a section for the new frequency.

Section “Current frequency [MHz]” shows the presently activated frequency (s. Figure 13, field 1).

Section “New Frequency [MHz]” allows the input of a new value (s. Figure 13, field 2).

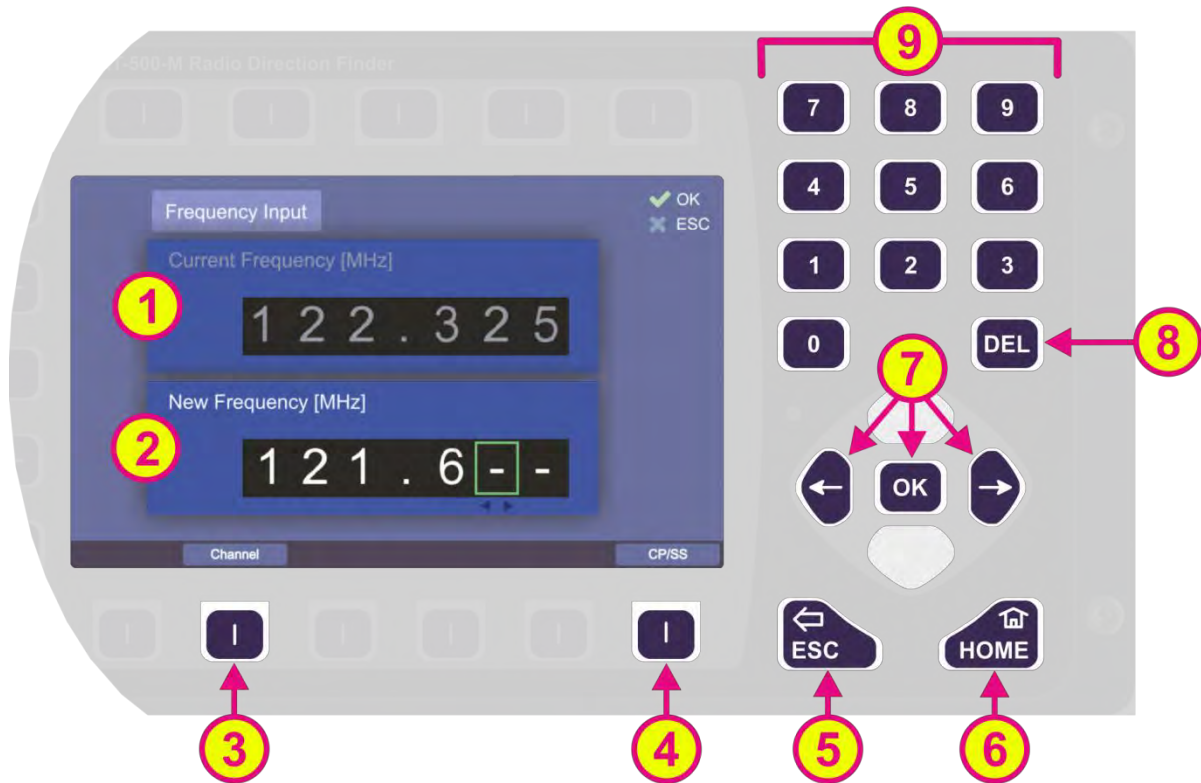


Figure 13. Input of a new frequency

The input of digits is done with the numerical buttons on the front of the device (s. Figure 13, field 9).

Note

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

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

The following actions are possible:

- Pressing the “left” arrow deletes the currently marked digit and marks the next higher digit left of the deleted one. The “right” arrow returns to the previous digit position (s. Figure 13, position 7).
- The “DEL” button (s. Figure 13, position 8) deletes the whole input. The input field shows “---.---”.
- Pressing the “OK” button (s. Figure 13, position 7) adopts the new frequency value and closes the dialog. This is not possible until the input is complete from the first to the last digit.
- Pressing the “ESC” button (s. Figure 13, position 5) closes the dialog without changing the current frequency.
- If a marine band frequency was entered, and all digits of frequency are valid after the confirmation with “OK”, the bearing page will automatically show the number of the channel associated with that frequency (besides the indication of the corresponding frequency band).
- If a Cospas-Sarsat frequency is being entered, the value will be automatically converted to an input in the 8.333 kHz grid. That means, 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)

Input of Channels

Generally, channel input works the same way as frequency input: the input dialog is divided into a section for the current channel and a section for the new channel (s. Figure 14, fields 1 and 2).

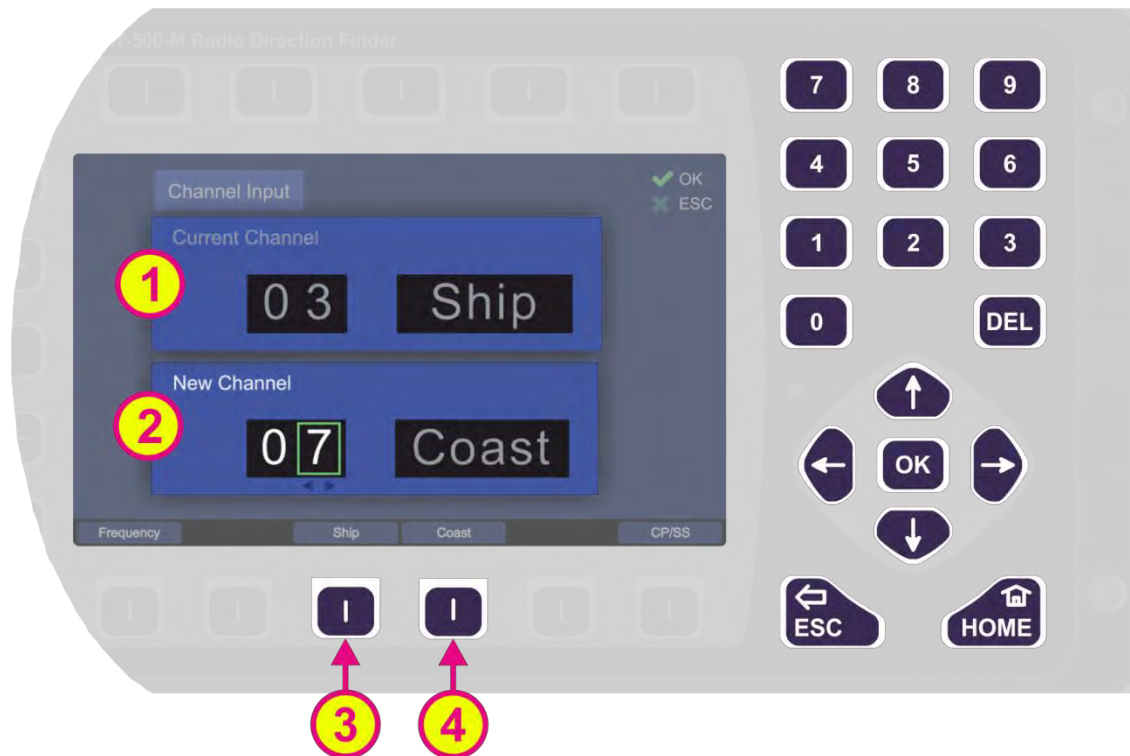


Figure 14. Input of a new channel

However, there are two additional hotkeys: “Coast” and “Ship” (s. Figure 14, positions 3 and 4), which allow 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 to frequency input dialog 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 under the “Current Frequency [MHz]” field (s. Figure 13, field 1).
- 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 “New Frequency [MHz]”

Selecting Cospas-Sarsat Frequency Groups

The hotkey “CP/SS” (s. Figure 13, position 4) 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, a colored frame moves and highlights the frequency group, which can then be selected by pressing “OK”. Pressing “ESC” will close the dialog without adopting the new frequency.

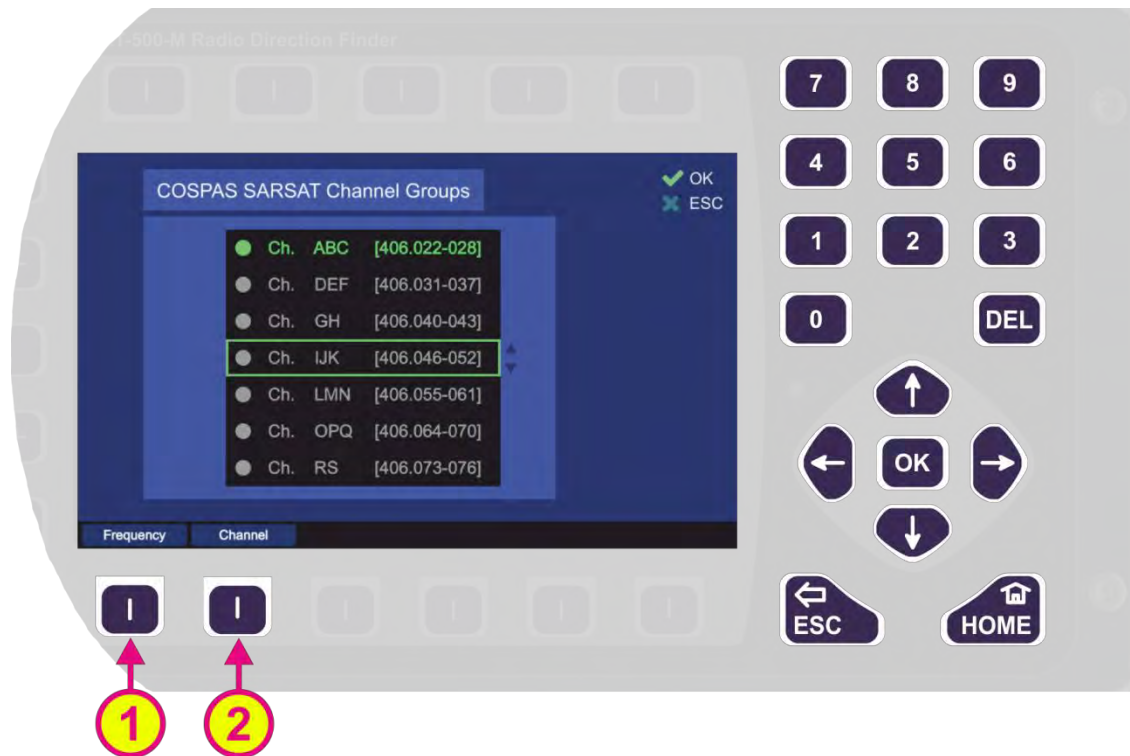


Figure 15. Input of a new COSPAS-SARSAT frequency

As a result of the 8.333 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

7.1.2.3 Memory Dialog

The memory dialog (s. position 5, Figure 10) 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.



Figure 16. 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.


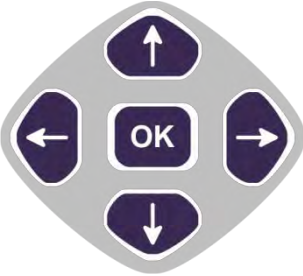


8		Pressing this button will close the dialog without adopting the values and open the “Bearing” page.
9		<p>The “up” and “down” arrows are used to select between the stored frequencies in the “memory” dialog. When editing the name of a frequency, these buttons are used to navigate on the displayed keyboard.</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 deleted). ○ 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 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”	<p>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.</p> <p>Using the “ESC” button without previously confirming the changes with “Save” will close the memory dialog without saving the changes.</p>

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 inputting/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 17). The dialog is closed by confirming with the button “End of User Input” on the virtual keyboard.



Figure 17. 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 17) since the virtual keyboard itself does not contain number keys. Using the “DEL” button (s. position 4, Figure 17) the whole input will be deleted.

The arrow-keys   on the virtual keypad have the same function as “shift” and “caps” on a standard PC keyboard. The “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 “down” arrow acts as “caps” (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 17) 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 10) 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 7.5.2.

7.1.4 Function Repeat

Pressing the hotkey “Repeat” (s. position 7, Figure 10) shows the last valid bearing, reference and level values.

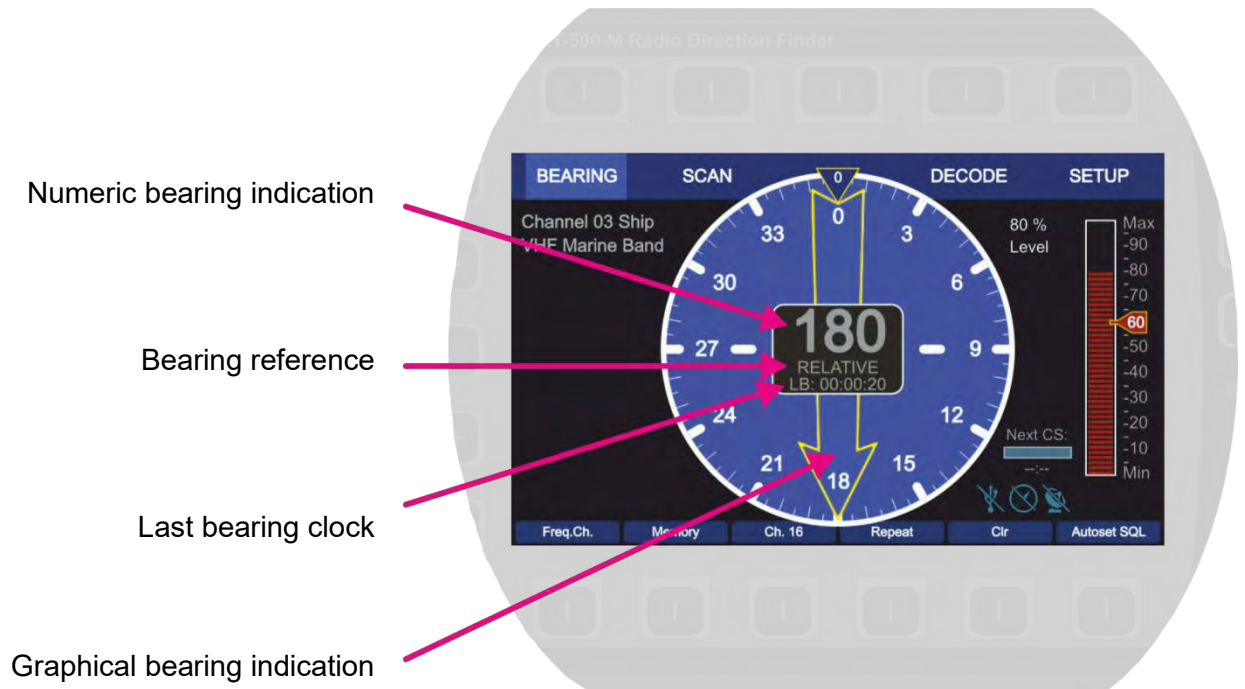


Figure 18. Repeat indication

The last bearing clock in the lowermost line of the digital bearing display (s. Figure 18) shows the elapsed time since the last valid bearing was interrupted.

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

Pressing the hotkey “Clr” (s. position 8, Figure 10) will clear the last valid bearing together with all the corresponding values.

The function “Clr” 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).

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

7.1.6 Function Autoseq SQL

In normal bearing mode (no scan active) the hotkey "Autoseq SQL / Seqelch / Automatic / Manual" hotkey is designated as "Autoseq SQL" (s. position 9, Figure 10). Pressing this hotkey will automatically set the seqelch level above the noise level by 6 dB (this is a default value and can be modified in "Setup", s. 7.4.3.11). A manual readjustment might be necessary (s. chapter 7.5.1).

When bearing a Cospas-Sarsat frequency this hotkey is designated as "Manual"/ "Automatic", which allows switching between these seqelch adjustment possibilities. For further information please refer to chapter 7.5.2.

If any scan algorithm is activated, this hotkey is designated with "Seqelch", or is empty (s. "Scan" page). Pressing this hotkey will open the seqelch dialog to adjust the seqelch 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 the currently 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 19 shows the most important elements of the “Scan” page.

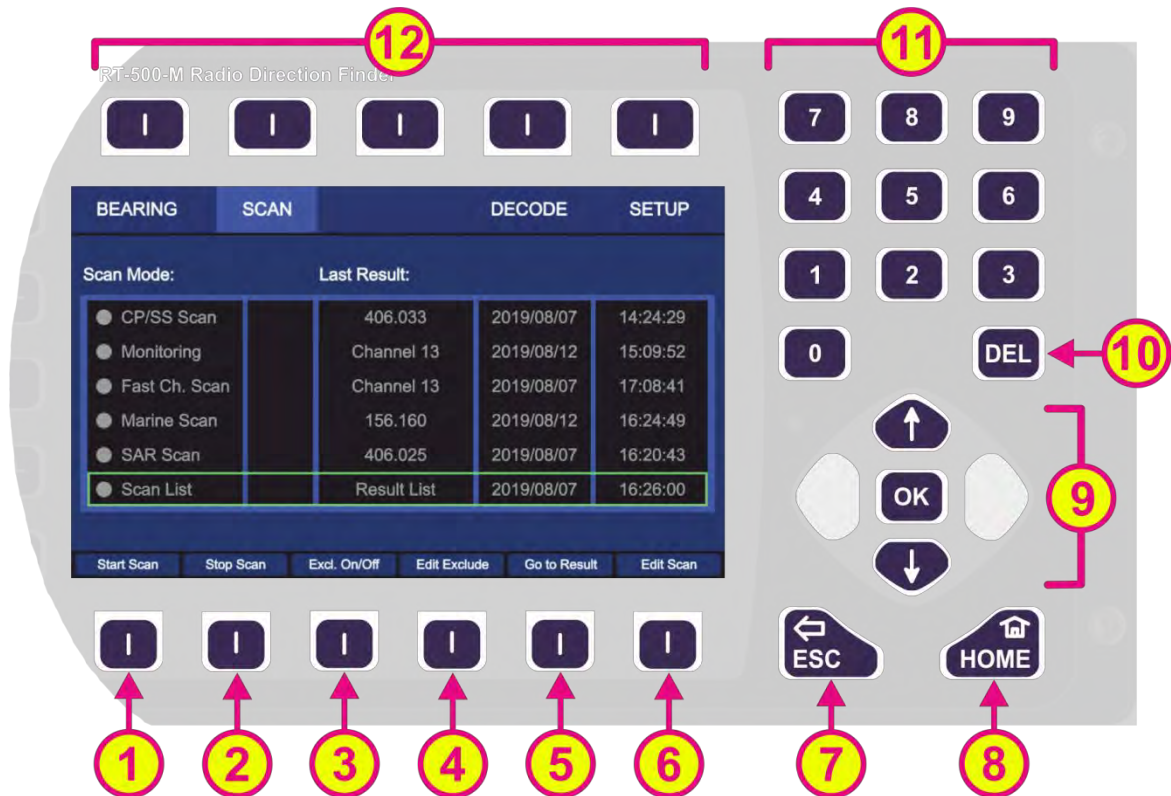


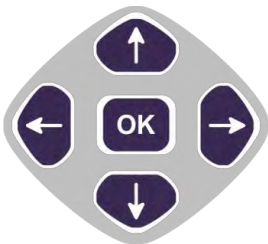

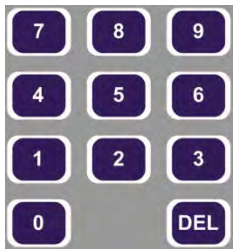


Figure 19. Scan page. General view

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. 7.4.3.12)
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”	This hotkey appears only when the “Marine Scan” or “Scan List” is marked.

		By pressing this hotkey, the dialog for editing the “Exclude List” is opened (s. 7.2.4.3).
5	“Go to Result”	Terminates the currently activated scan algorithm, acquires the frequency which was found during the last scan and switches to the “Bearing” page. If “Scan List” is marked, pressing this hotkey opens the corresponding dialog. This hotkey appears only if there is a result for the currently marked scan algorithm.
6	“Edit Scan”	Opens the dialog to edit the currently marked scan algorithm.
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 while on the “Scan” page will close the “Scan” page and open the “Bearing” page (home page). 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. Confirming with “OK” terminates the scan operation and the system will change to the normal bearing mode on the previously selected frequency. By pressing the “ESC” the scan procedure will be continued. If a sub-dialog is opened, pressing this button will close it and lead to the “Bearing” page, 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. value editing) they are used to navigate between the characters of the virtual keypad. “Right and “left” arrows have no function on this page. If no scan mode is currently activated, pressing “OK” will activate the marked scan mode. With the “OK” button the confirming of values or opening the general settings dialogs is accomplished. 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.
10		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. Inside the settings dialogs, the “DEL” button is used to clear the whole input at once
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 (“General”, “Display”, “System”, “Interface” and “Service”).
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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 20, field A). This allows the direct opening of a frequency for bearing, which was found in an earlier scan cycle.

● CP/SS Scan	A	406.025	2019/07/11	14:47:20
● Monitoring		-	-	-
● Fast Ch. Scan		-	-	-
● Marine Scan		-	-	-
● SAR Scan		406.025	B	Running
● Scan List		Result List	-	-

Figure 20. 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 20, field B).

● CP/SS Scan		406.033	2019/08/07	14:24:29
● Monitoring		Channel 13	2019/08/12	15:09:52
● Fast Ch. Scan		Channel 13	2019/08/07	17:08:41
● Marine Scan	C	Excl	156.145	2019/08/13
● SAR Scan		406.025	2019/08/07	16:20:43
● Scan List		Result List	2019/08/07	16:26:00

Figure 21. "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 “Excl” (s. Figure 21, field C).

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 22, field A).



Figure 22. 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 22, 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 23, position 1)

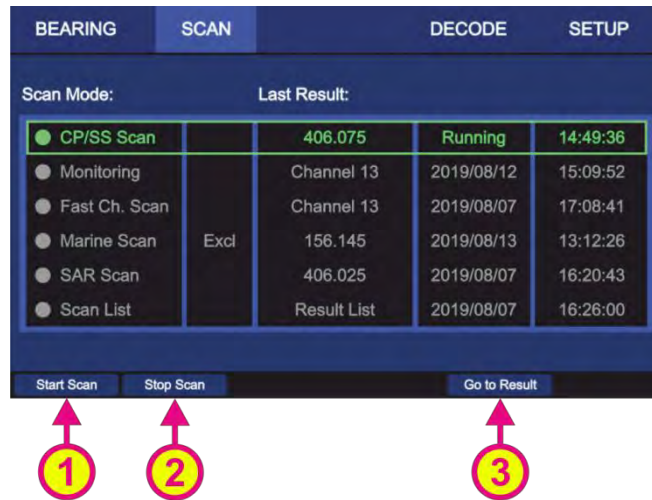


Figure 23. "Cospas-Sarsat Scan" mode has been activated

- Pressing the hotkey “Stop Scan” (s. Figure 23, 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 24), this mode will be terminated.

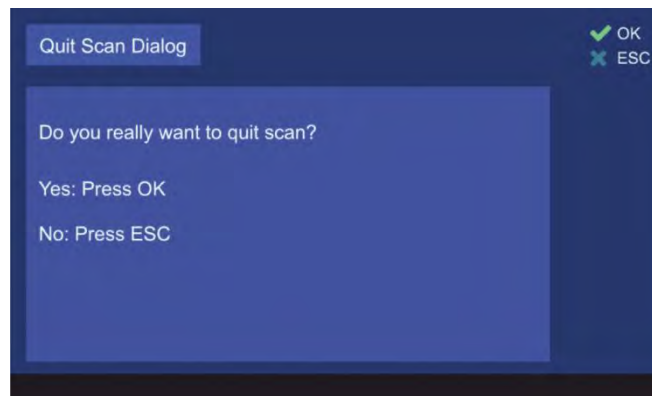


Figure 24. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 23, position 3) during the Cospas-Sarsat 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. 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 frequencies/channels, 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 that depend 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 a 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 25).

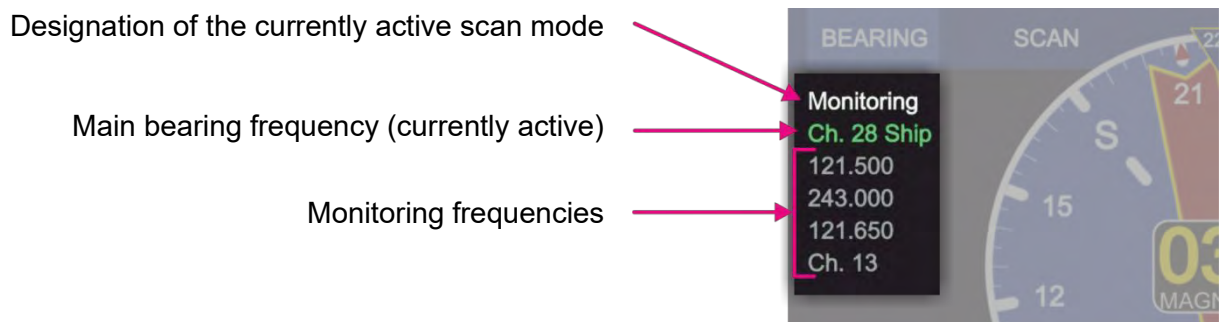


Figure 25. “Monitoring” mode. Indication of frequencies.

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 25).

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 was 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).

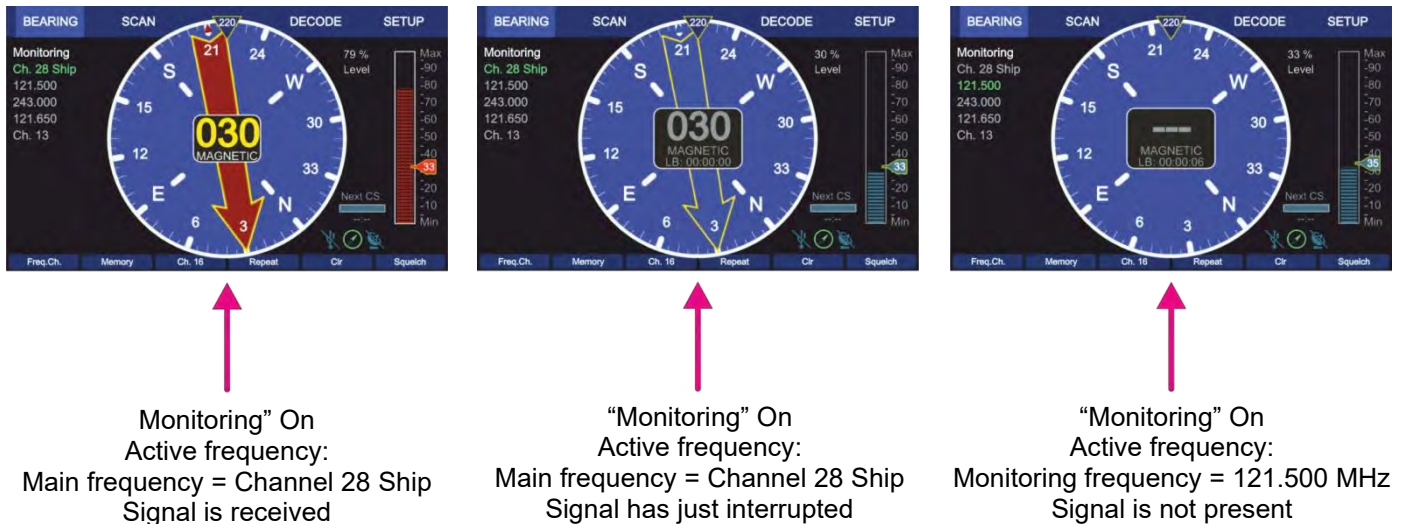


Figure 26. “Monitoring” mode. Example views of the “Bearing” page

- 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.

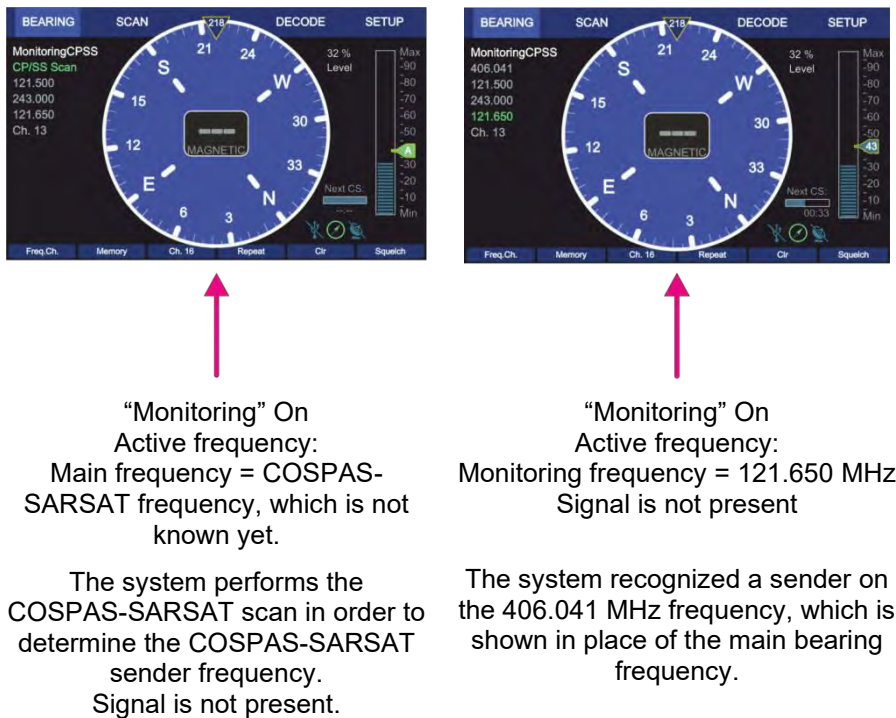


Figure 27. “Monitoring CP-SS” mode. Example views of the “Bearing” page

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 decodes 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

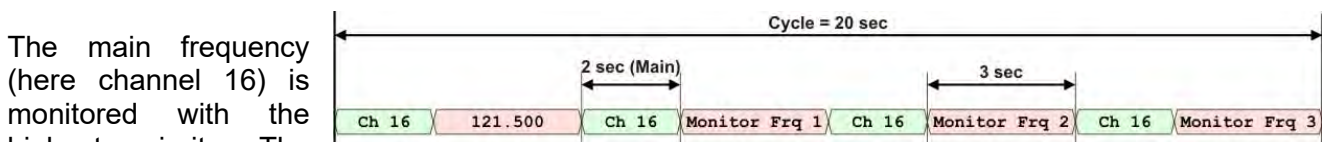


Figure 28. Example: Timing normal monitoring

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.

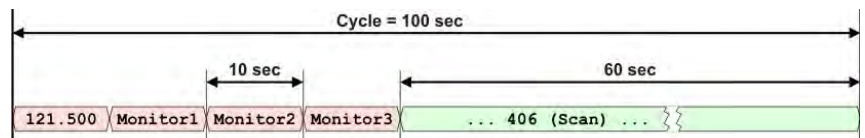


Figure 29. Example: Timing Cospas-Sarsat monitoring

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

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 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 30, position 1)

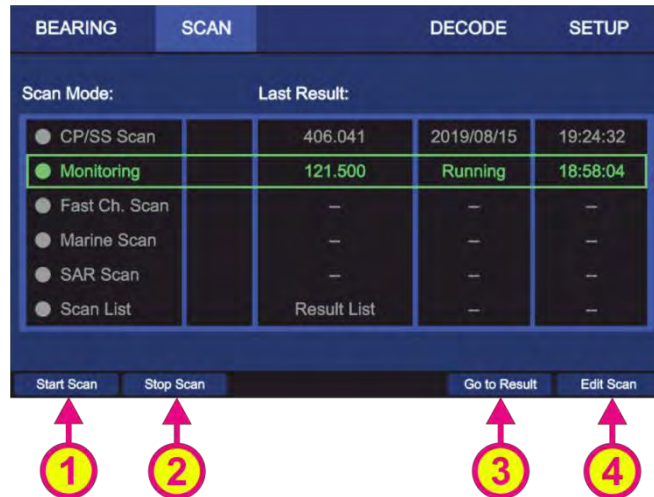


Figure 30. "Monitoring" has been activated

- Pressing the hotkey “Stop Scan” (s. Figure 30, 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 24), this mode will be terminated.

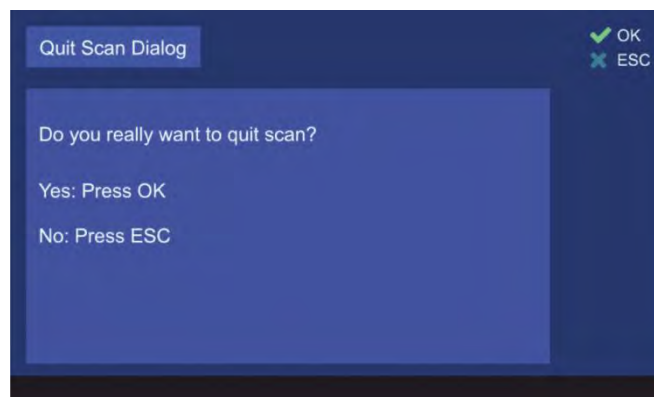


Figure 31. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 23, 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 23, position 4) will open the dialog for changing the monitoring settings (s. Figure 32).

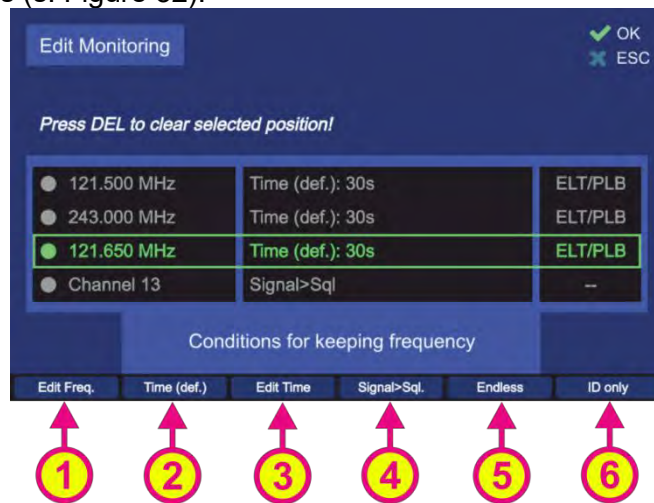


Figure 32. Monitoring mode settings

- The hotkey “Edit Freq.” opens the “Frequency/Channel” input dialog and allows the modification of the currently marked frequency.
- Pressing the hotkey „Time (def)” (s. Figure 32, 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 32, position 3) will open the sub-dialog for changing the hold time to the customized value (s. Figure 33). Use the number keys of the DCU keypad to type the new value in and confirm it with “OK”.

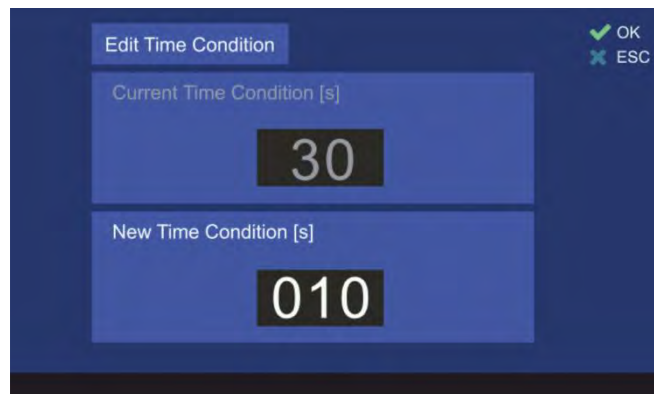


Figure 33. Hold time setting

- The hotkey “Signal > Sql” defines the behavior of the monitoring algorithm to “signal level > squelch level” (s. Figure 32, 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 32, 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 32, position 6) activates or deactivates the feature “ID Only” (s. 7.2.2.3):

1. **“ELT/PLB”**:
Alarm is only triggered if an ELT/PLB signature has been detected.
2. **“ – “**:
Alarm is never triggered, no matter if there is any modulation on it 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

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 mode is terminated.

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. 7.4.3.11). 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 will be 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.

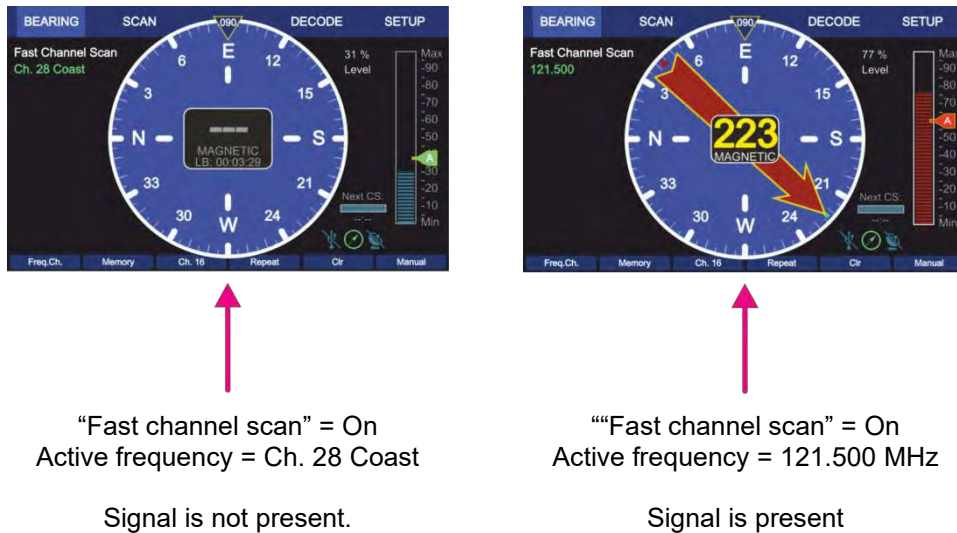


Figure 34. Fast channel scan indication on the "Bearing" page.

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 the direction finder should bear this signal 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 read also chapter 7.5.2)

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.

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

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).

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 35, position 1)



Figure 35. Activating the “Fast Channel Scan”

- Pressing the hotkey “Stop Scan” (s. Figure 35, 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 36), this mode will be terminated.

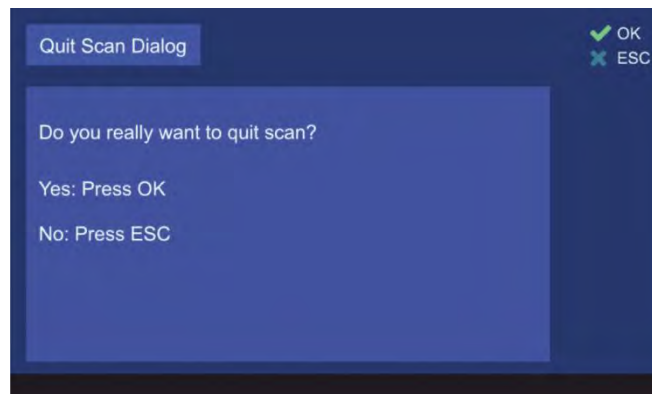


Figure 36. Confirming of leaving the scan mode

- 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 35, 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 35, position 4) will open the dialog for changing the settings of the fast channel scan (s. Figure 37)

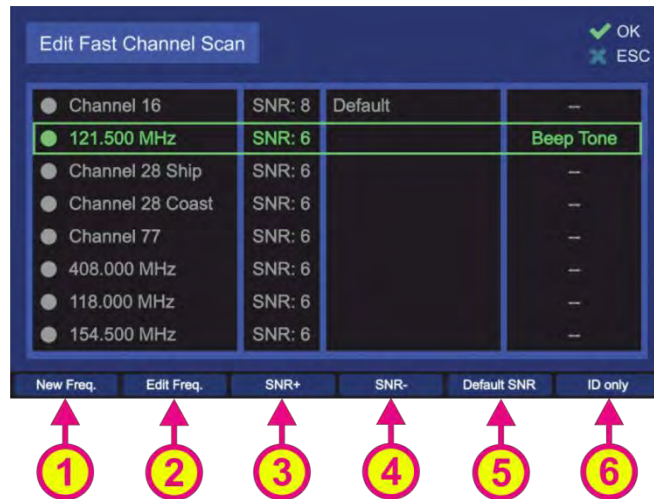


Figure 37. Fast channel scan settings

- The hotkey “New Freq.” opens the “Frequency/Channel” input dialog for adding the new frequency in the list (maximum 8 frequencies/channels).
- The hotkey “Edit Freq.” opens the “Frequency/Channel” input dialog and allows the modification of the currently marked frequency.
- Pressing the hotkey „ SNR+” (s. Figure 37, position 3) will increase the SNR value of the currently marked frequency by 1%.
- Pressing the hotkey „ SNR-” (s. Figure 37, position 4) will decrease the SNR value of the currently marked frequency by 1%.
- Pressing the hotkey “Default SNR” (s. Figure 37, 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. 7.4.3.11).
- Pressing the hotkey “ID only” (s. Figure 37, 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

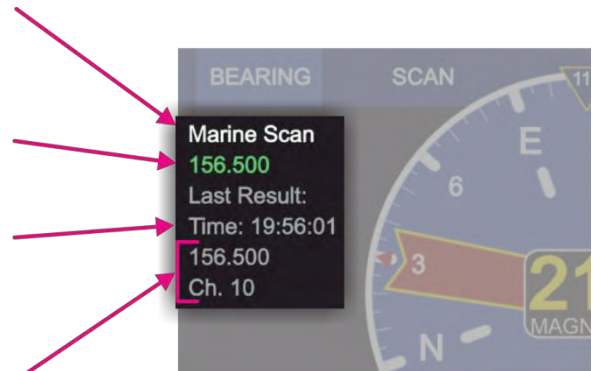


Figure 38. Marine scan. Indication of frequencies

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 = 156.920 MHz

Signal is not present.

"Marine Scan" = On
Active frequency = 156.500 MHz

Signal is present

Figure 39. 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 7.5.2).

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 40, position 1).



Figure 40. Marine scan is activated.

- Pressing the hotkey “Stop Scan” (s. Figure 40, 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 40, 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 40, 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 40, 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 40, position 6) will open the dialog for changing the settings of the marine scan (s. Figure 41).



Figure 41. Marine scan settings

- “Time (def.)” hotkey (s. Figure 41, 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 41, 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 41, 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 41, 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 19, 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 40, 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 42. „Exclude List“ configuration

- To insert a new frequency/channel or a range of frequencies/channels, press the hotkey „New Freq.“ (s. Figure 42, position 1). The “Frequency Input Dialog” will be opened (s. 7.1.2.2), 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 of the start- and stop-frequencies.
- Mark any line in the list and press the hotkey “Edit Start F.” (s. Figure 42, position 3) to edit the start-frequency of the desired range to be excluded. The “Frequency Input Dialog” will be opened (s. 7.1.2.2), where you can input any desired frequency.
- Mark any line in the list and press the hotkey “Edit Stop F.” (s. Figure 42, position 4) to edit the stop-frequency of the desired range to be excluded. The “Frequency Input Dialog” will be opened (s. 7.1.2.2), where you can input any desired frequency.

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 42, 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. 5W), 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 frequencies are free selectable.

Designation of the currently active scan mode

Main bearing frequency (currently active)

Scan frequencies

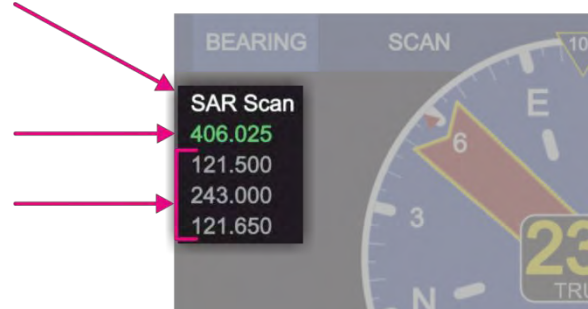


Figure 43. SAR scan. Indication of frequencies.

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 43).

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.



↑

“SAR scan” On
Active frequency:
Main frequency = “All CP/SS”
The system performs the COSPAS-SARSAT scan in order to determine the COSPAS-SARSAT sender frequency.
Signal is not present.

↑

“SAR scan” On
Active frequency:
Scan frequency = 243.000 MHz
Signal is present
The system recognized a sender on the 406.058 MHz frequency, which is shown in place of the main bearing frequency.

Figure 44. “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.

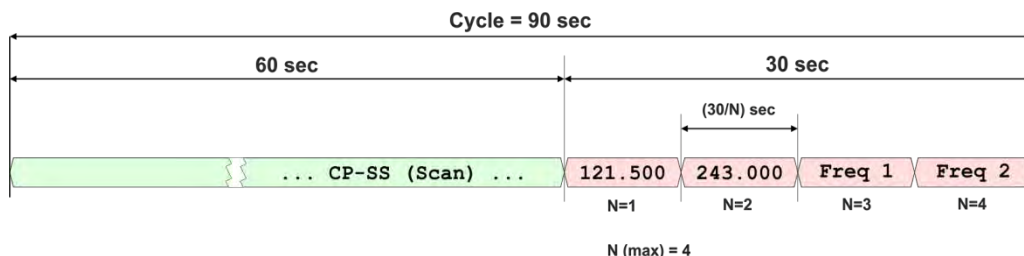


Figure 45. Example: Timing SAR scan, if no frequency is detected.

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.

The scanning time for each scan frequency depends on the number of the selected frequencies (30 sec / N, N = number of frequencies).
 If the COSPAS-SARSAT pulse is not detected, the total time for scanning of the scan frequencies is 30 seconds, which enables the faster run-through of them.

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.

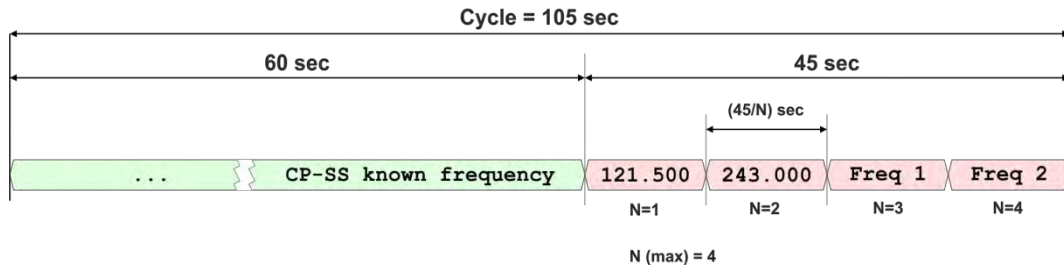


Figure 46. Example: Timing SAR scan, if only COSPAS-SARSAT frequency is detected.

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-second-time elapses.

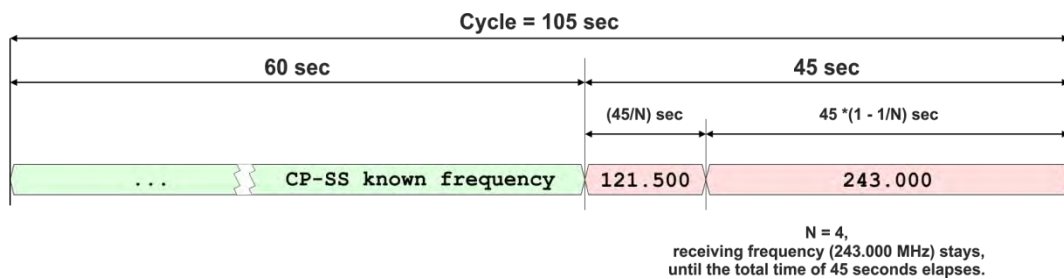


Figure 47. Example: Timing SAR scan, if no CP-SS pulse but a signal on an emergency frequency is detected.

The algorithm returns back 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 48, position 1)



Figure 48. Selecting SAR scan

- Pressing the hotkey “Stop Scan” (s. Figure 48, 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 49), this mode will be terminated.

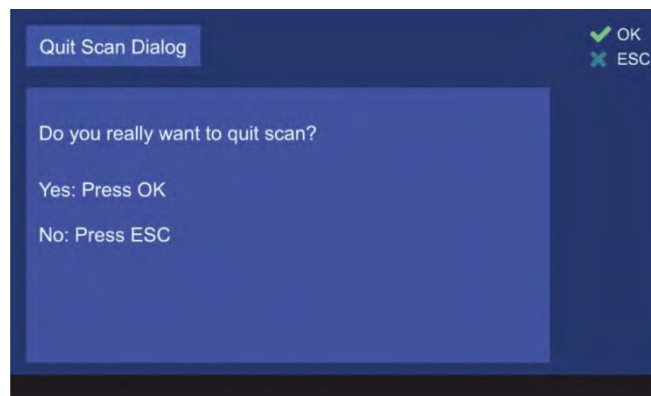


Figure 49. Confirming of leaving the scan mode

- Pressing the hotkey “Go to Result” (s. Figure 48, 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 48, position 4) will open the dialog for changing the SAR scan settings (s. Figure 50)

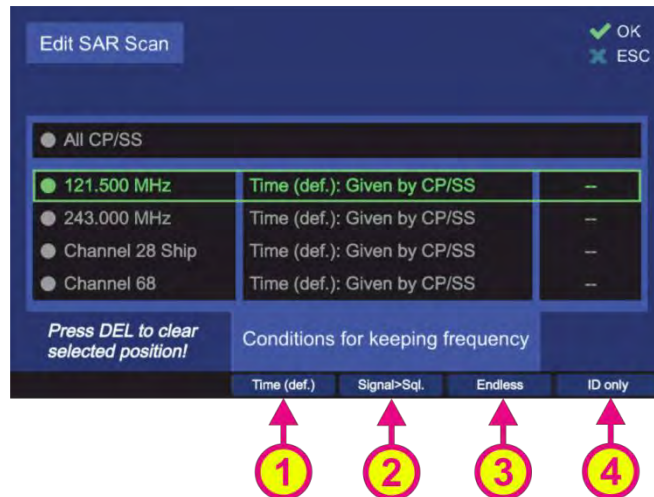


Figure 50. SAR scan. Edit scan settings.

- The hotkey “Edit Freq.” is only visible if the COSPAS-SARSAT frequency (top frequency) or one of the free selectable frequencies is marked (s. Figure 51, position A). By pressing this hotkey the frequency input dialog will open.

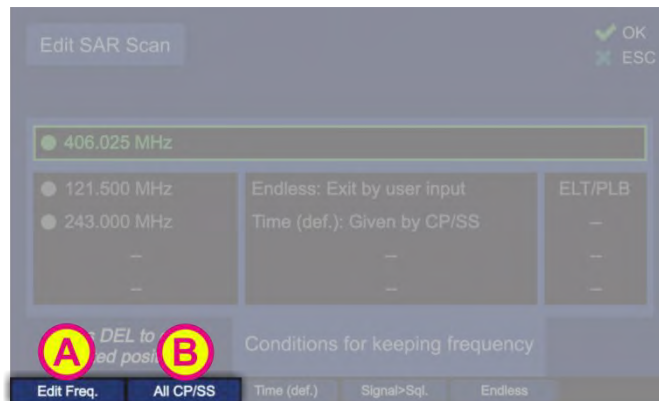


Figure 51. Alternating hotkeys

- The hotkey “Edit Freq.” opens the “Frequency/Channel” input dialog and allows the modification of the currently marked frequency. This hotkey only appears for the frequencies that are configurable (the last two displayed frequencies: Channel 28 Ship and Channel 68, s. Figure 50).
- The hotkey “All CP/SS” is only visible if the COSPAS-SARSAT frequency is marked (s. Figure 51, 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 50, 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 50, 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 50, 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 50, position 4) activates or deactivates the feature “ID Only” (s. 7.2.2.3):
 3. “**ELT/PLB**”:
Alarm is only triggered if an ELT/PLB signature has been detected. Else the bearing is suppressed.
 4. “**-**”:
Alarm is never triggered no matter if there is any modulation on it 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 will be scanned. All results (received signals) are saved in a “Result List”.

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 lie inside one frequency band (s. Table 1 in chapter 4).

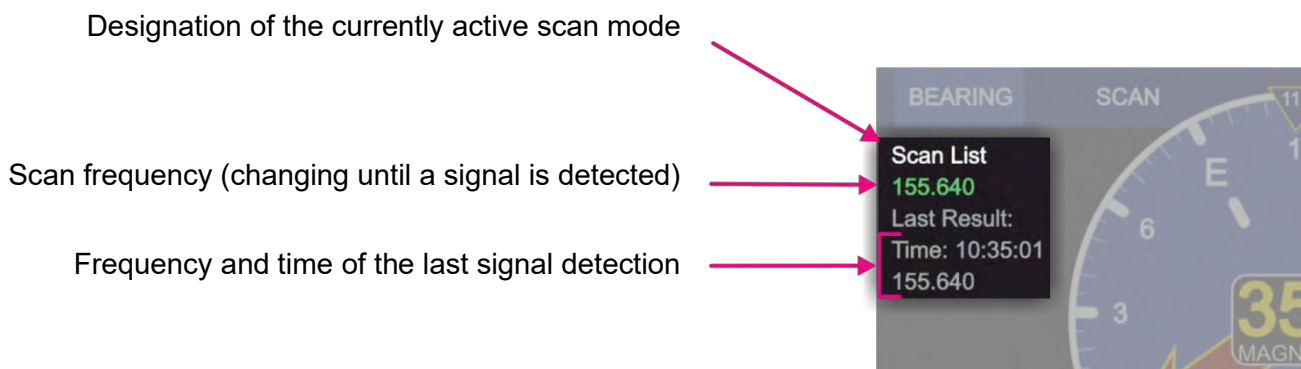


Figure 52. Scan List. Indication of frequencies.

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 53, position 1).



Figure 53. "Scan List" is activated.

- Pressing the hotkey “Stop Scan” (s. Figure 53, 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 53, 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 53, 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 53, 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 54). This hotkey appears only if there is a result for this scan.



Figure 54. Result List Settings

- Pressing the hotkey “Go to Freq.” (s. Figure 54, 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 54, 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 54, 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 54, position 4) will open the “Search List” dialog (s. “Edit Scan” below).
 - Pressing “Edit Exclude” (s. Figure 54, position 5) will open the “Exclude List” dialog (s. 7.2.4.3).
- Pressing the hotkey “Edit Scan” (s. Figure 53, position 6) will open the dialog for changing the settings of the “Search List” (s. Figure 55)

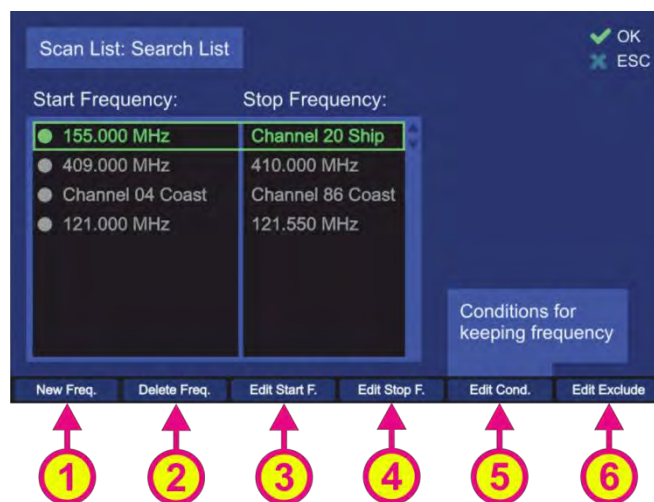


Figure 55. "Search List" settings

- Pressing the hotkey “New Freq.” (s. Figure 55, position 1) generates a new line in the “Search List” and opens the “Frequency Input Dialog” in order to input a valid start frequency. By the input of 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 55, 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 be scanned in the normal manner, when you restart the scan.
- Pressing the hotkey “Edit Start F.” (s. Figure 55, 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 55, 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.

- Pressing the hotkey “Edit Cond.” (s. Figure 55, position 5) opens the “Scan List Conditions” dialog

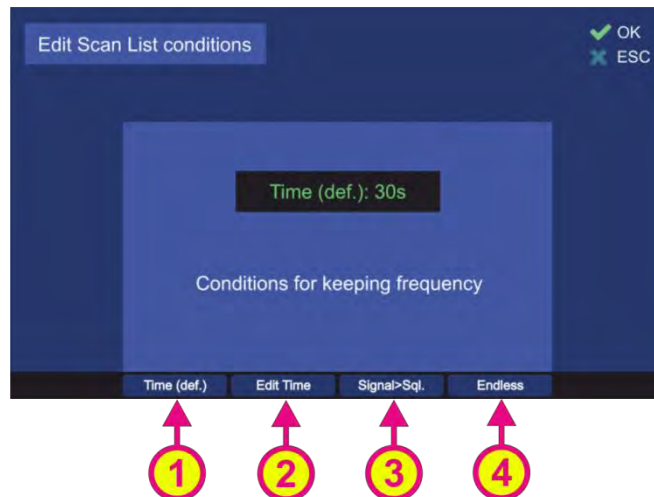


Figure 56. "Scan List Conditions" dialog

- “Time (def.)” hotkey (s. Figure 56, 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 56, 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 56, 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 56, 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).

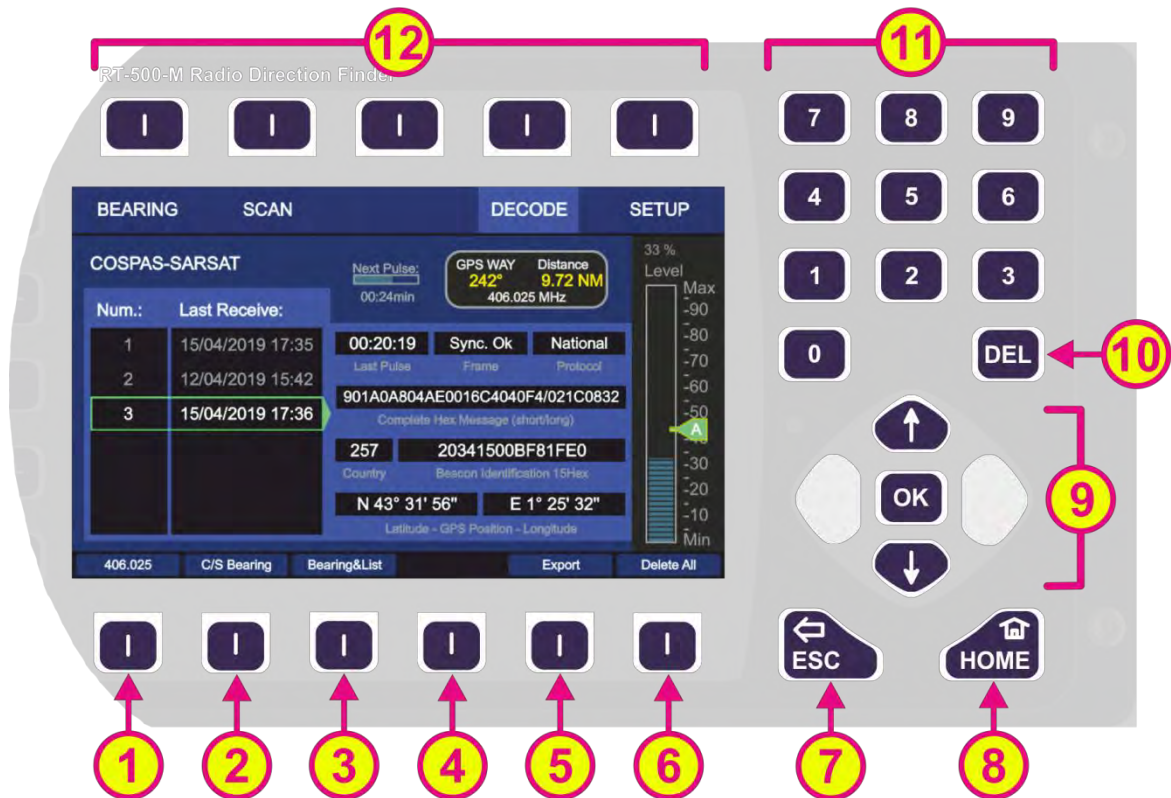


Figure 57. Decode Page. General view.






Indication on Decode Page		
Pos.	Element	Meaning / Description
1	„406.025“	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 57, 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 58). Additionally, an acoustic warning tone is emitted. Press “Confirm” in order to accept the message and to clear the alarm.

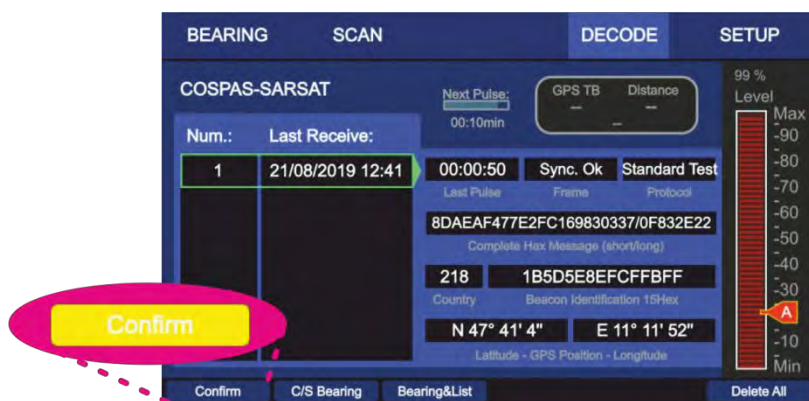


Figure 58. Confirming a new COSPAS-SARSAT message.

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 59, “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.

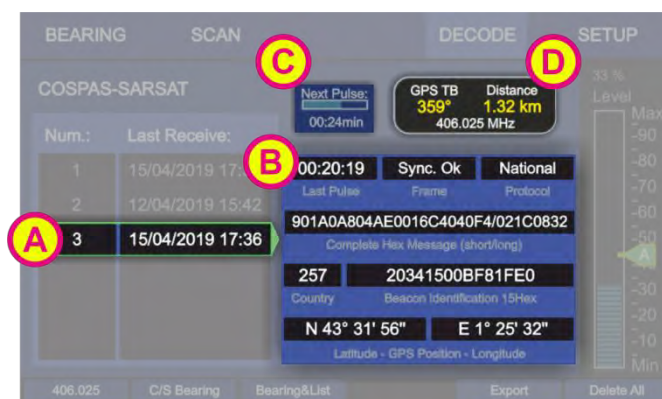


Figure 59. Decode Page. COSPAS-SARSAT List View.

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 in order to delete a selected message. Press hotkey “Delete All” in order 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 59, “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.7.4.2.4).
- 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 57, 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.

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 60. Decode Page: Bearing View.

- Change the active COSPAS-SARSAT frequency by using the hotkey “406.025” (s. Figure 60, position 1).
- Pressing the hotkey “C/S List” (s. Figure 60, position 2) will open to the “COSPAS-SARSAT List” view (s. 7.3.2).
- Pressing the hotkey “Bearing&List” (s. Figure 60, 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 60, position 5).

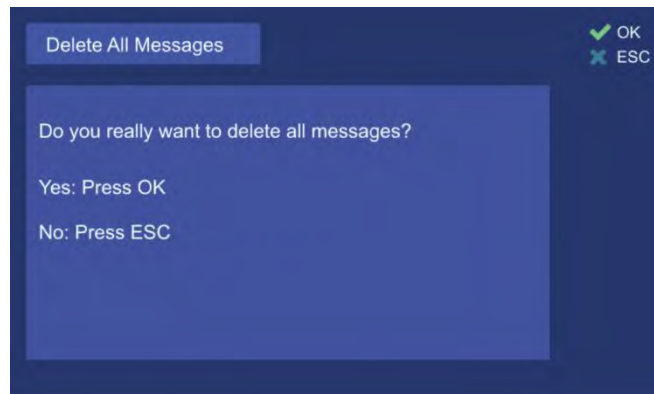


Figure 61. Dialog for confirming of deleting all CP-SS messages.

- Hotkey “Export” exports the GPS coordinates of the currently displayed COSPAS-SARSAT message to the “Bearing” page. (s. Figure 60, 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 62).



Figure 62. "Decode" page. "Bearing and List" view.

- Use the hotkey “406.025” for changing the frequency (s. Figure 62, position 1).
- Pressing the hotkey “C/S Bearing” (s. Figure 62, position 2) will change to the “COSPAS-SARSAT Bearing” view (s. 7.3.3).

- Pressing the hotkey “C/S List” (s. Figure 62, 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 60, 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 60, 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”. 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 63. Indication of the GPS based bearing on the Bearing page

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 on the "Bearing" page, the following menu page opens (s. Figure 64).

The menu "General" contains uncritical settings that 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.

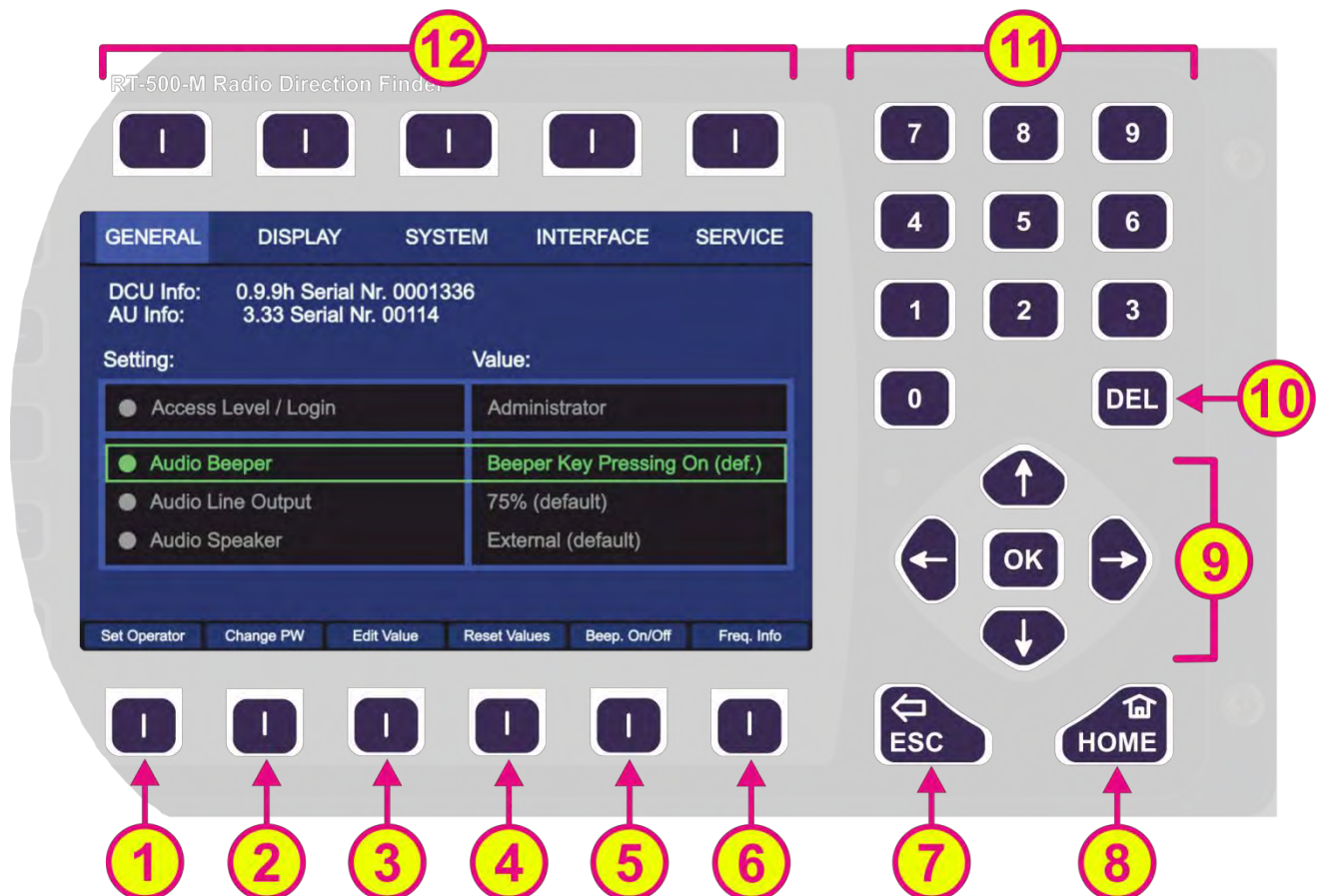


Figure 64. Setup page. General settings (administrator view)



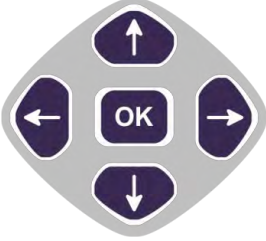

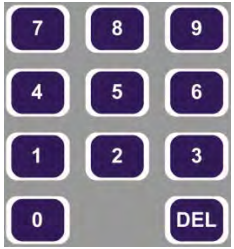
Indication on Setup Page, General Settings		
Pos.	Element	Meaning / Description
①	„Set Operator“ / „Set Admin“	Switches between two states: <ul style="list-style-type: none"> - Access level: operator - Access level: administrator
②	“Change PW”	Pressing this hotkey will lead to the dialog for changing the password for the “Administrator” access level, where the old password has to be entered first, whereupon the new password can be defined.
③	“Edit Value”	Depending on the currently marked line, using this hotkey will open the dialog for changing the corresponding value (s. descriptions below).
④	“Reset Values”	Resets all values to the default settings. The default setting values cannot be changed by the user.
⑤	“Beep. On/Off”	Switches between two states: <ul style="list-style-type: none"> - Beeper is activated by each button press - Beeper does not react on button presses
⑥	“Freq. Info”	Opens a dialog which shows the currently available frequencies (also not available or locked frequencies will be shown) (s. 7.4.1.8).
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.

The “General” menu provides general information like serial numbers and software versions of DCU and AU (s. Figure 65).

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.

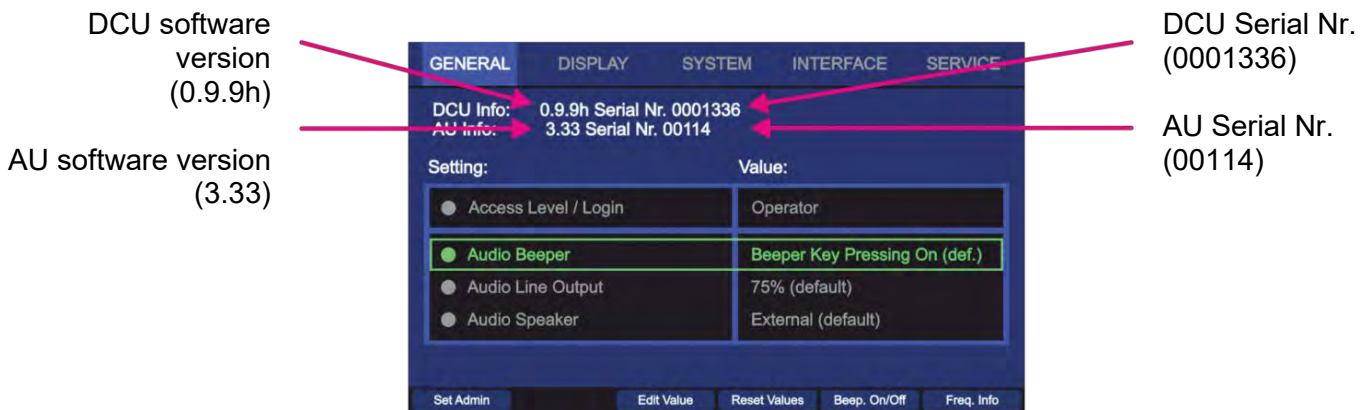


Figure 65. Setup page, General settings appearance for the access level “Operator”

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.

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.

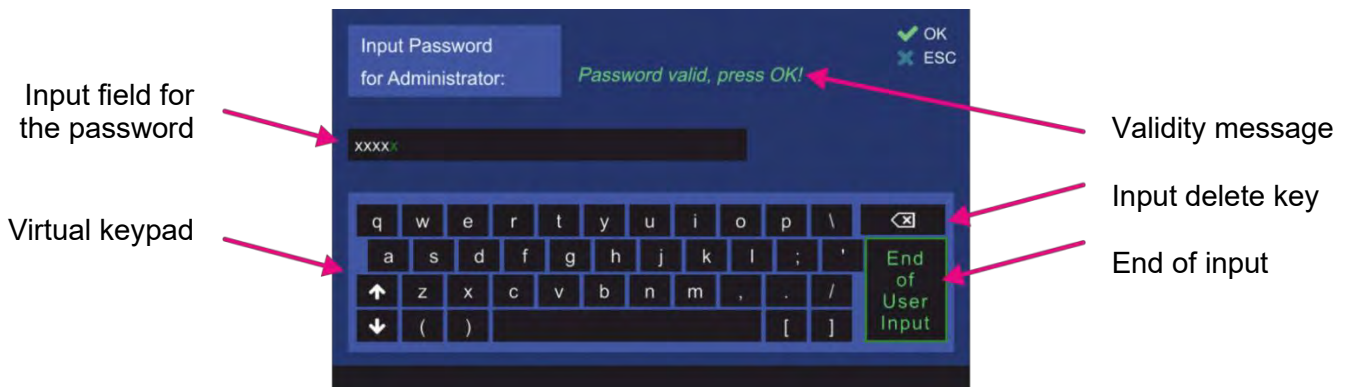


Figure 66. Accessing the administrator level

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 66, “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 67) 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 67. Changing password

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



Figure 68. 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 68) 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 69. 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 70):

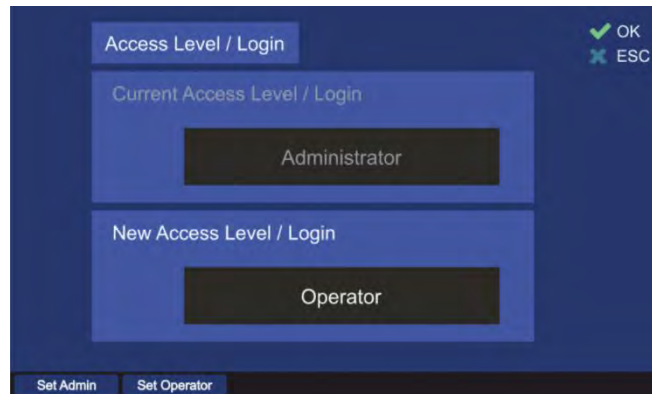


Figure 70. Editing the access level to "Operator"

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”

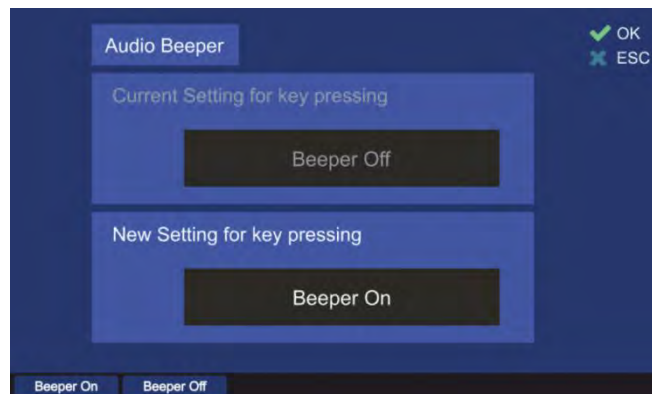


Figure 71. Editing the value for the audio beeper

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”

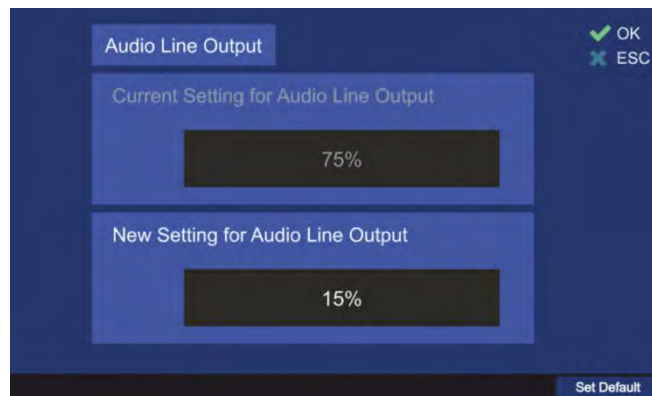


Figure 72. Edit value of the audio line output level

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”

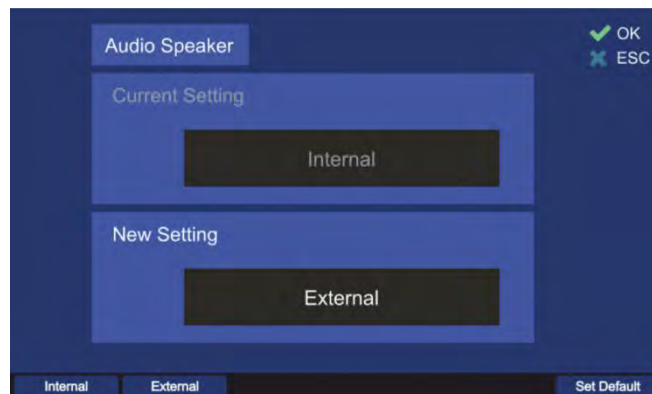


Figure 73. Edit value for the speaker

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 65) the frequency information dialog opens. The frequency information is presented in the form of a list of the available and not available frequency bands.