User Manual

DF COMMANDER

Direction Finder
Remote Control and Monitoring Software

R H O
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Note

The manufacturer reserves the right on making modifications of the product described at any time and without previous information.

Content

1   Overview

The main purpose of the "DF Commander" Software is to provide the remote control and monitoring of multiple DF-Channels and DF-Systems from a standard PC. This software allows the visualizing of the bearing data, such as bearing angle, signal level and frequency of an appropriate channel. The simple and convenient design of the "Bearing Page" and the possibility to adjust the orientation of the compass rose towards the tower window view makes the controller's work very comfortable.

Furthermore the software provides the possibility to simultaneously monitor the status of all channels connected, which is also a helpful feature for the technical monitoring and maintaining of the DF-System.

Page Area

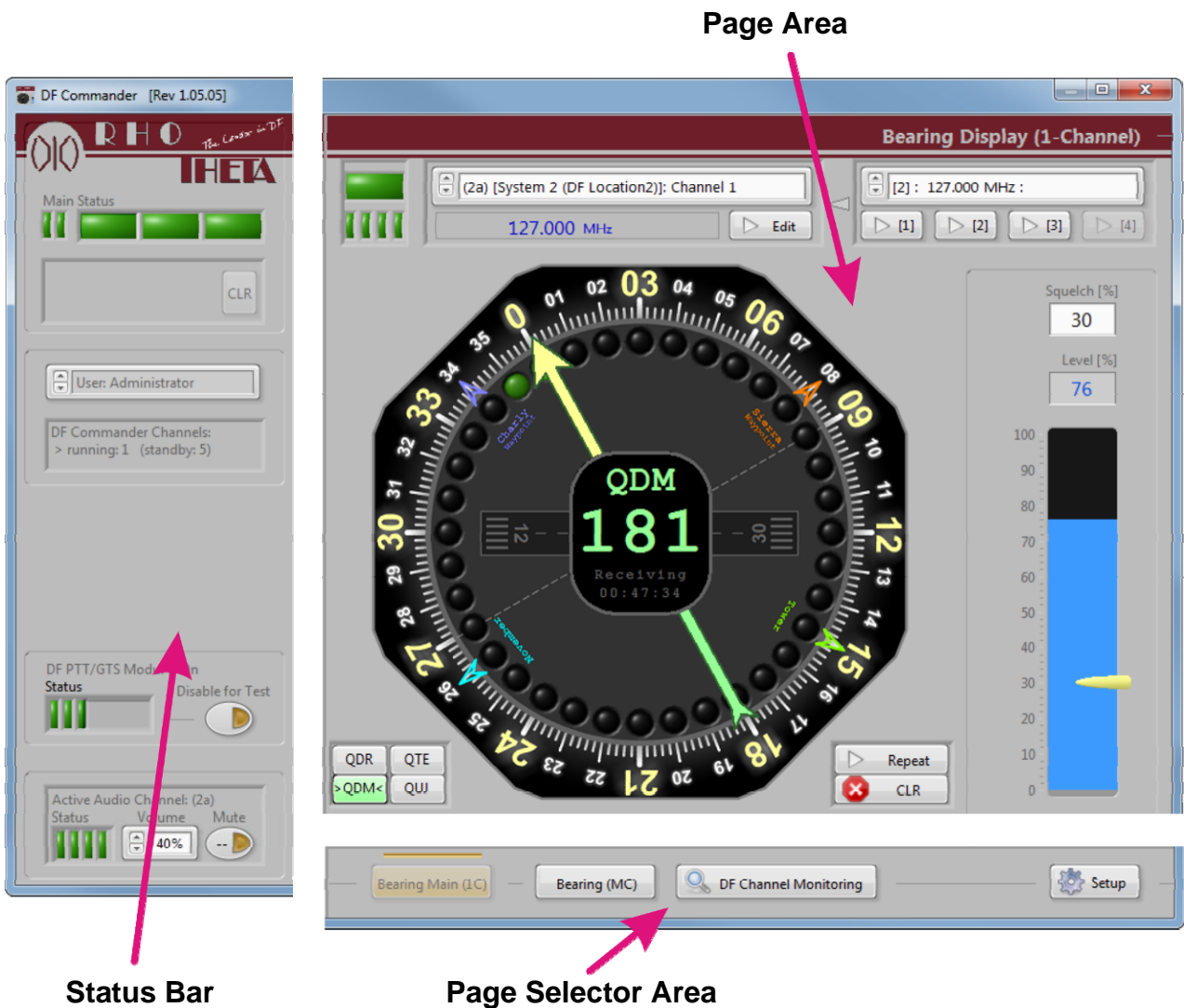**Status Bar**   **Page Selector Area**

Figure 1: DF Commander - Overview

The display is separated into three main areas – The "Status Bar", the "Page Selector Area" and the "Page Area".

The "Status Bar" is always visible (beside the actual page) and provides the information about the technical status of the system. It delivers:
- The main status of the system using the "Error-" and "Warning"- LEDs

- The error flag displays the error message and the time when the error was registered for the first and last time. The error flag can be cleaned by pressing the CLR button
- The user login (as administrator, operator or technician)
- The information about the running and standby channels. In case of "Bearing Main (1C)"-page this field shows one "running" channel, which is currently operating, and all other available channels as "standby". In case of "Bearing (MC)"-page this field indicates all activated channels as "running" an all switched off channels as "standby".
- The information about the PTT/GTS Module ("Push To Talk / Ground Transmitter Suppression" otherwise called "self-transmitter suppression") with its technical status (for further information see chapter 5.3.4).
- The information about the active audio channel with its technical status.

Four different pages can be selected from the "Page Selector Area", which also remains visible during the operation (beside the actual page).
The selected page will be displayed in the "Page Area". Each page has its own image presentation of the page area, which is described in the corresponding chapters.

The "**Bearing Main (1C)**" page is designed for the visualization of the bearing data of selected DF-Channel. The frequency and the squelch level can be changed on this page.

The "**Bearing (MC)**" page is developed for the simultaneous visualization of the bearing data of several operating DF-channels. On this page the particular DF-channels can be switched on and off, the arrows can be highlighted in different colors.
This page is only available, when the software unlock-option "Service Multichannel" is ordered. Otherwise the button "Bearing (MC)" is shown grayed out.

The page "**DF Channel Monitoring**" is designed for simultaneous observation of all configured channels and can be used for technical monitoring and maintenance.
This page is only available, when the software unlock-option "Service Multichannel" is ordered. Otherwise the button "Bearing (MC)" is shown grayed out.

The page "**Setup**" provides all necessary tools to configure the software and the Direction Finder.

2 Bearing Main (1 Channel)

2.1 Overview
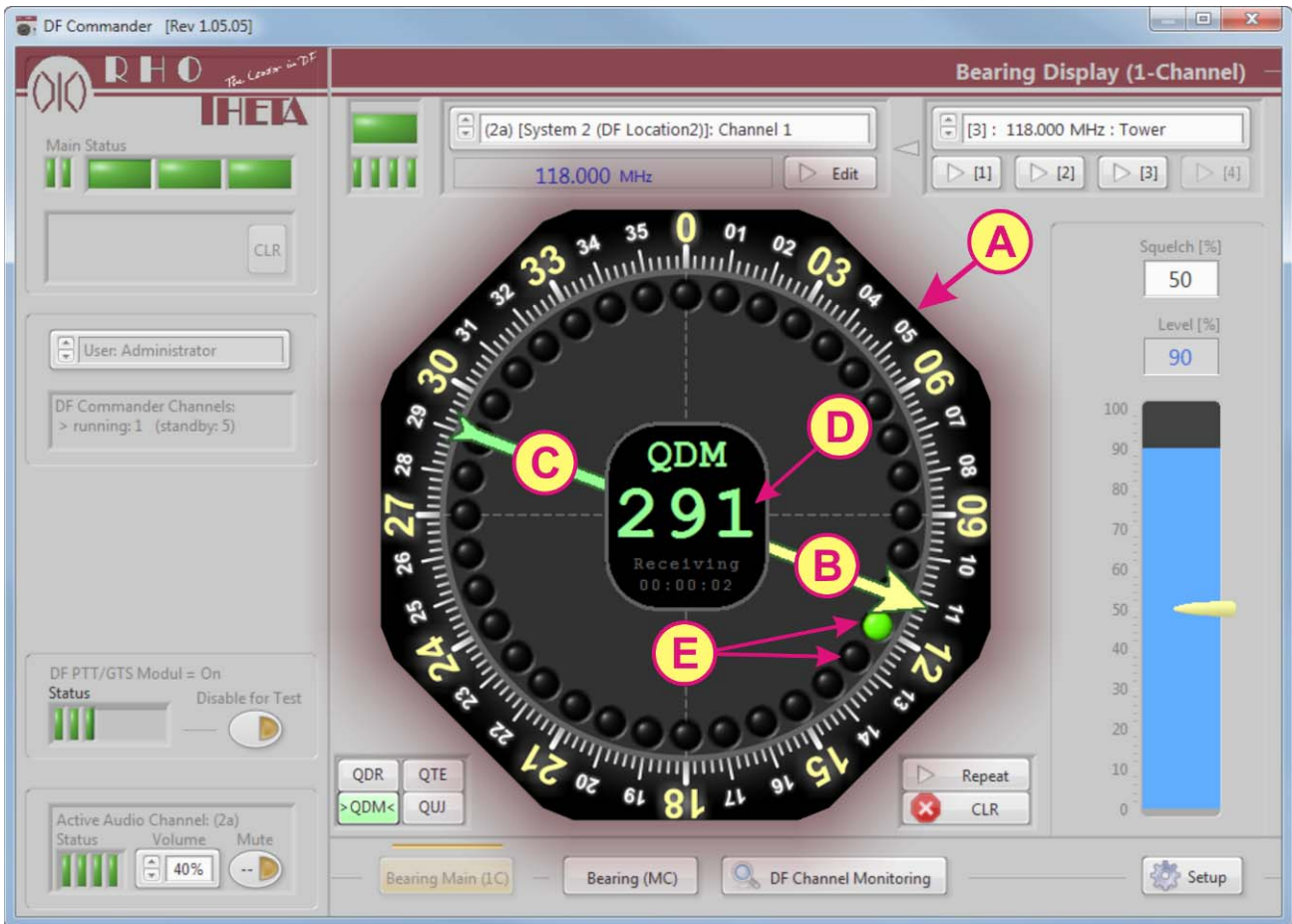
Figure 2: "Bearing Main (1C)"- Main Display

A: Compass Rose / Wind Rose

The compass rose is rotatable. The top of the compass rose can be adjusted towards the tower window view (air traffic control). This feature allows the controller to look out of the window in the direction indicated by the arrow (see "B"). It allows an easy visible detection of aircrafts by just looking out of the window, without calculating the desired north offset.

B: Arrow Forward Direction

The arrow forward direction indicates the QDR **averaged** bearing.

C: Arrow Reverse Direction

The arrow reverse direction indicates the QDM **averaged** bearing.

D: Main Display

The main display provides the indication of the numeric bearing value depending on the reference direction set (s. "B" and "C"): QDM or QDR, QUJ or QTE – in case of ATC-Style, and True North or Magnetic North – in case of Std./VTS-Style (s. chapter 5.4.1). The reference direction can be changed in the area "F" (s. Figure 3).
Main display also provides the time since the signal has arrived at the Direction Finder while the signal still exists – "Receiving".
When the signal disappears (the signal level drops below the squelch level), no bearing indication will be displayed. The time indicator shows the time since the last transmission – "Last Bearing".

E: Life Bearing

The indication of life bearing is realized by a LED circle of green lamps. It indicates the **not averaged** bearing. Life bearing allows evaluating the quality of a bearing signal. If the "life" bearing indication shows considerable variations or differences to the averaged bearing (Arrow Forward Direction "B"), the operator can see that the Direction Finder is affected by noise, shadowing, reflections or strong modulation.
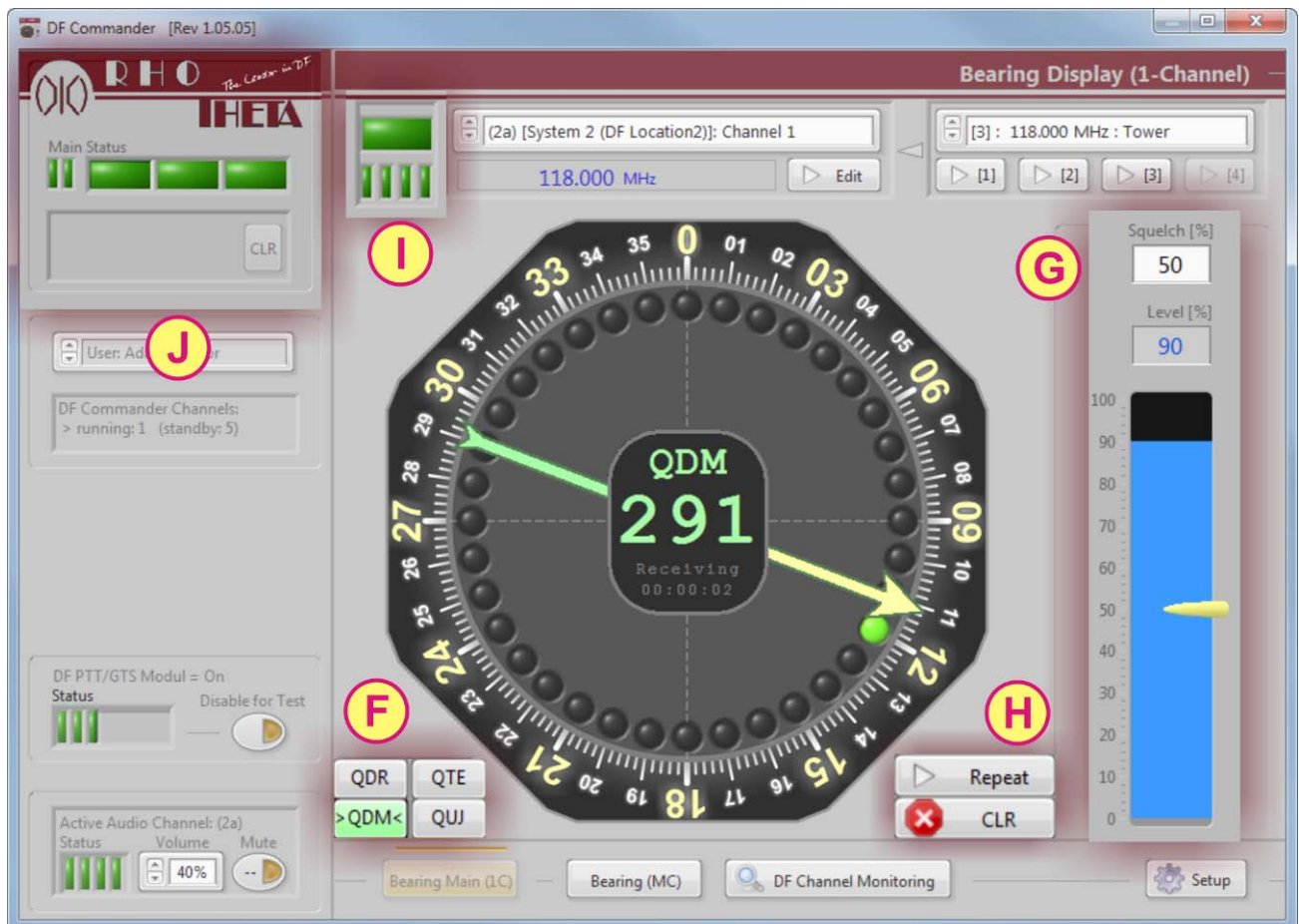

Figure 3: "Bearing Main (1C)"- LEDs and Controls

F: Reference Direction Buttons

Reference Directions and Variation	Meaning	Reference Direction	
QDM	Magnetic bearing (course) of aircraft / vessel to the DF station	Magnetic north	QDM = QDR ± 180° QDM = QUJ - VAR
QDR	Magnetic bearing from the DF to the aircraft / vessel	Magnetic north	QDR = QDM ± 180° QDR = QTE – VAR
QTE	True bearing from the DF to the aircraft / vessel	True north	QTE = QUJ ± 180° QTE = QDR + VAR
QUJ	True bearing (track) of aircraft / vessel to the DF station	True north	QUJ = QTE ± 180° QUJ = QDM + VAR
VAR[1]	Variation		

The pictorial explanation of these reference directions is shown in Figure 4.
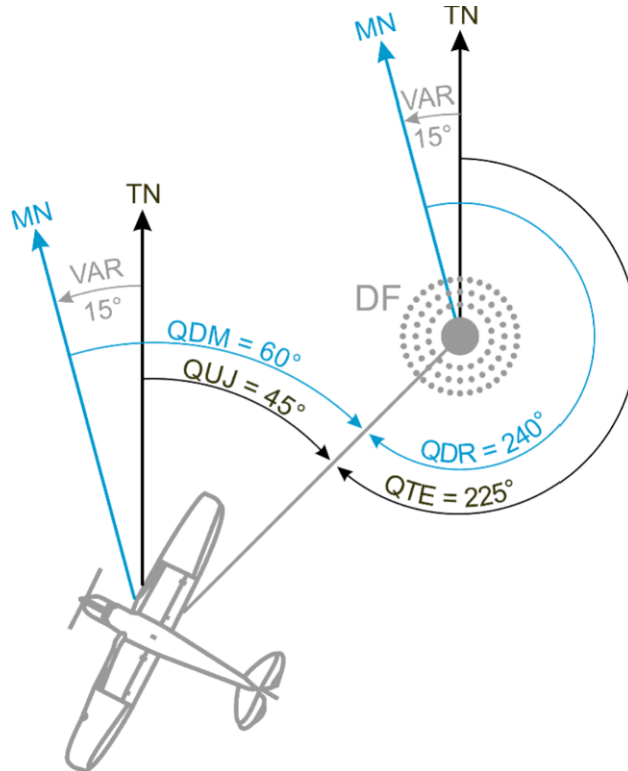The picture shows the variation of 15°W. Then the variation value is -15°.

Figure 4: Explanation of reference directions QDM, QDR, QTE, QUJ, True North (TN), Magnetic North (MN)

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[1] The west variation has a negative sign "-" and the east variation has positive sign "+".

Reference Direction buttons change the indication of the numerical bearing in the main display (see "D"). These buttons can also be locked by the administrator or technician in the display setup menu, in order to avoid unexpected changing of the reference direction.

G: Signal Level Indicator

The signal level indicator provides the indication of a signal level in [%]. Low signal level means a long distance to the aircraft / vessel. Analogue the high signal level stands for a short distance to the aircraft / vessel.
The signal level indication is also used to evaluate the channel noise and to setup the appropriate level of squelch.

H: Repeat and Clear Buttons

While the button "Repeat" is pressed, the last saved bearing and the frequency of the selected channel will be displayed as a numerical value on the main display (see "D") and by the bearing arrow. The indication of the last saved signal level is also provided.
This feature allows the tower controller to review the last bearing after the signal has been lost.
Clicking on "CLR" button deletes the last saved bearing.

I: Channel Status Indicator

Figure 5: Channel status indicator

1 – Indicates the status of the **"Interface"** (hardware) of the working channel. It turns red if the interface is not working. This indication shows whether the DF-Channel is physically accessible.

2 – Indicates the data **"Time Out"**. The lamp is divided into two halves. The upper half turns red if the data is not arriving in a specified time. The lower half becomes yellow and flashes. This state shows that the system is trying to fix the error.
Data "Time Out" indication shows whether the data is cyclically arrived from DF-Channel.

3 – Indicates the status of **"Data"**. The lamp is divided into two halves. The upper half turns red if the data is wrong or not consistent.

4 – Indicates the status of the DF – **"DF Error"**. It turns red if the DF produces an error. The appropriate text message will be indicated in the error flag below the main status display.

5 – Indicates the **"DF Warning"**. It turns yellow if the DF produces a warning. The appropriate text message will be indicated in the error flag below the main status display.

J: Summarized Error Indication

Figure 6: Summarized error indication

1 – Display Refresh
These two LEDs shell continuously flash. It shows that the given PC is working in order to avoid the standing display and to provide safety.

2 – Summarized ERROR Indicator
This LED indicates an error, if the selected DF-Channel or DF-Channels on the monitoring page produces an error.

3 – Summarized WARNING Indicator
This LED flashes yellow, if the system produces a warning.

4 – Setup Error Indicator
This indicator will show an error, if the user made a setup error (e.g. The user types the same IP in two different Channels).

5 – Error Flag
This field will show and save an error, if any error appears and hold more than 15 seconds. The indication can be cleared by clicking on Button "CLR".

2.2   Change Frequency

Please go to the "Bearing Main Page" (see "A") by clicking on "Bearing Main" button.
Select the desired DF-Channel from the channel selector drop down menu (see "B").
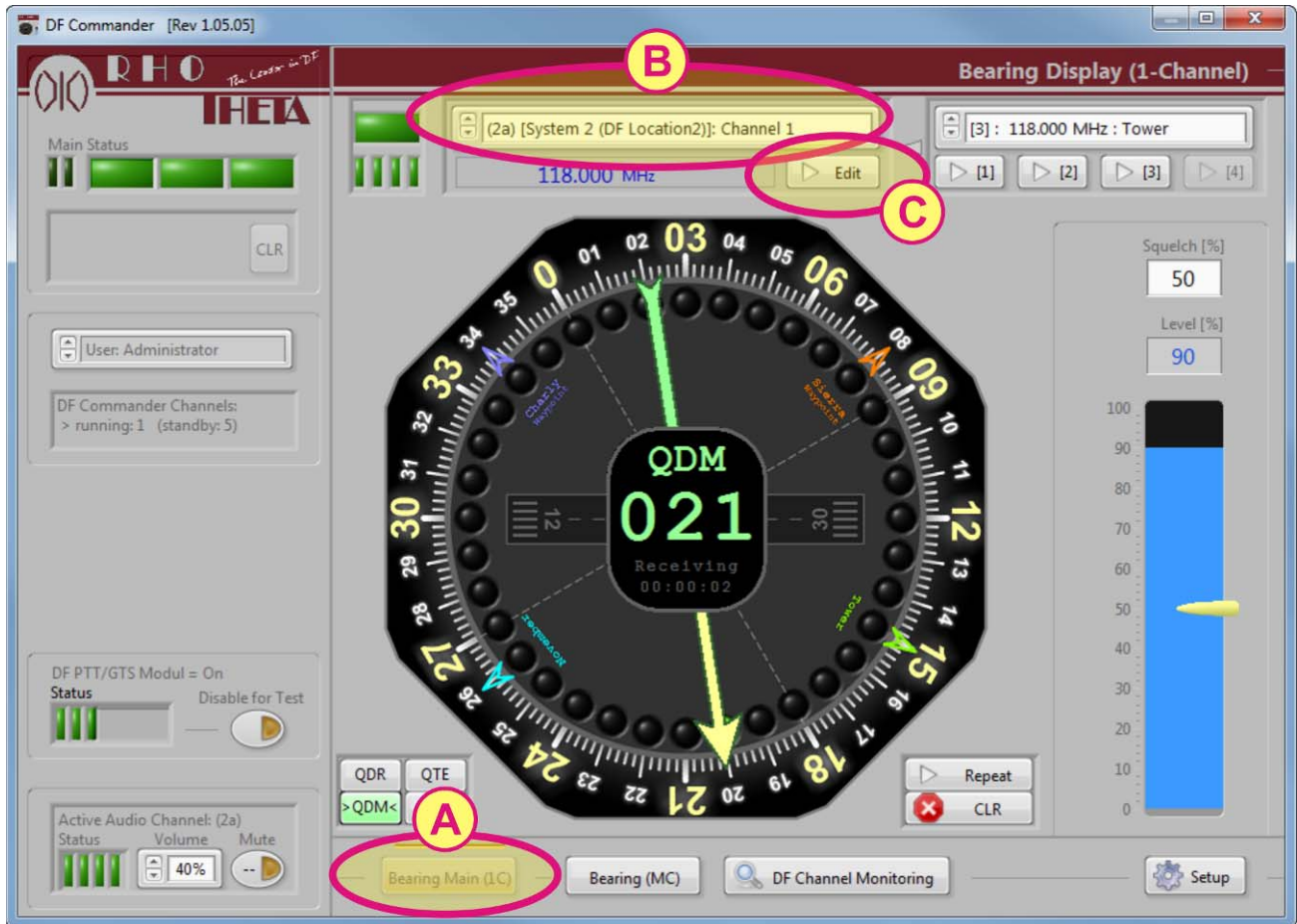Click on "Edit" button (see "C").

Figure 7: Changing frequency

The frequency input window will appear at the screen (s. Figure 8).
Insert the frequency you want to setup. The input can be carried out either as a frequency or as a frequency channel number (s. Figure 8).
It is also possible to enter the frequency via the keyboard:

- Figure-buttons for entering the single figure
- Backspace and arrow-keys correspond to the keys "<" ">"
- Enter corresponds to the key "OK"
- Press "S" or "C" for changeover between "Ship" and "Coast"
- Press "F" for switching to the frequency input
- "Delete" and "Esc" keys correspond to the buttons with the same name in the frequency input window

Current frequency of the channel selected

Type new frequency

Switching between frequency and frequency channel input

Pressing the key cleans the entire input

Pressing the button deletes single digits

Pressing the button deletes single digits
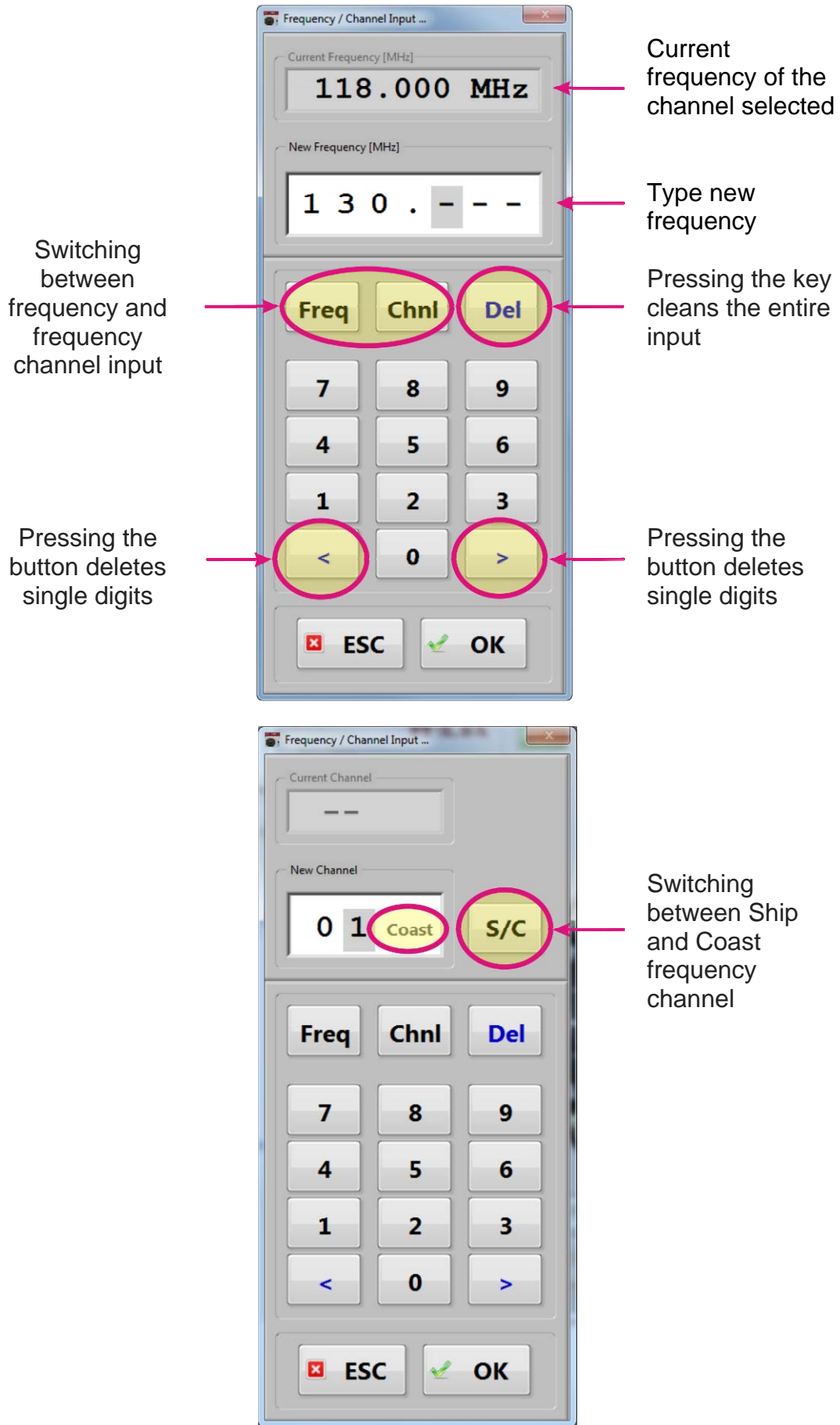
Switching between Ship and Coast frequency channel

Figure 8: Frequency input mask

The new frequency will be stored in the DF-Channel hardware. Wrong or excluded frequencies from "Exclude Frequencies / Channels List" (s. chapter 5.3.3) will not be accepted. If no user entries occur, the window will close after 10 seconds. No frequency change will happen.

The frequency of the selected channel can also be changed using the list of "Preselected Frequencies".
Please click on the dropdown menu of "Preselected Frequencies" (see "D") or select one of the desired buttons corresponding to the frequency numbers in the list (see "D").
See Chapter 5.3.2 "Setup the Preselected Frequency List" to understand how to modify the list.

Figure 9: Hot keys for preselected frequencies

2.3   Fixed Frequency

In order to prevent a frequency from being changed e.g. when several users are simultaneously accessing the same channel, the "Fixed Frequency" - function can be used (for setting the fixed frequency, see chapter 5.2.3).
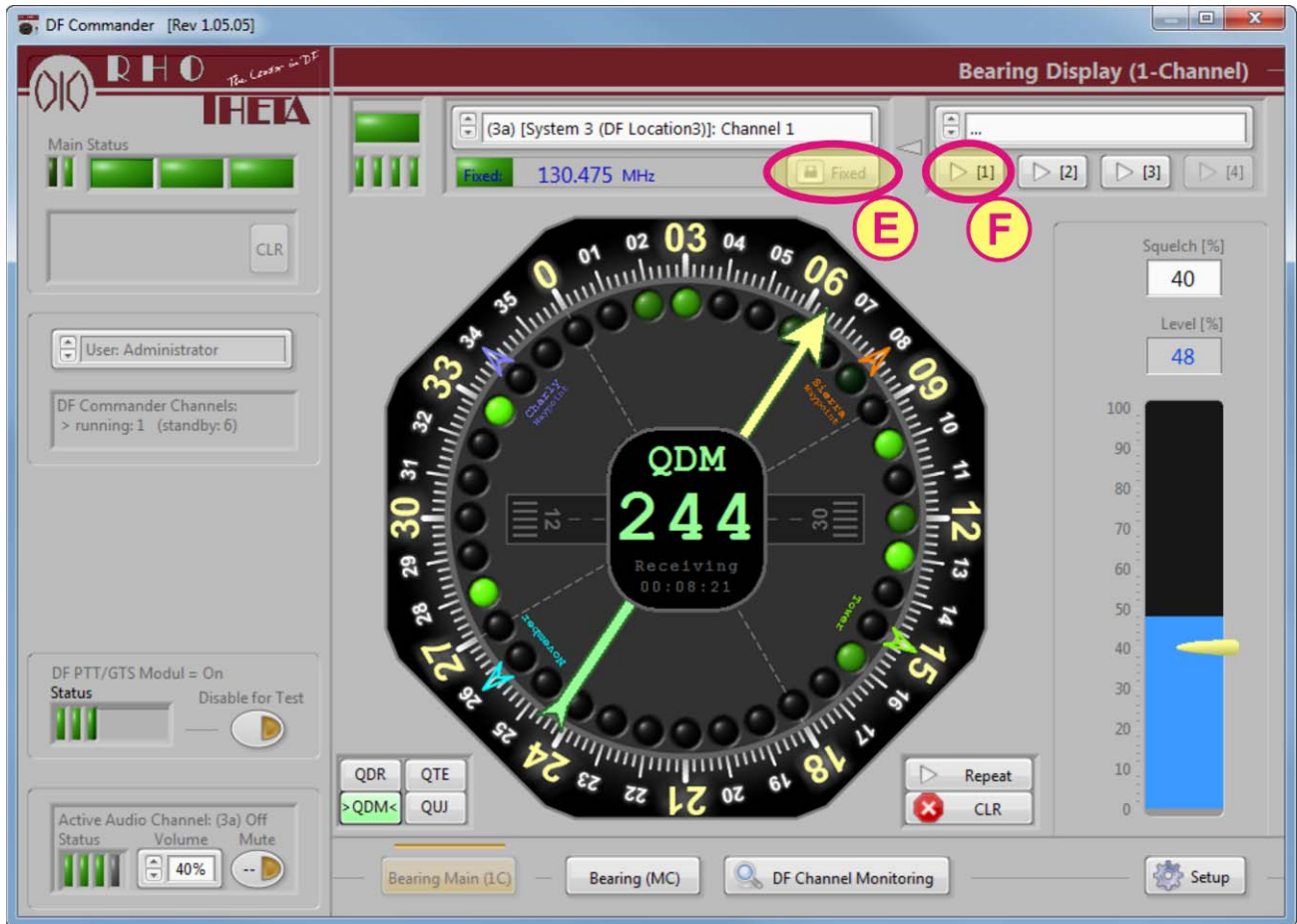

Figure 10: Frequency input when a frequency is fixed

Frequency input in the "Fixed Frequency"-mode is not possible. The "Edit" - button is locked and appears as "Fixed". A frequency can only be entered by pressing one of the optional hotkeys "F". In such a case, the following screen will appear (s. Figure 11).

Flashing indication of configured "Fixed Frequency" and actual adjusted DF channel frequency.
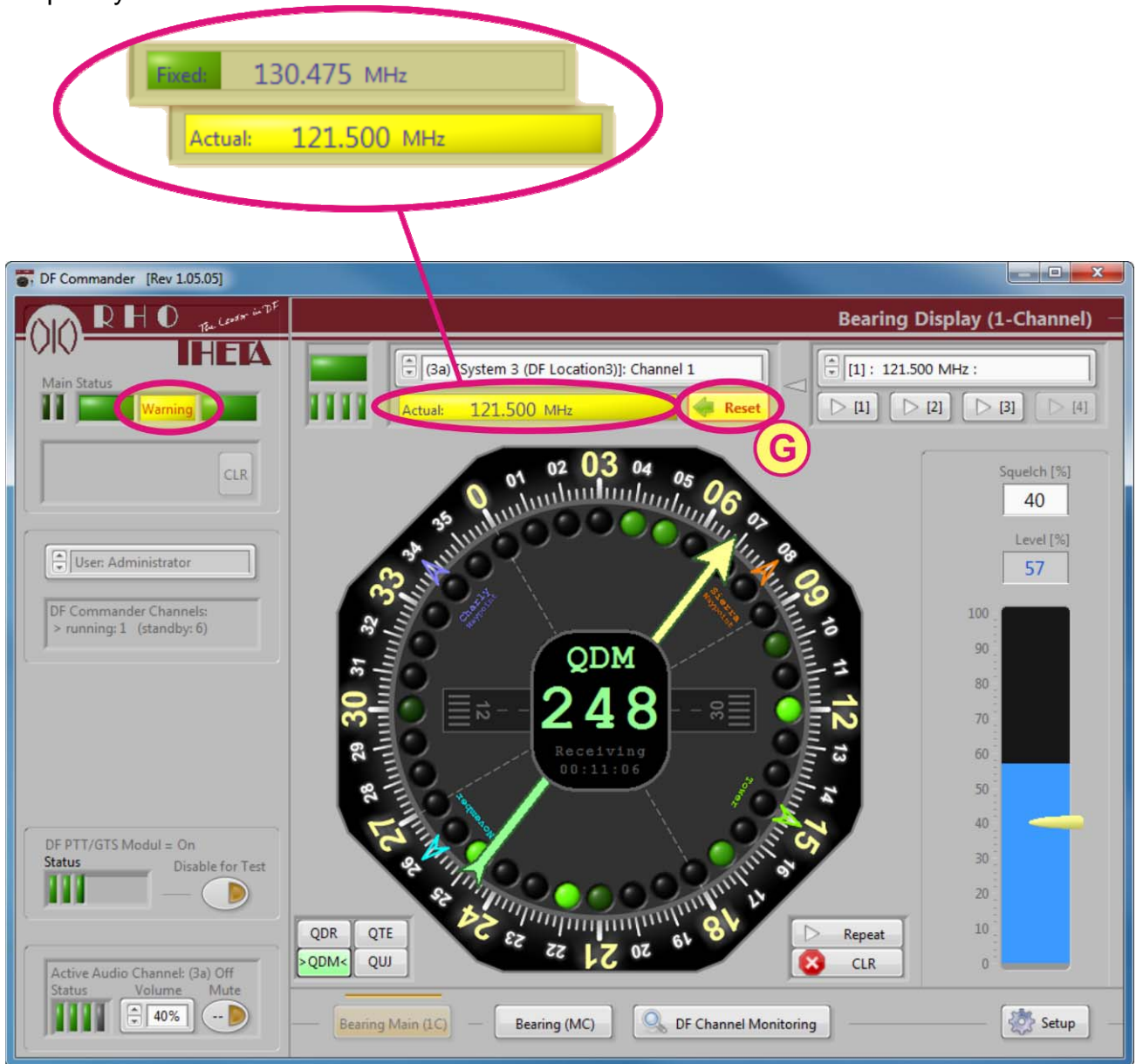

Figure 11: Warning message when attempting to change the fixed frequency

To disable the warning, press "Reset" (see "G") – the configured fixed frequency is set again. For setting the fixed frequency, see chapter 5.2.3.

2.4 Change Squelch Level

The change of the squelch level is only possible if the user has been logged in as a "Technician" or "Administrator".

Please go to the "Bearing Main Page" by clicking on "Bearing Main (1 C)" button (see "J"). Select the desired DF-Channel from the Channel Selector drop down menu (see "H").
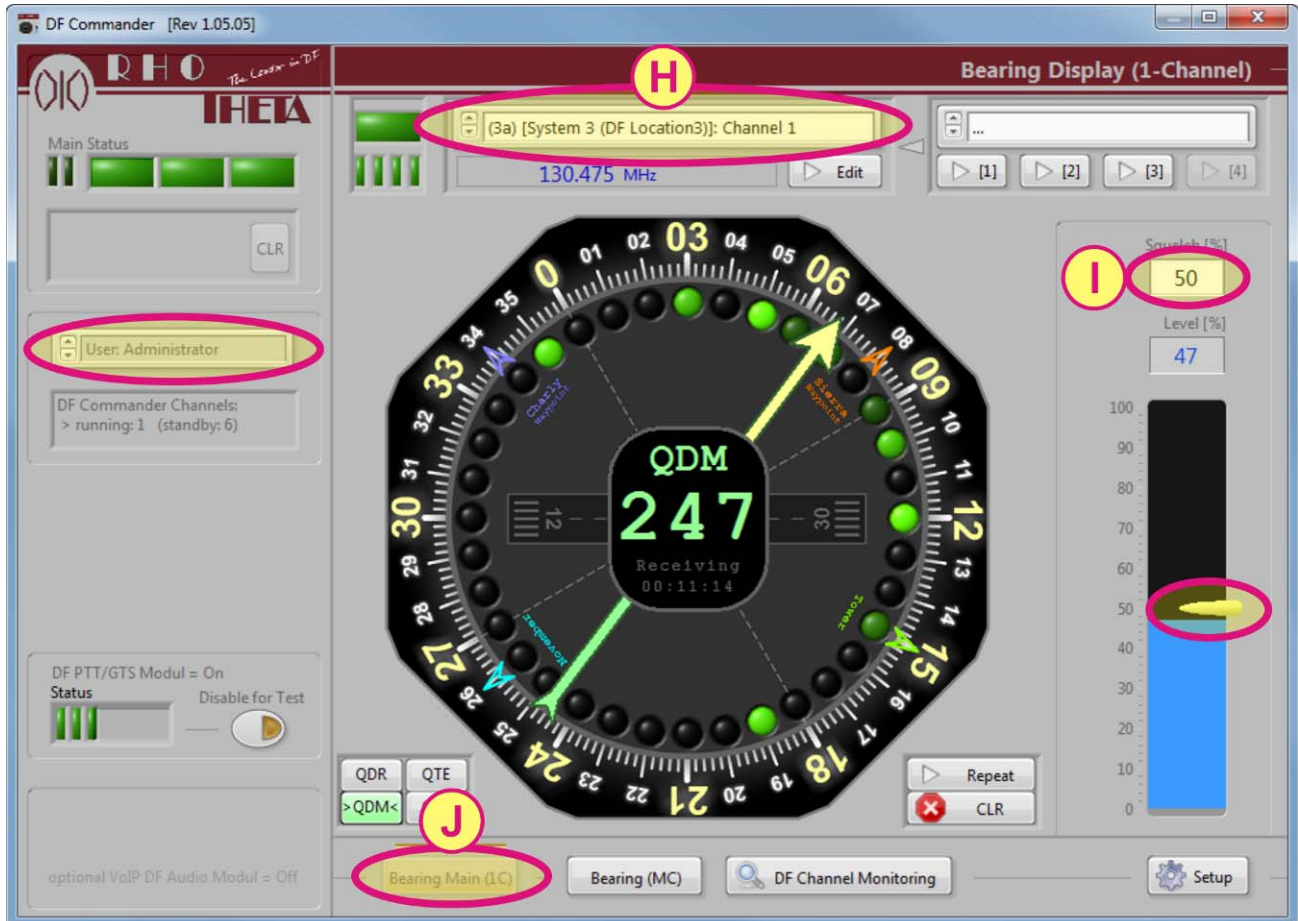

Figure 12: Changing the squelch level

Type the appropriate level of squelch in [%] (see "I").

Be aware that the adjusting of squelch level defines the sensitivity and therefore the working distance range of the channel selected. The squelch level is factory adjusted. Change the squelch level only if an increased noise level or other kind of disturbance is measured on the selected frequency.

3 Bearing (Multi Channel)

In the „Bearing (Multi Channel)" page, the operator has the ability to visually control all channels and to view the bearing on the compass rose at the same time. For example in air traffic control applications, this page provides the possibility to monitor certain frequencies like "Approach" or "Tower" and also to monitor the emergency frequency at 121.500 MHz. In vessel traffic service applications, the operator can also monitor the emergency frequency at 121.500 MHz, Channel 16 and other required frequencies simultaneously.

As it shown in the following figure, the "Baring (MC)" page contains of three main areas "A", "B" and "C".

Area "A"

Area "A" represents the compass rose, where the bearing of all active channels can be displayed. The allocation of channels to the arrows is done by colors. Therefore the operator, using the DF – Commander first time, has to select appropriate colors of channels in the area C in order to have the ability to differentiate channels visually.

It is important to know that the display setup, which has the impact on reference directions (QDM, QDR, QTE, QUJ, magnetic North, True North), the top of the compass rose, markers, runway, bearing and hold time is done in the Display Configuration page (press "Setup" then "Display Settings"), have the influence as well on the Bearing Main (1 Channel) as on the Bearing Multichannel page.
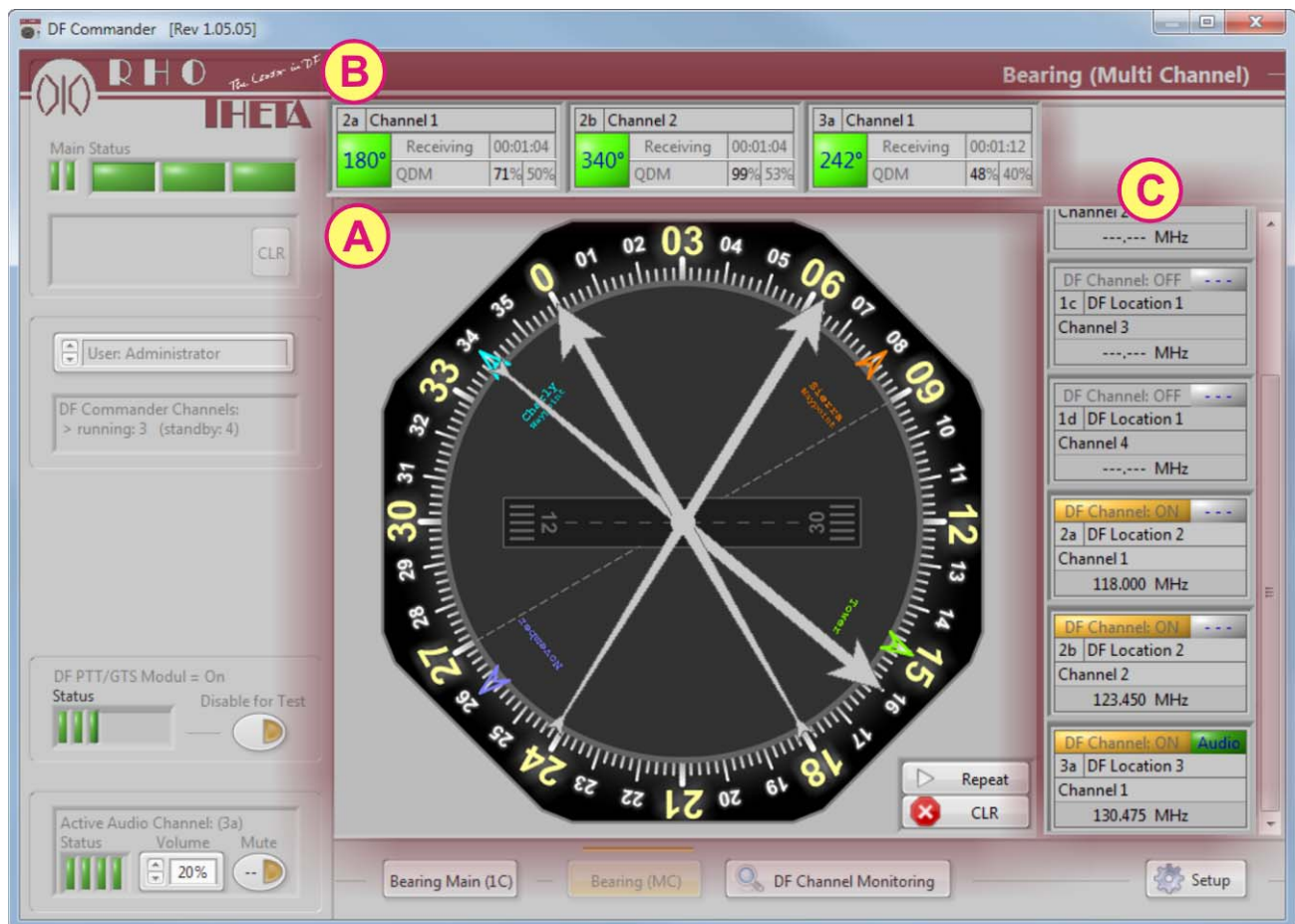

Figure 13: Bearing (Multichannel) Overview

Area "B"

Area "B" has mainly the same function as the main display in the "Bearing Main (1 Channel)" page with the difference that the information of more than one channel is shown. First, the display shows the system channel number and the channel name, which is set in the "System & Channel Configuration" page. Second, it shows the bearing value numerically, depending on the reference direction (QDM, QDR, QUJ, QTE, Magnetic North, True North), which is set in the "Display Configuration" page. The appropriate reference direction is also shown right to the bearing value. Additionally, the signal status information (e.g. Receiving, PTT, Last Bearing) and the corresponding time is displayed below the channel name. Finally, the display shows the current squelch and signal level.
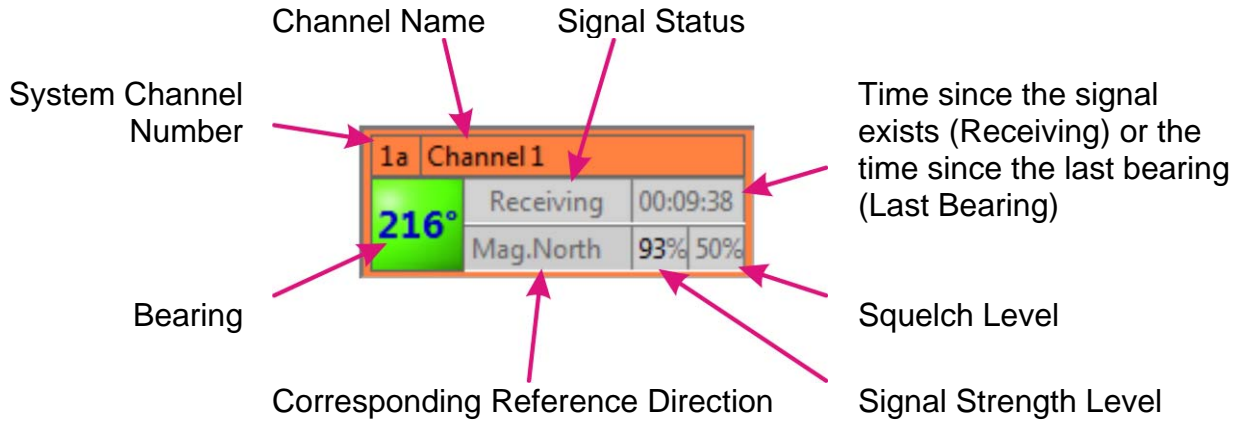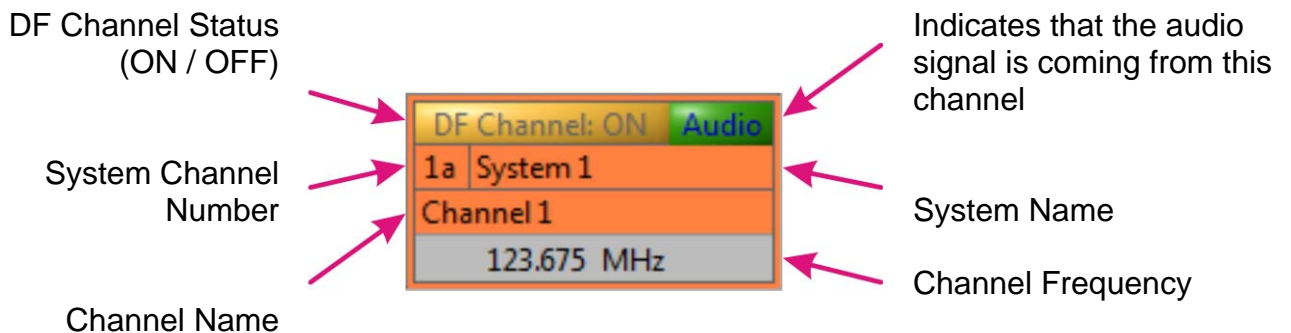

Area "C"

Since the area "B" shows only active channels in a horizontal line, the area "C" represents the column of all configured channels in the "System & Channel Configuration" page independently of whether the channel is active or not. The list can be vertically scrolled in order to have access on all channels.

The area "C" allows the controller to setup the following three things:

-   Activate or deactivate channel
-   Select color of the channel
-   Select the channel on which the audio signal is needed.

Further the display shows the channel status (Active "ON" or not active "OFF"), the system channel number and name, the system name and the channel frequency.

The color and name of channels in the area "C" corresponds exactly to the displays in area "B" and also to the arrows displayed in the area "A".

Press the left mouse button on the appropriate channel in the area "C" in order to modify the channel. The following window will be displayed.

Select color

Activate or deactivate channel

Switch ON or OFF audio

Quit without saving of settings
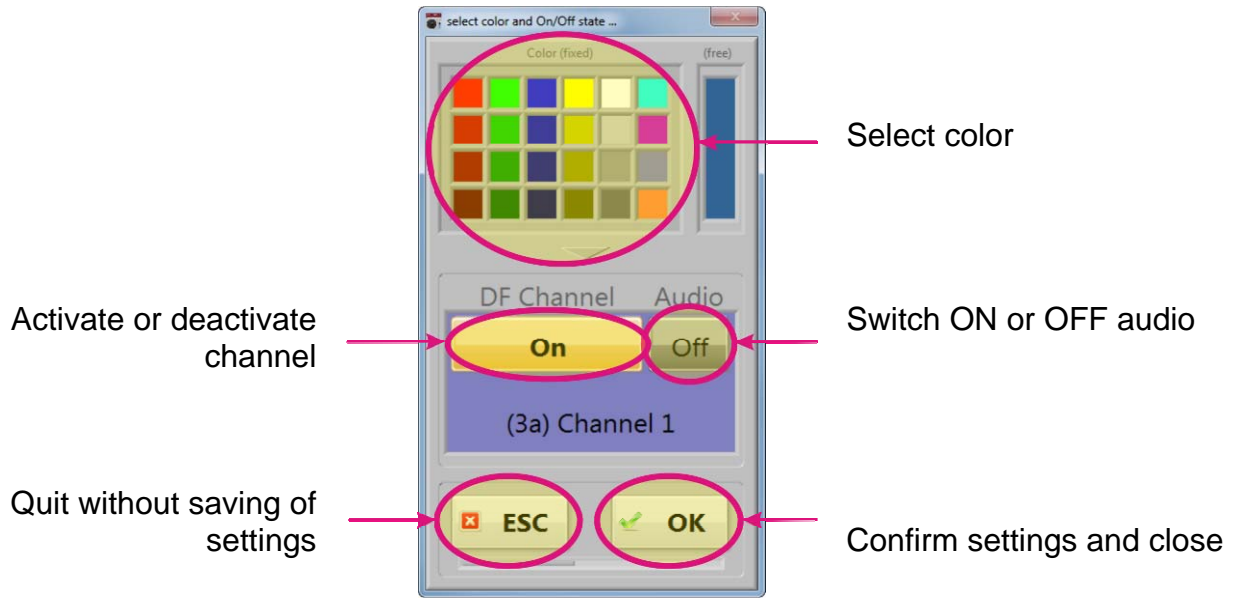
Confirm settings and close

Figure 14: Modifying the channel

It is also possible to quickly activate or deactivate the channel by clicking with the right mouse button on a channel.

The following figure shows an example of the "Bearing (MC)" page after the setup.

Figure 15: Bearing (MC) page after the color assignment to the channels

4   DF Channel Monitoring

The "DF Channel Monitoring" page gives the overview of all defined DF-Channels inside all defined systems simultaneously.
On the right side is a system and channel tree view, which also gives the overview of all defined DF Systems and corresponding channels (s. Figure 16).

This page provides the:
- General channel status
- Channel name and its frequency
- Bearing indication for every channel in the current setting of Bearing Reference Direction (QDM, QDR, QTE, QUJ or True North / Magnetic North)
- Receiving status of the channel (On / Off)
- Signal level (in dBm and %) and adjusted squelch level (%)
- TCPIP Socket information
- Power On Time
- DF Type/ID
- Detailed status of all channels indicating the:

     Interface: Shows whether the DF Channel physically accessible
     Timeout: Shows whether the data from DF-Channel arrives cyclically
     Data: Shows whether the data from DF-Channel is correct
     DF Error: Shows whether the DF-Channel has an error
     DF Warning: Shows whether the DF-Channel has a warning
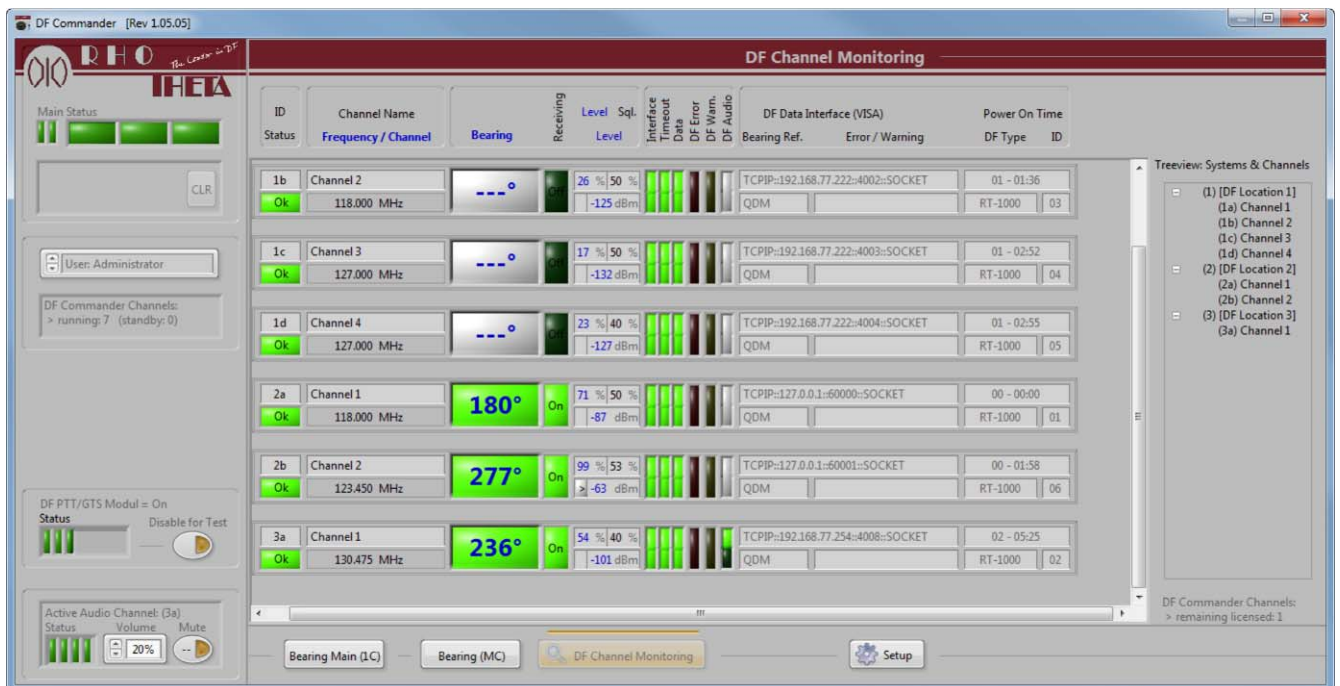   **DF Audio:** If this option is in use, the LED shows whether the audio communication is established.

Figure 16: Channel monitoring

Example of complex Service & Maintenance "DF Channel Monitoring" configuration, showing differently possible error and warning states.
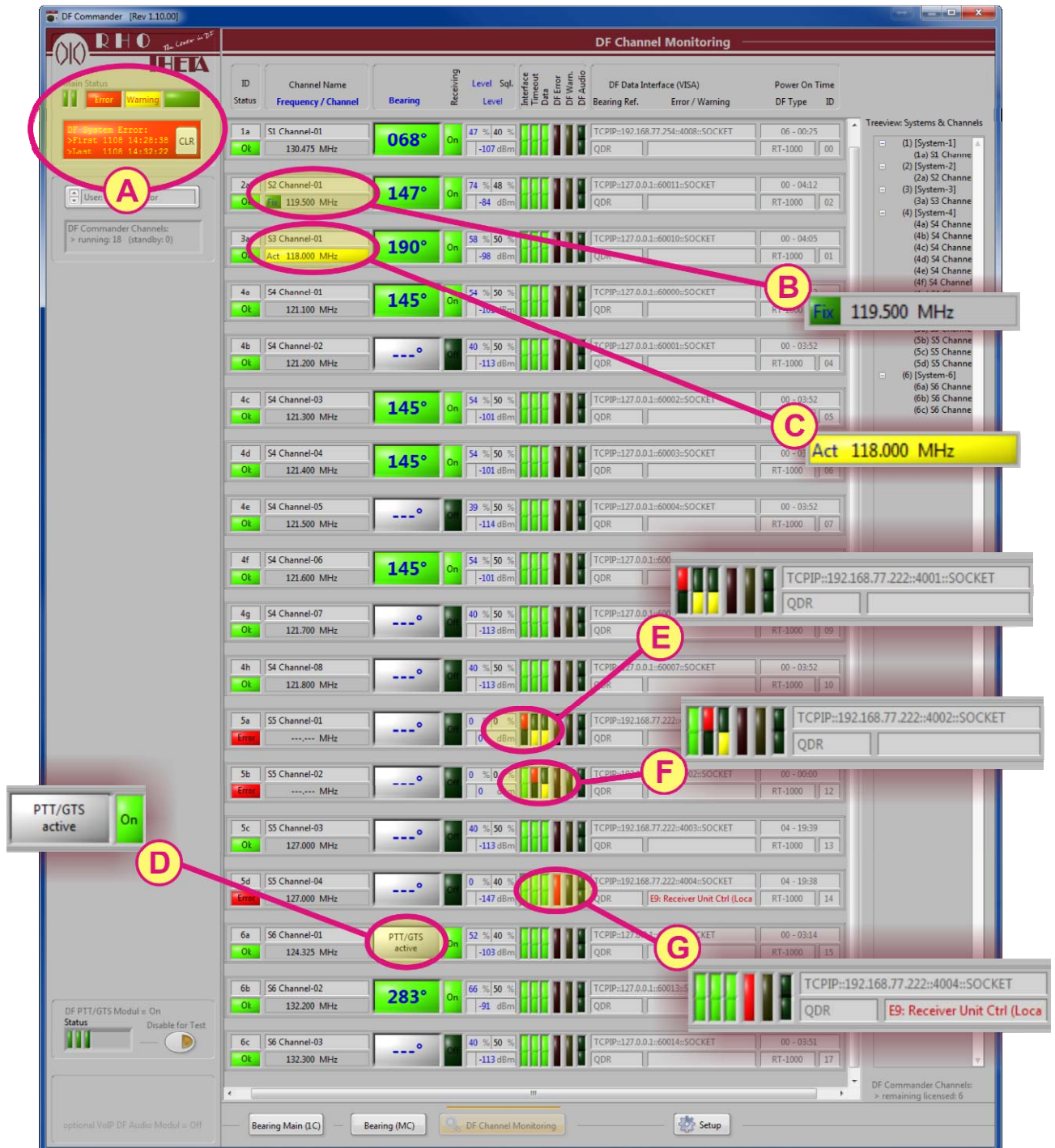

Figure 17: Example of differently possible error and warning states

- "A"   summarized Error&Warning indication of all configured Systems/Channels
- "B"   shows DF channel with active "fixed Frequency"
- "C"   warning, because a "fixed Frequency" channel was changed to a new frequency
- "D"   DF channel is receiving, but an active PTT/GTS signal disables the bearing
- "E"   interface error on one DF channel (as example no LAN connectivity)
- "F"   DF Data Timeout error (as example, the DF channel on site is switched Off"
- "G"   DF Error (DF channel is working, but an internal DF error is detected)

5   Setup

5.1   Previous Steps

Following preparations have to be done in advance:

- The DF-Channel is switched on and connected to the "MOXA NPort Device"
- The configuration of "MOXA NPort Device" has successfully been done.
- The network socket information (IP-Address and TCP Port) of the DF-Channel is available.

  If audio option is available:
- The configuration of audio In-Streamer devices has been successfully done.
- The configuration of audio Ex-Streamer devices has been successfully done.
- The socket information (IP-Address and TCP Port) of all audio devices is available.

After the license code has been entered successfully and the "DF Commander" has been started for the first time, the following page will be opened:
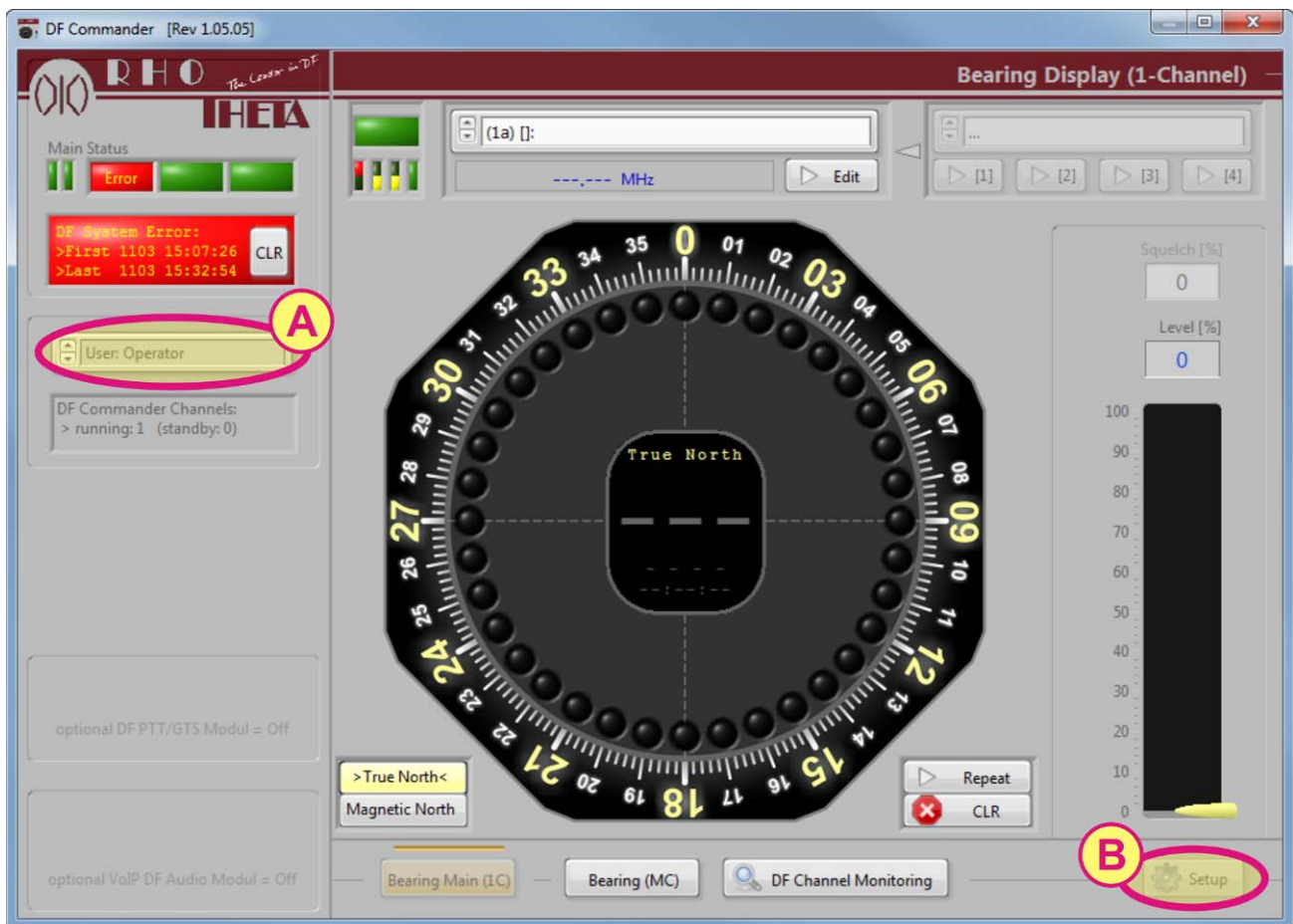

Figure 18: First page after starting the DF Commander

Select the "Administrator" in the drop-down menu on the Status Bar (see "A"). Following input window will appear (s. Figure 19).
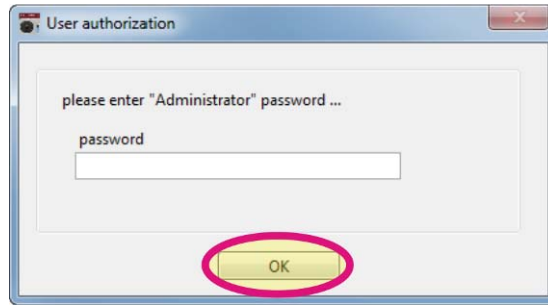
Figure 19: Input Administrator password

Administrator password has not been set yet, so the input field should remain empty. The administrator password can be changed later (s. Chapter 5.3.1). Press "OK".
Please click on "Setup" button (see "B") to get to the "Setup Page".
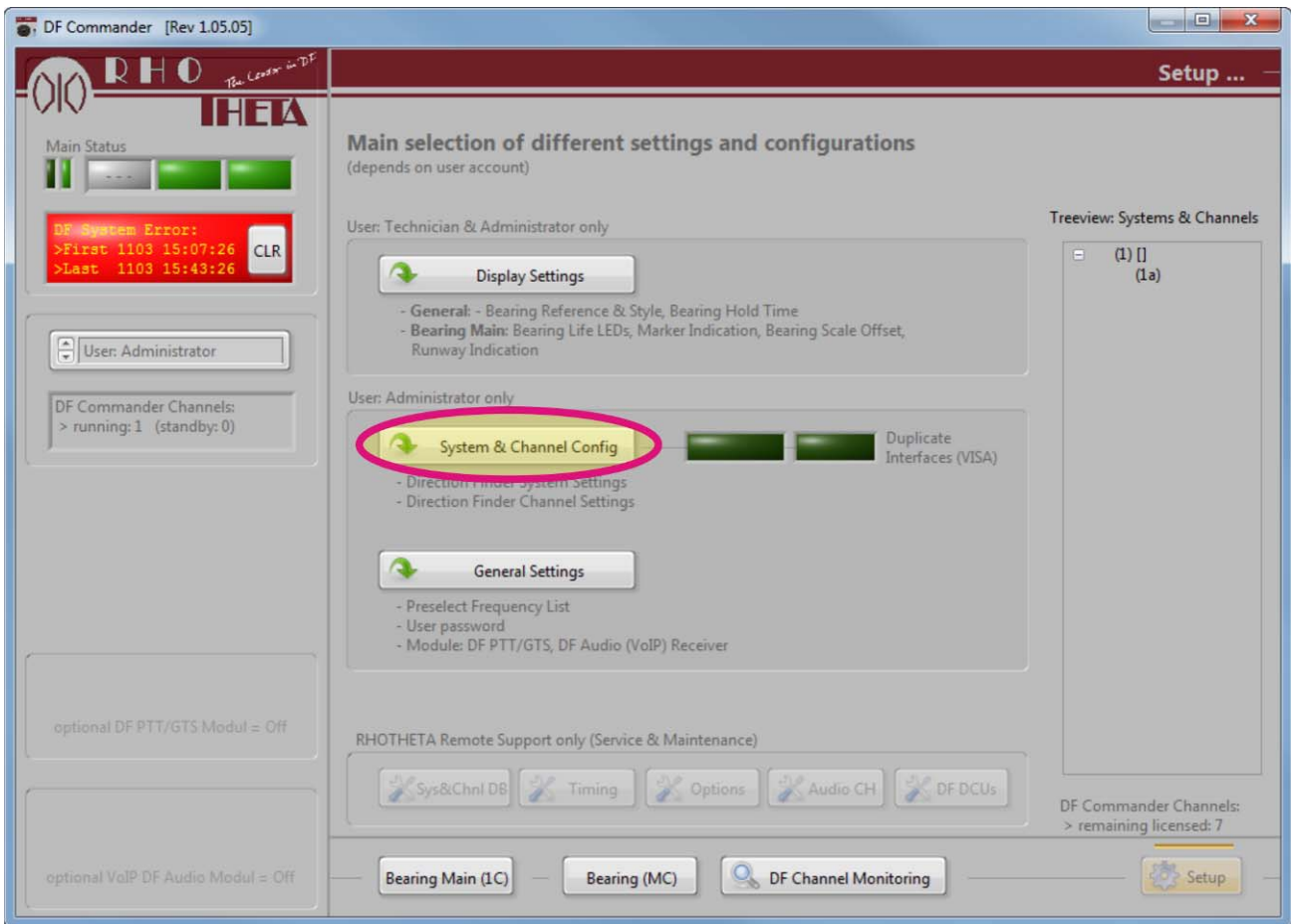Then click on "System & Channel Configuration".

Figure 20: Setup Page

Note:
The field "RHOTHETA Remote Support only (Service & Maintencane)" is not available for the user. In case of failure or demand for support, RHOTHETA have the possibilty, using remote access, to unlock the additional options and get detailed information of the system and network in order to ease the serching for a failure. In urgent cases please contact RHOTHETA.

5.2   System & Channel Configuration

5.2.1   Create and Setup Systems

The "DF Commander" allows the user to control more than one DF-System on different locations with more than one DF-Channel added. Therefore it is necessary to add/define a new system and to add DF-Channels to it.
One system and one corresponding DF-Channel inside this system are already created when the "DF Commander" was started for a first time:
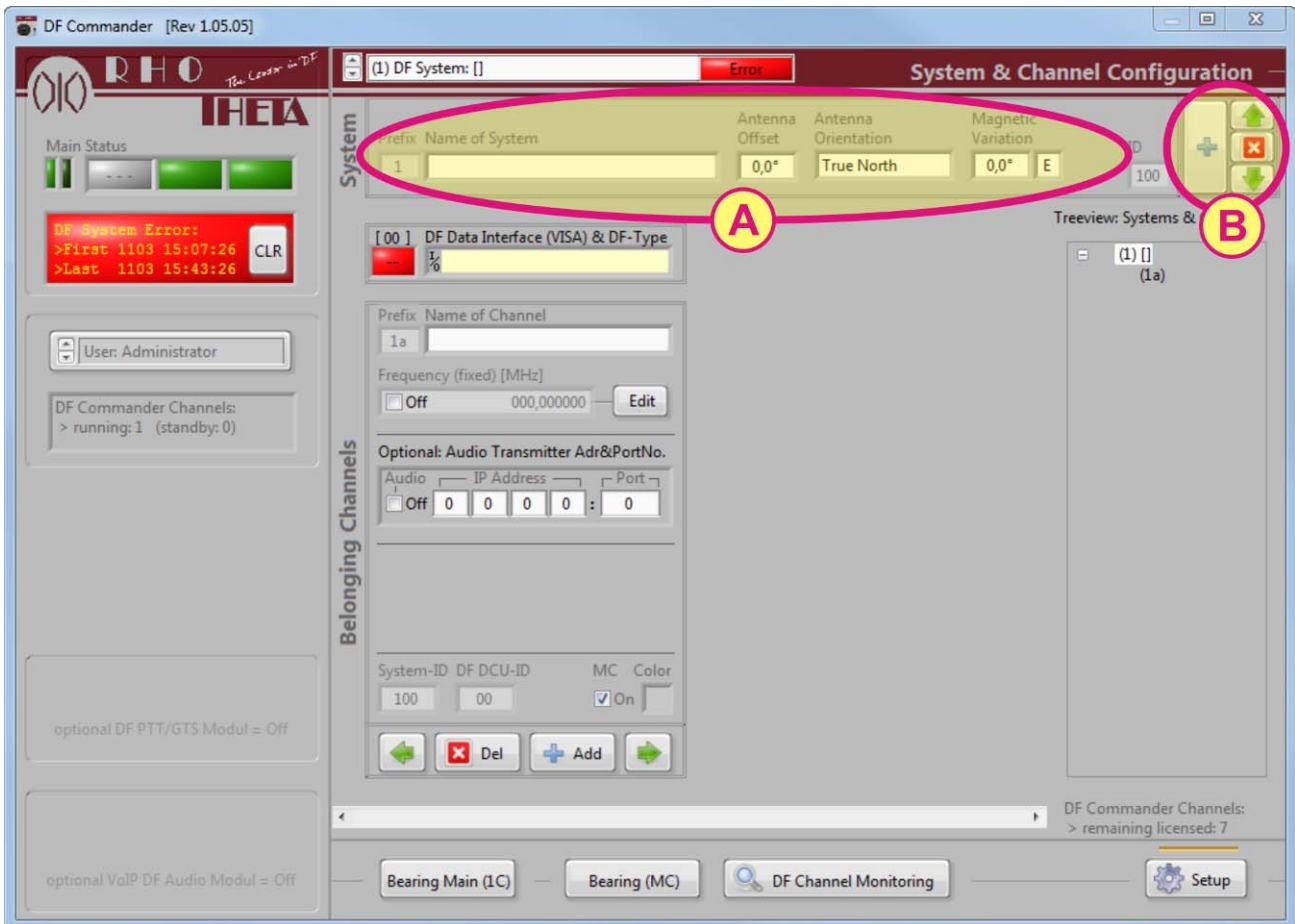

Figure 21: System and Channel Configuration

Configure and create system

Generally, a system should be understood as the DF-System with one antenna and channels, which are connected to the antenna. Therefore it is necessary to enter certain information, which belongs to the antenna in the system field (see area "A").

Prefix: This is the number of a system which is automatically assigned by DF-Commander.

Name of System: The user is allowed to enter a meaningful system name in this field.
Usually the system name should correspond to the antenna location. For example it can be "Munich South" in ATC application or "Coast Gibraltar South" for VTS applications.

Antenna Offset: Antenna offset is the deviation in degree from the desired antenna orientation to magnetic or true north caused by an inaccurate installation of the antenna. Usually the antenna offset can be determined by the flight check or the ship trial, where the bearing is recorded from more than one known position. The mean value of all bearing deviations, determined by DF site test, represents the mechanical antenna offset, which has to be entered in this filed. DF-Commander will use the antenna offset for the calculation and displaying the corrected bearing values.

Antenna Orientation: The DF Antenna can be oriented to magnetic north or to true north in ATC and VTS applications. In mobile applications, the antenna is oriented relative to a certain direction (e.g. ship course). This information is needed in order to calculate the right bearing relating to reference directions (QDM, QDR, QTE, QUJ, True North, Magnetic North). Please select the appropriate antenna orientation of your system from the drop down menu.

Magnetic Variation: The magnetic variation is the difference between true north (geographical north) and magnetic north. Depending on the installation place (GPS Position, continent, country) the variation can be different and it also changes annually. In order to have a correct calculation of QDM, QDR, QTE, QUJ, True North, Magnetic North bearing values, the magnetic variation have to be entered in this filed. Enter the variation in degree and "W" West or "E" East direction of your antenna location.

Area "B"

If it is desired to control another additional system, add a new system by selecting "+".

Press on "x" to delete a system.

Caution
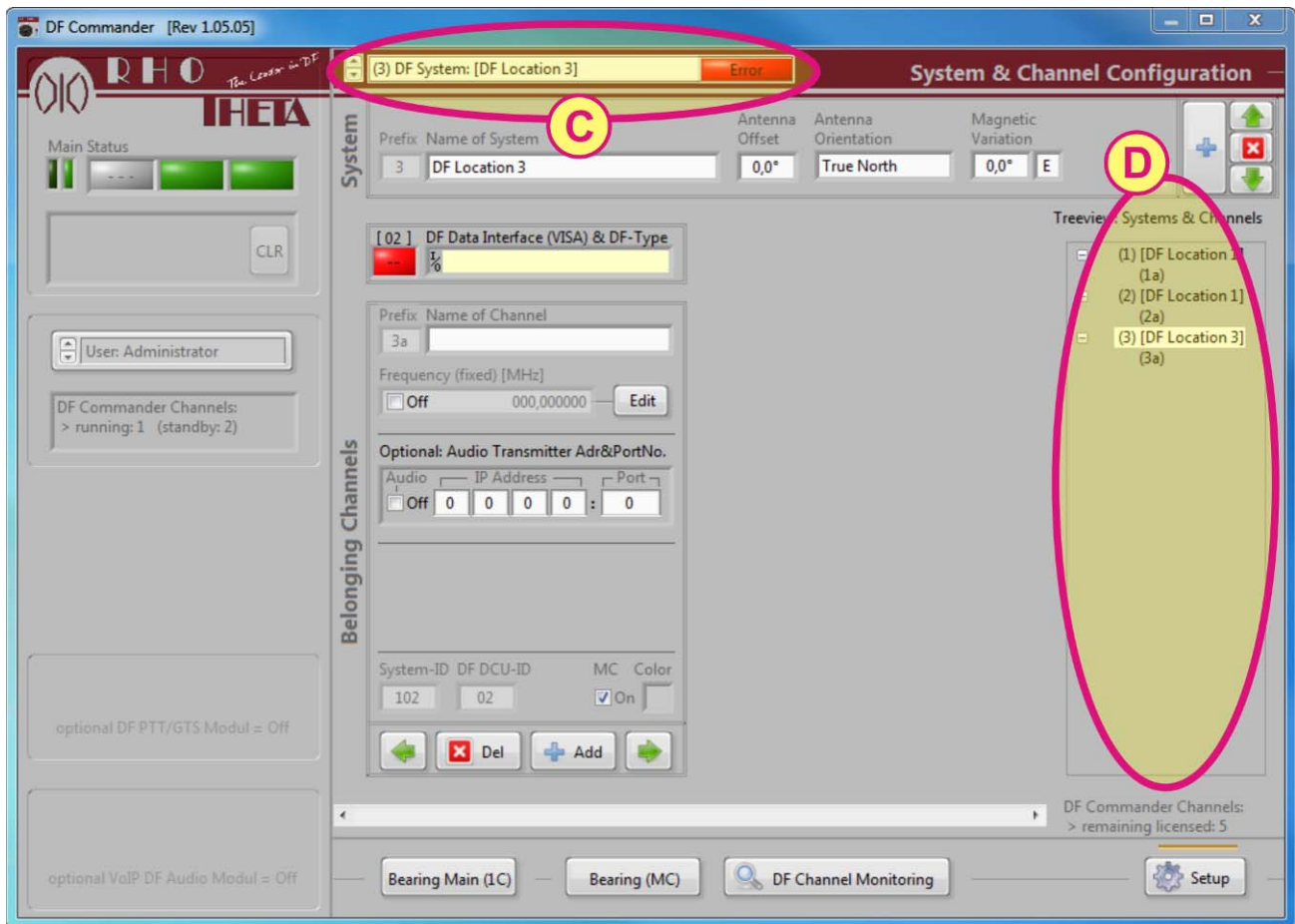All included DF-Channels will also be deleted!

Figure 22: Configuring Systems

The desired system can be selected using the dropdown menu (see "C").

Area "D" is a system and channel tree, which also gives the overview of all defined DF Systems and corresponding channels. Click on system (see "D") to select the desired system. Selecting a channel leads to the same result. The corresponding system with configured channels will be displayed.

5.2.2 Create and Setup Channels

5.2.2.1 Add and Delete Channel

Please enter the name of the already pre-defined channel (see "E") first.

Click on "Add" (see "F") to add a new channel to the system if desired and also enter the channel name.

To delete the channel, please click on "Del" button (see "F") of the channel you want to delete.

Use the left and right arrow to define a channel position inside the tree.
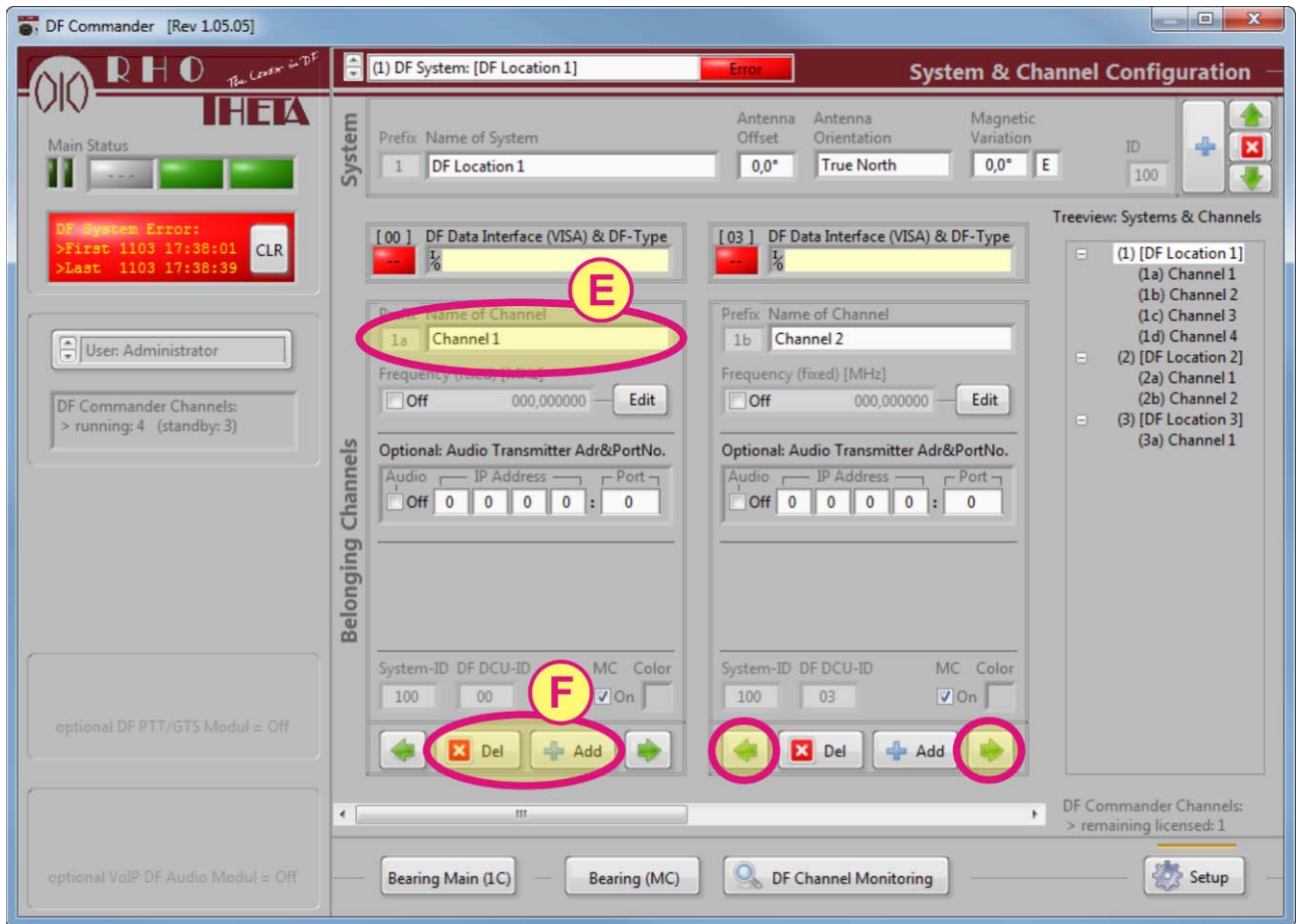
Figure 23: Configuring Channels

Typical ATC configuration could be the following:

Name of System (1):   DF Munich South
Name of Channel (1a):   Munich Tower
Name of Channel (1b):   Munich Ground Control
Name of Channel (1c):   Munich Radar Approach Control

5.2.2.2 Connect DF Commander to DF Channel

Click in the DF Data Interface (VISA) text field of a desired channel (see "G").
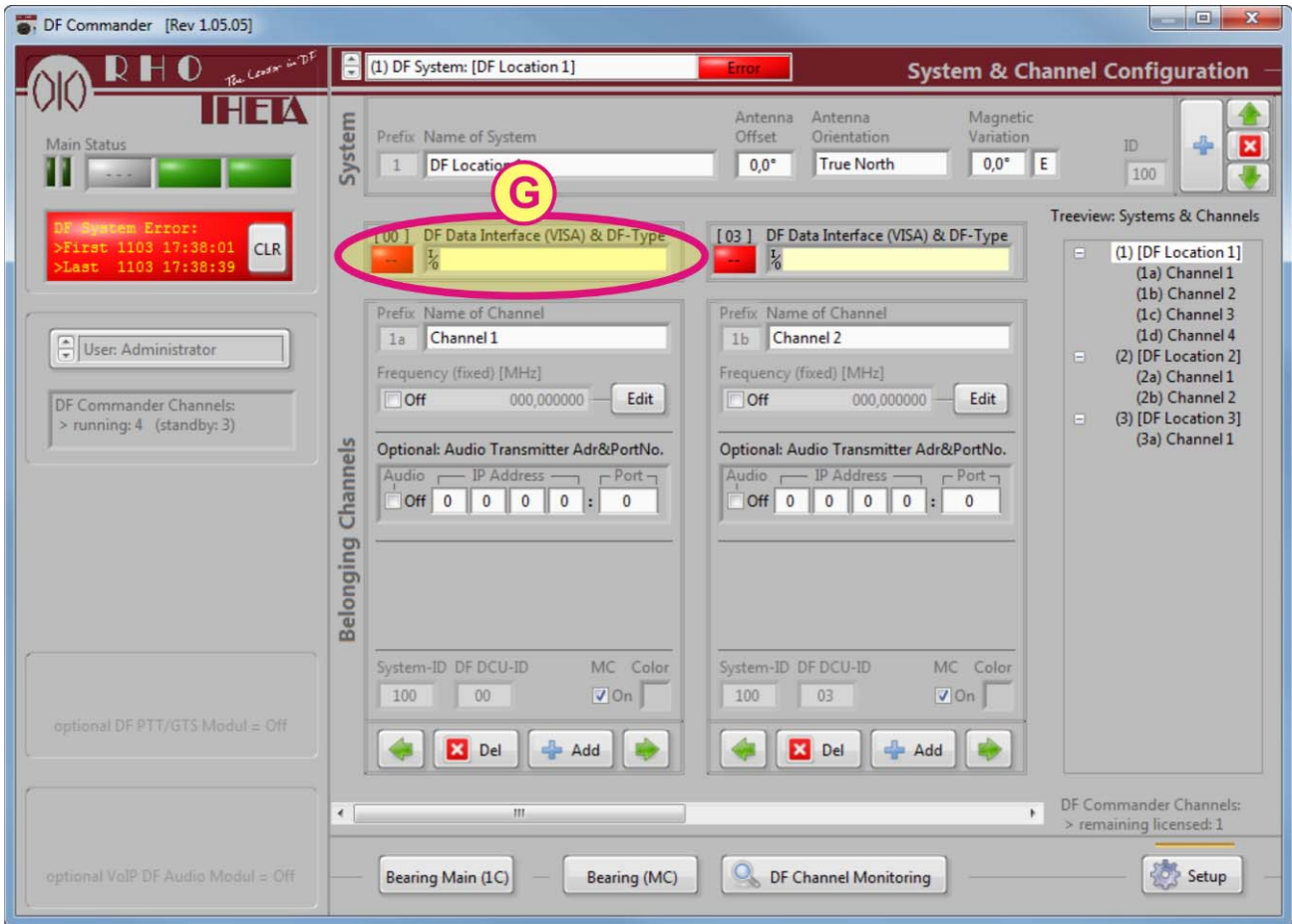

Figure 24: Establishing connection to DF Channel

Please enter the IP-Address and the port of the appropriate DF-Channel and click on "Apply".
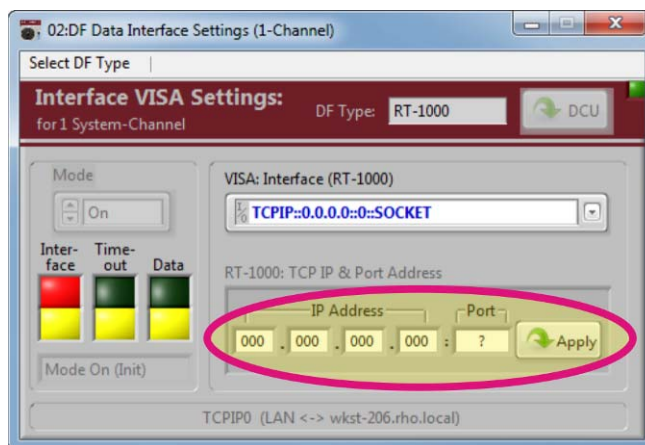

Figure 25: Input IP-Address

After some seconds, the connection should be established. Then please close the window.
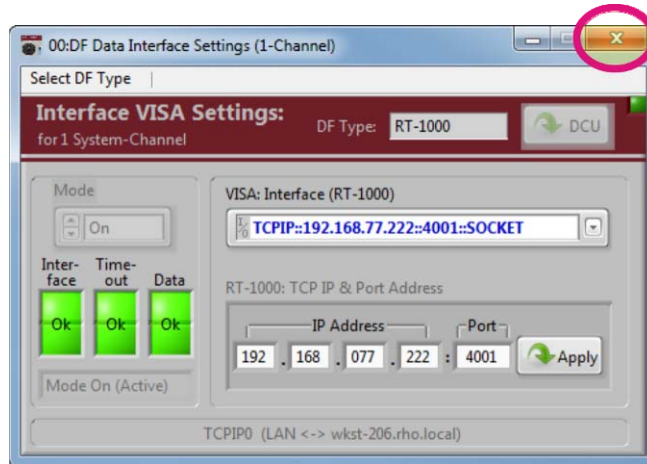
Figure 26: Successful connection via TCP/IP

Repeat this procedure with every desired DF-Channel in every used system.
If "DF Commander" has an established connection to all defined channels, the system status and all channel status LEDs appear green.
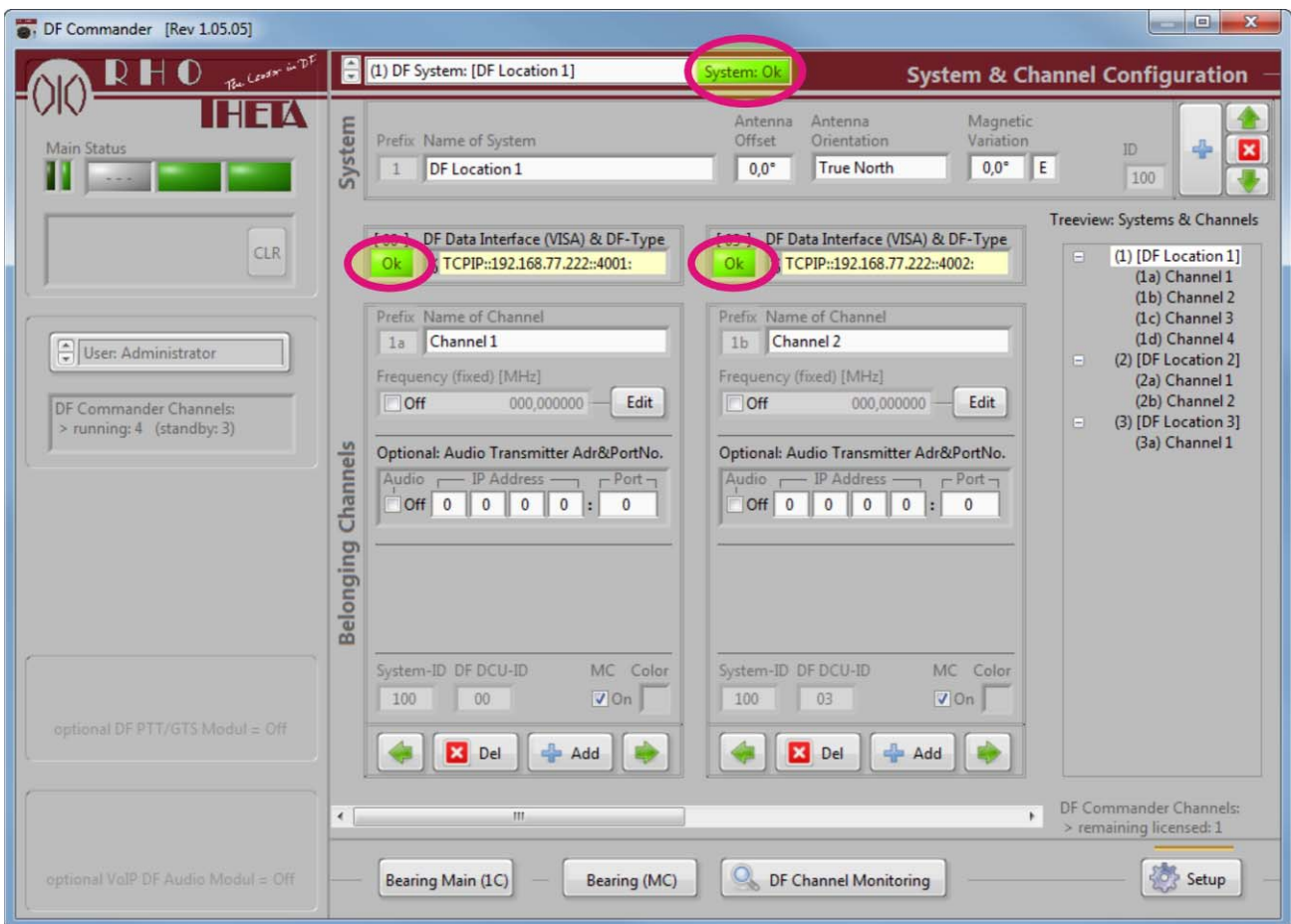

Figure 27: Connection status of systems and channels

5.2.3 Fixed Frequency Setup

For additional security and also to avoid unwanted or unexpected change of frequency directly from DF-Channel local control or from another user on other computer, the channel frequency can be set to a fixed value.
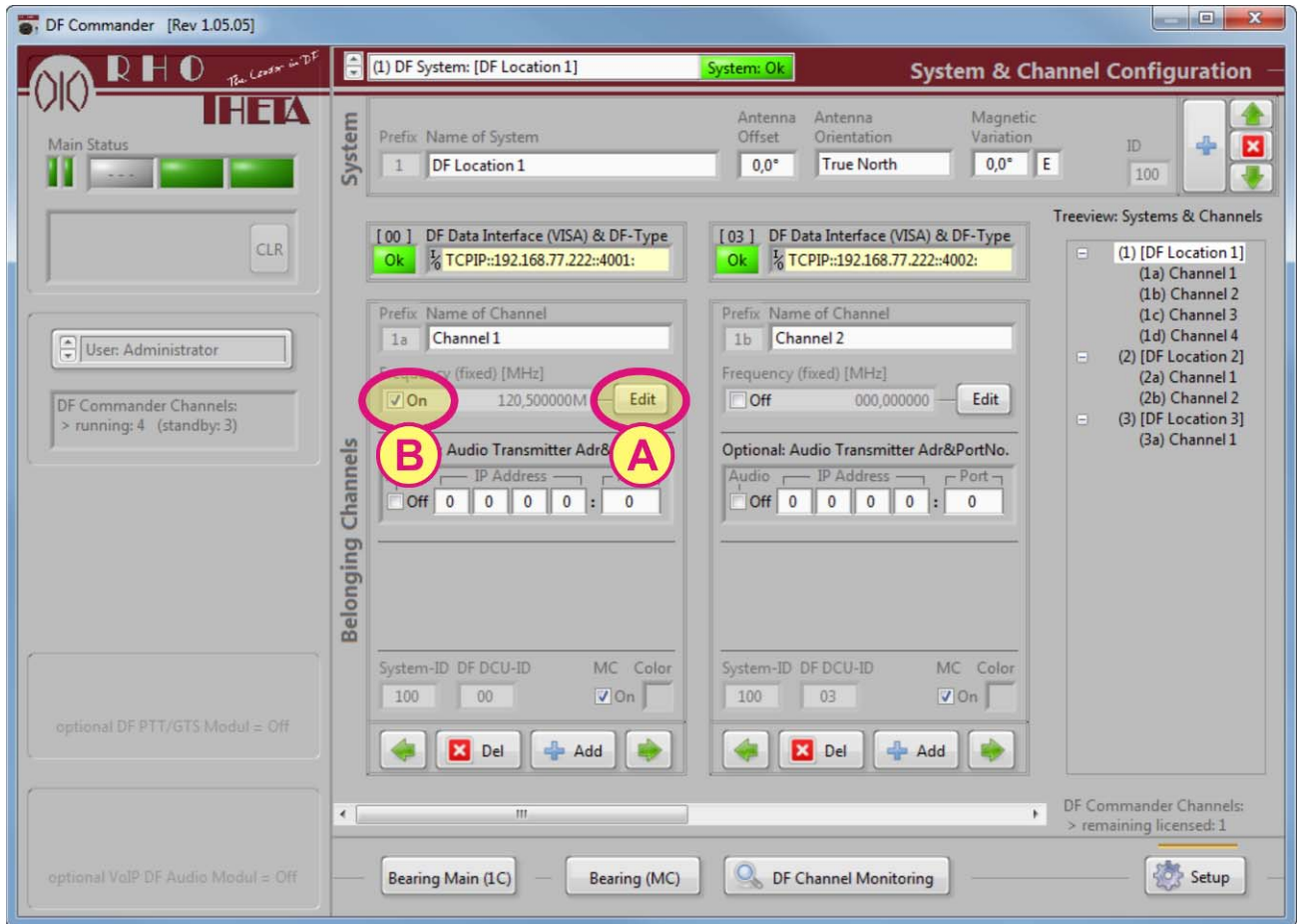
Go to the "Setup" page. Click on "System & Channel Config"

Figure 28: Defining fixed frequencies

Click on "Edit" button (see "A") and enter a desired frequency.

Activate the checkbox "On" (see "B").

After activating the checkbox, the DF-Channel will be immediately programmed with the fixed frequency value.

Go to "Bearing Main (1C)" page.

Since the frequency has been fixed to a constant value, it will be not possible to change it from the "Bearing Main (1C)" page any more.

This is also indicated in the area "A" that the frequency is fixed and in the area "B" the lock sign is indicated instead of "Edit".
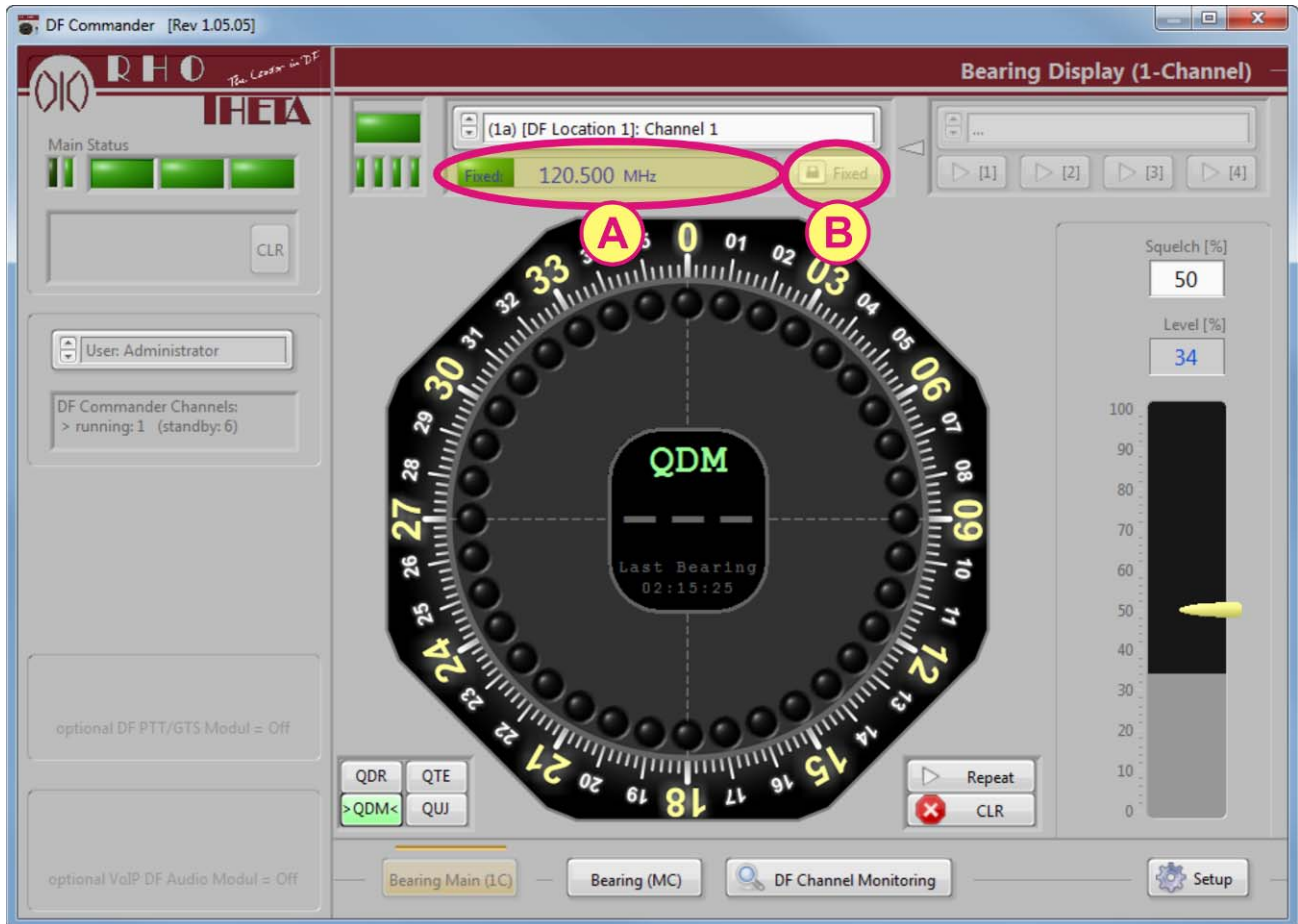

Figure 29: Indicating fixed frequency on the "Bearing Main (1C)"-page

Nevertheless, the frequency can be changed by another operator on another PC by using DF Commander or other remote software, where the DF is integrated. In this case the warning indication on the status bar will appear (see "E").

The change of frequency will be indicated by flashing the frequency display yellow (See "C"). The displayed frequency corresponds to the actual frequency, which is set on the physical DF Channel.

Now, the operator has a clear information that the channel frequency has been changed by someone else.

By clicking on "Reset" (see "D) the fixed frequency value will be programmed to the DF-Channel hardware again.
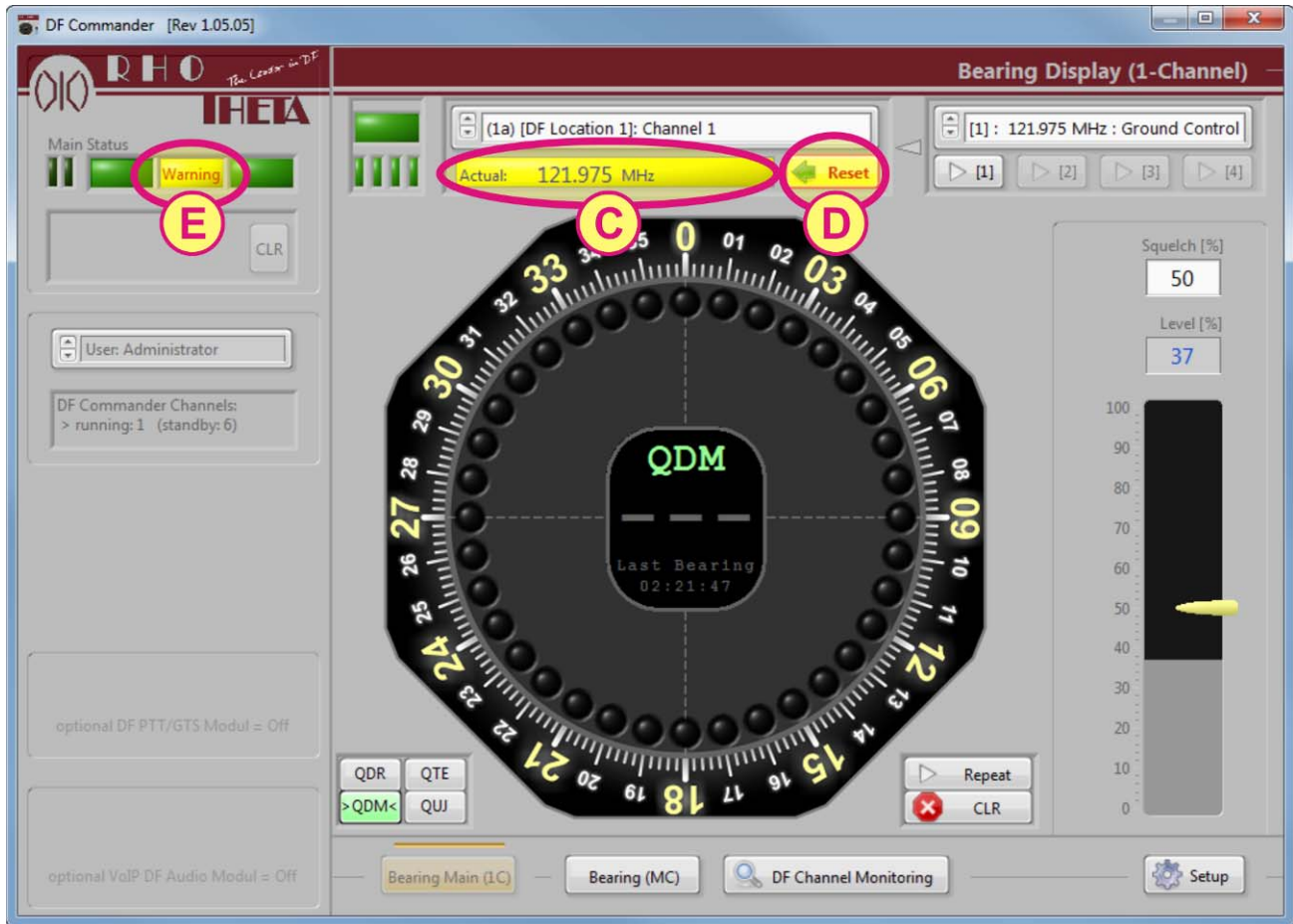

Figure 30: Resetting the fixed frequency

Note:

In case of more than one operator working with DF-Commander, a clear communication between users has to be ensured. DF-Commander shows always the actual frequency on a physical channel. Use "Fixed Frequency Function" in order to avoid a misdetection of a frequency changed by other operators.

5.3   General Settings

Please log in as "Administrator". The initial administrator password is empty (" ").

Please click on "Setup" button to get to the "Setup" page.
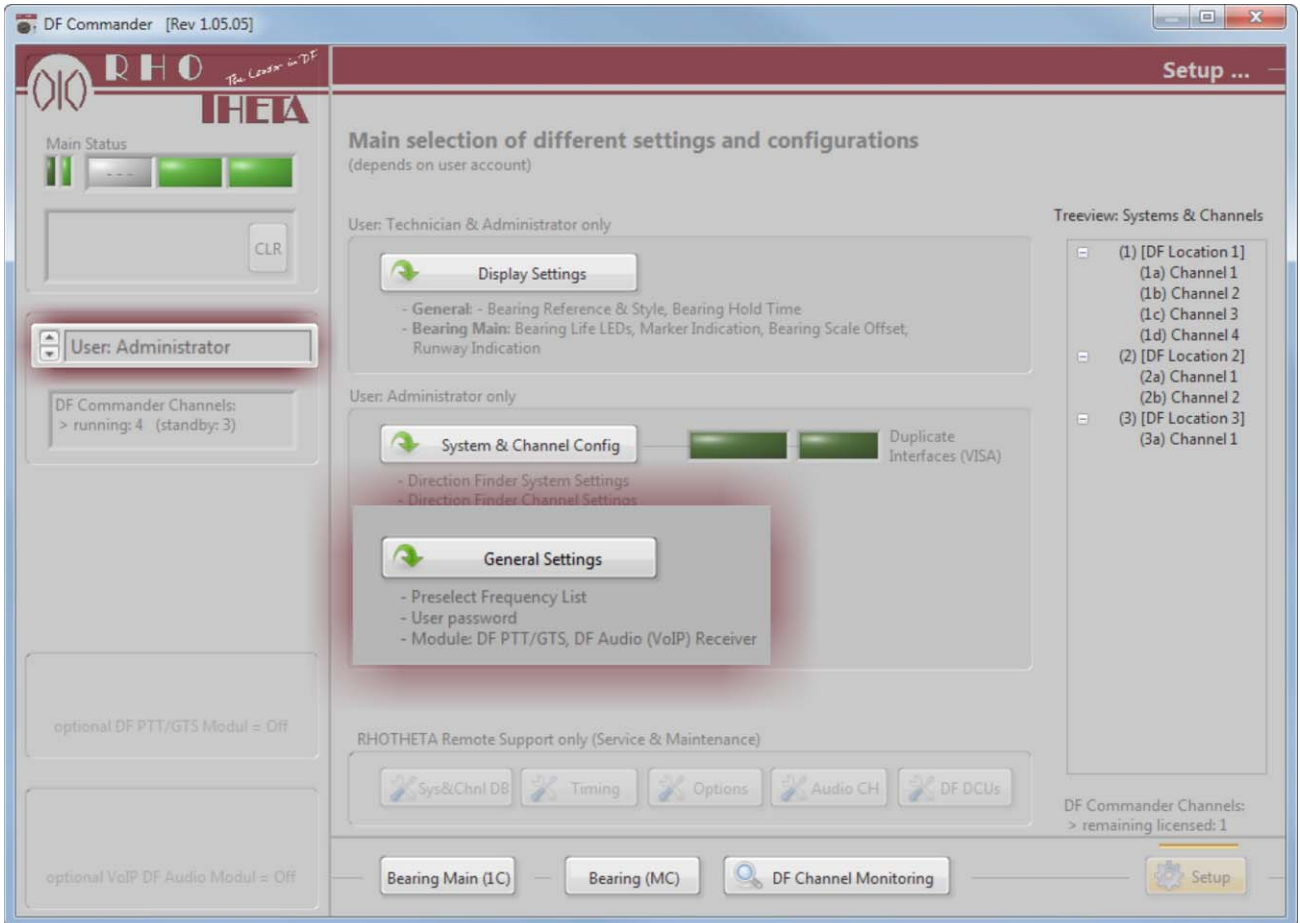
Please click on "General Settings"

Figure 31: General settings

5.3.1 Set Passwords

In this page, the passwords for "Technician" and "Administrator" can be set. The password for the "Operator" is not necessary since the operator have the minimum set of DF-Control options.

Options for Administrator: Per definition, the administrator has the maximum set of control options, except the using "Debug Buttons", which are predefined for RHOTHETA specialists for maintenance and support issues.

Options for Technicians: In this context the technician should be understood as a person, who is responsible to setup the display for the operator. Hence, the technician has only access to the "Display Configuration" page.
If a person in your organization is responsible for maintenance and technical monitoring of the DF system, she or he should be administrator.

Options for Operators: Operators do not require passwords. They have no access to "Setup" page at all. However, in the "Bearing (Multi Channel)" the operator can assign colors, switch control the audio signal. Furthermore, the technician or administrator can define additional functions, which can be used by an operator.

Set the password for a "Technician" in area "A" and the administrator password in area "B". Contact RHOTHETA if the password is lost.
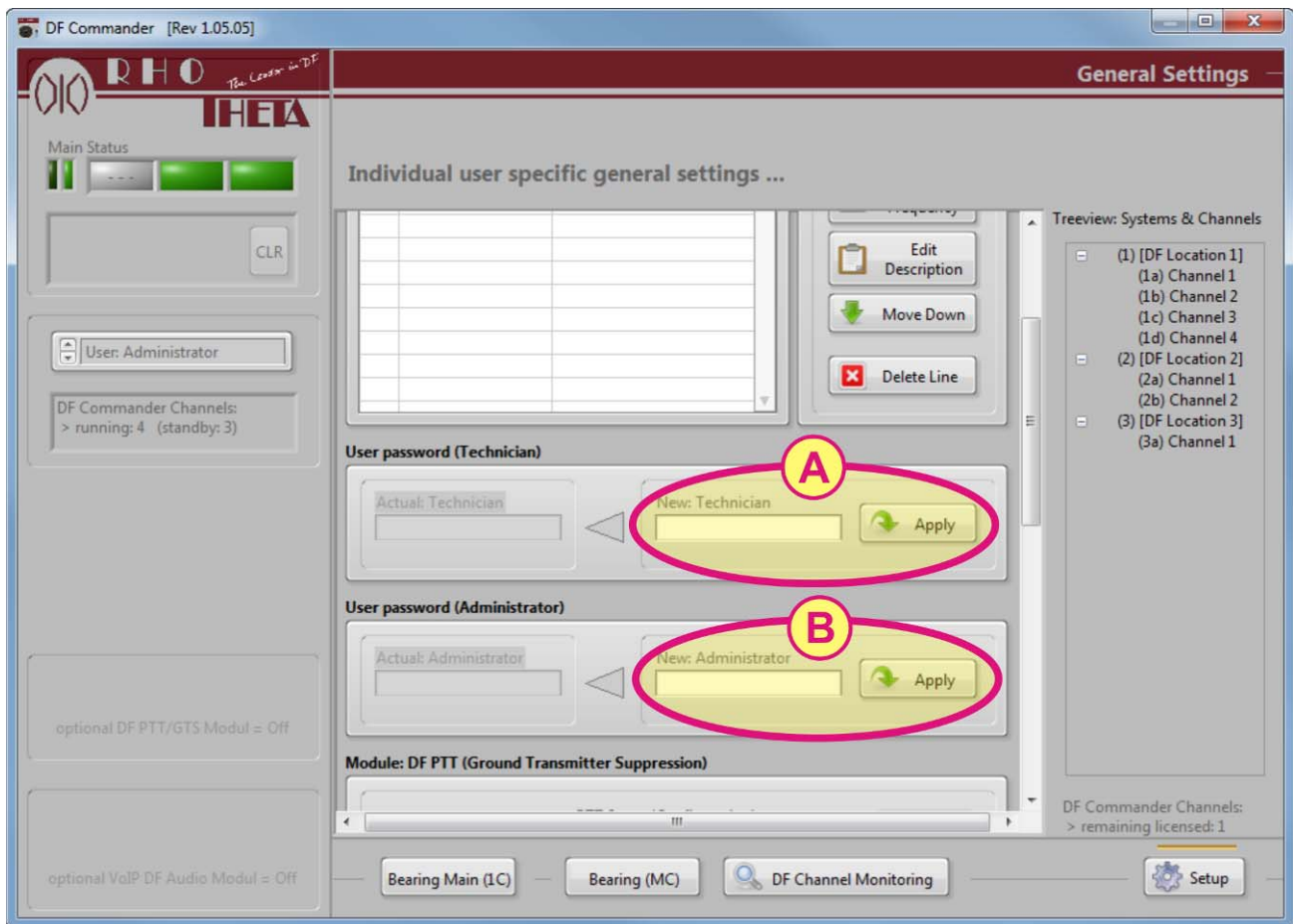

Figure 32: Setting passwords

5.3.2   Setup the Preselect Frequency List

Please login as "Administrator".
Click on "Setup" button to get to the "Setup" page and click on "General Settings".
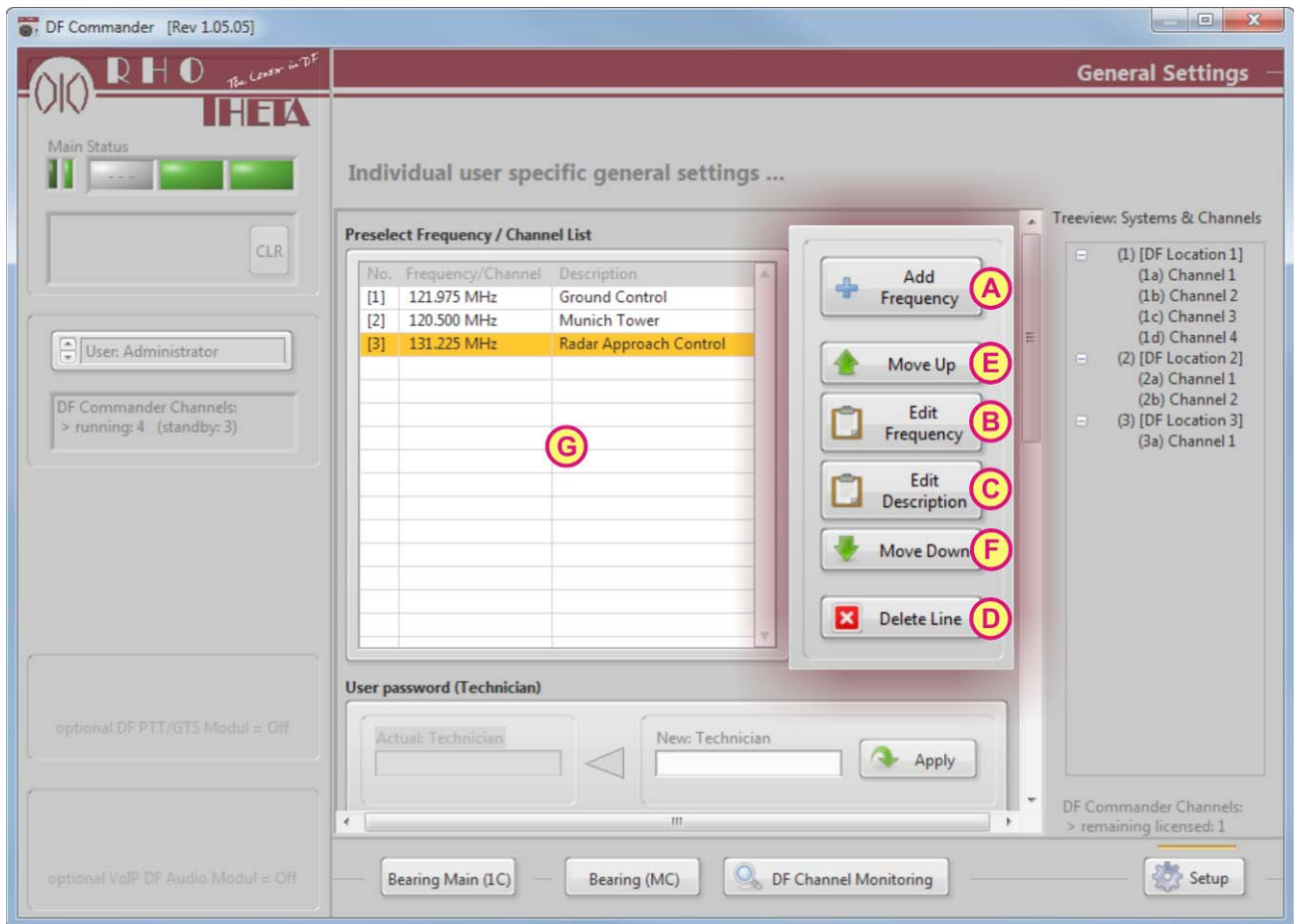

Figure 33: Setting up the Preselect Frequency List

Click on "Add Frequency" (see "A") to add a new frequency to the list.

Click on "Edit Frequency" (see "B") and enter the desired frequency in the "Frequency Input" window.

Click on "Edit Description" (see "C") and give the name of this frequency by entering it in the "Description Input" window.

Repeat this procedure with every additional frequency needed.

Sort the frequencies on the "Preselect Frequency List" (see "G") using buttons "Move Up" (see "E") and "Move Down" (see "F")

To delete an entry from the list (see "G") please select the desired frequency line and click on button "Delete Line" (see "D")

5.3.3 Setup the Exclude Frequencies List

This page allows the user to lock certain frequencies or frequency areas in order to avoid the entering undesirable frequencies by the operator. It actually represents the customer specific list of frequencies, which should be excluded from operation. Since the frequency is entered into the list (see "G"), it will be not possible to set the frequency concerned in the "Bearing Main (1C)" page.
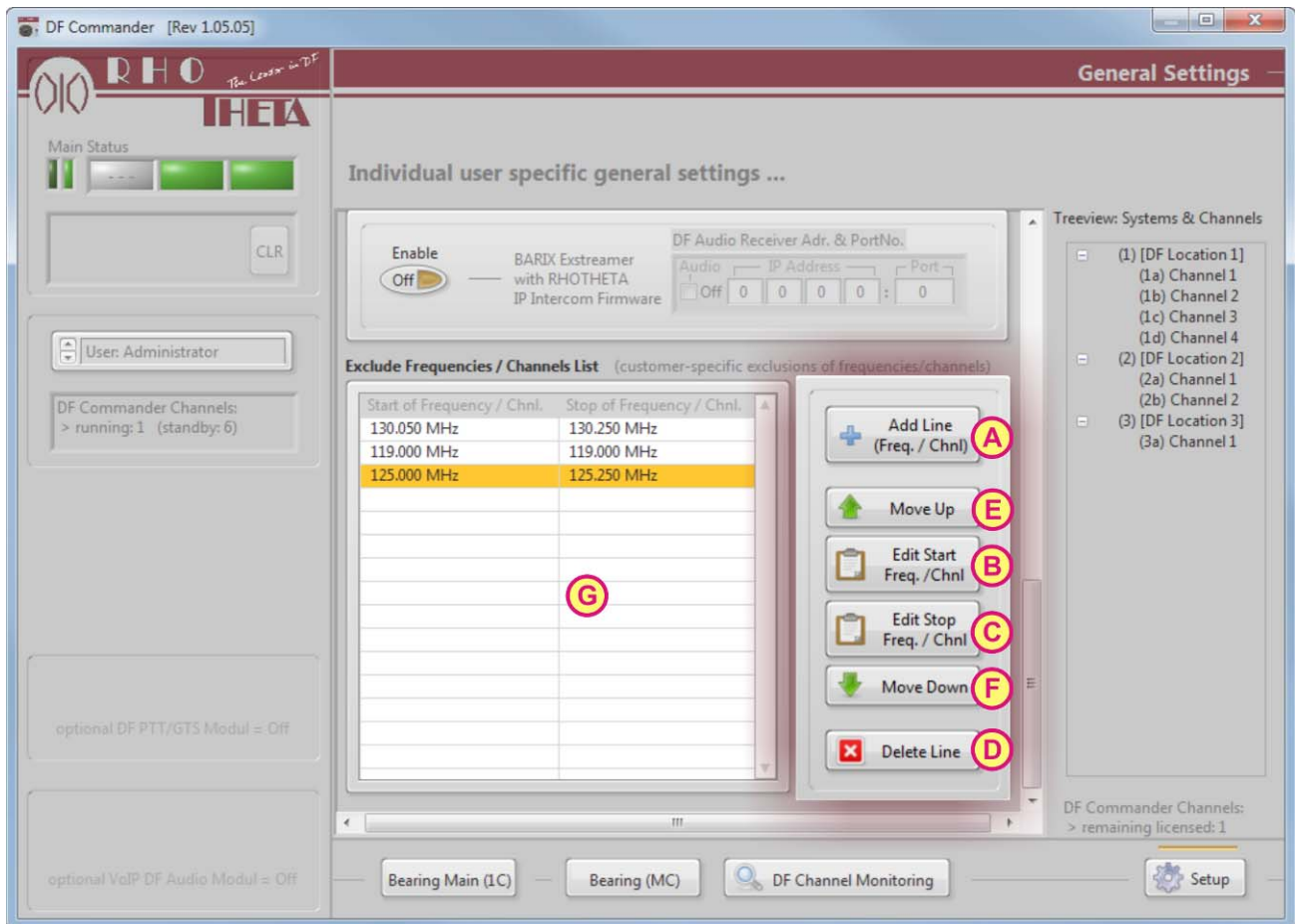

Figure 34: Setting up the Exclude Frequencies List

Click on "Add Line" (see "A") to add a new frequency to the list and enter the undesired frequency.

Click on "Edit Start" (see "B") to modify the start frequency of the frequency range, which should be excluded.

Click on "Edit Stop" (see "C") to modify the stop frequency of the frequency range, which should be excluded.

Use arrows (see "E" and "F") in order to change the line position in the list.

Click on "Delete Line" (see "D") in order to delete a certain frequency or frequency range.

Note: It is not possible to define frequency range for the exclusion in the marine band.

5.3.4   Configure the PTT-Function / Ground Transmitter Suppression (GTS)

PTT-Function (Push to Talk) is used for suppressing the bearing indication when a RF signal is transmitted from the ground transmitter station. This function is also called the Ground Transmitter Suppression (GTS).

In order to ensure this function, it is necessary to setup the hardware (PTT Module) and to configure the DF-Commander. Generally speaking, the PTT (Push to Talk) button of the ground transmitter has to be connected to the input port of the PTT-Module first. Second, the IP Address and TCP Port of the PTT-Module has to be configured and connected to LAN (Local Area Network). Further, it is necessary to establish the TCP/IP connection between DF-Commander and the PTT-Module and also to assign the frequency, which should be suppressed, to the input port of the PTT-Module. When the PTT-Module detects a low voltage level on the input port, the DF-Commander will immediately get the information on which input port of the PTT-Module it has occurred and suppress the bearing indication of the channel working on the frequency concerned.

In order configure the DF-Commander it is necessary to know the IP Address and Port of the PTT-Module. Please review the user manual of the PTT-Module.

Go to "Setup". Then press on "General Settings" and click on "Open / Edit" button in the DF PTT Module (see area "A").
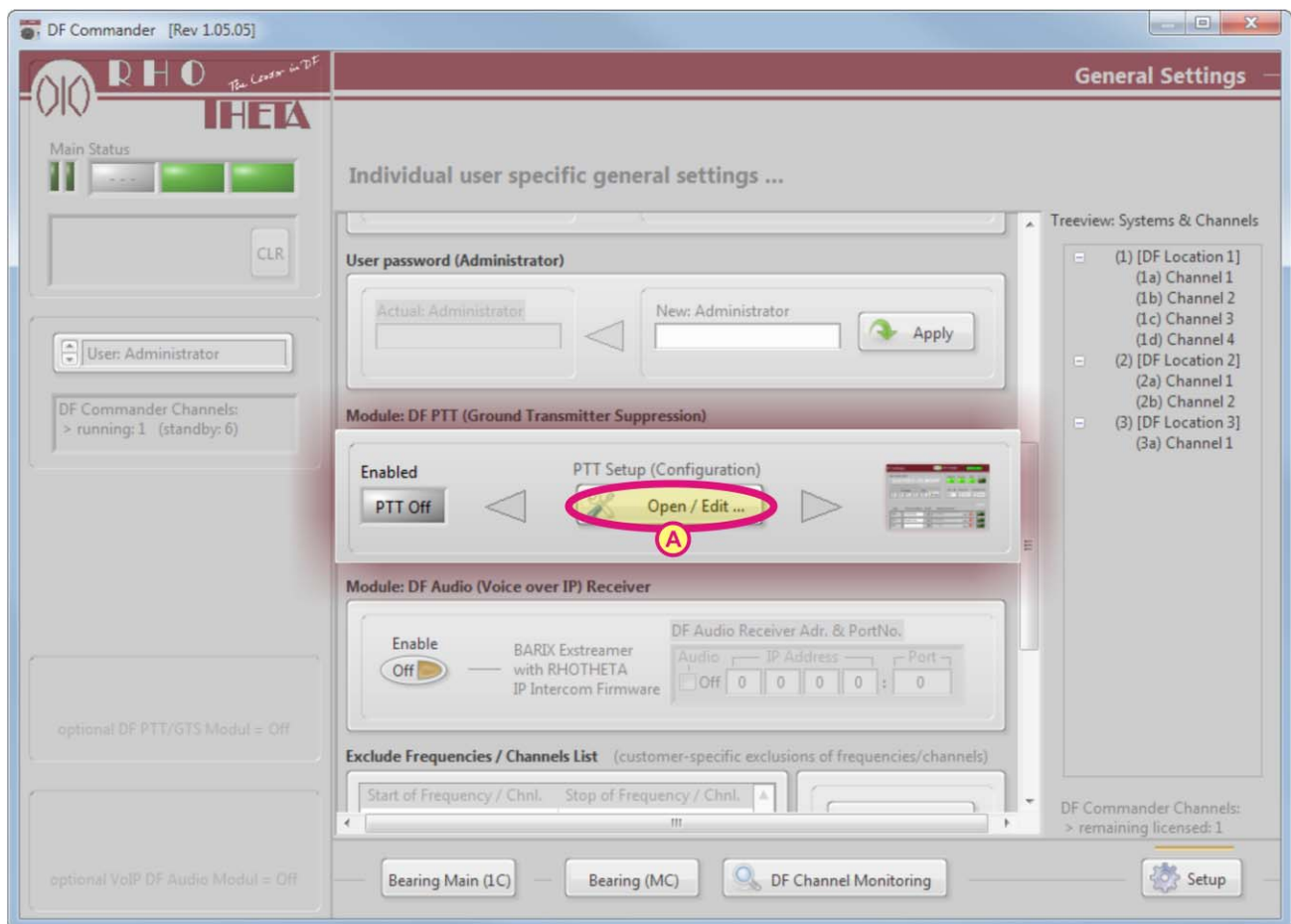

Figure 35: PTT-Setup (Open / Edit)

Enable the PTT-Function by activating the PTT-Mode button (see "F")

Enter the IP address and TCP port of the PTT-Module and click on "Apply" (see "B"). The LEDs Interface, Timeout and Data become green if the successful connection is established.

Assign the working frequency to the appropriate DIO port of the PTT-Module, where the PTT button is connected by clicking on button "Edit" (see "C") and enter the frequency.

Activate the checkbox "On" in the area "C" and enter the "PTT Source Name" left to the checkbox.

Click on cross "x" in the area "C" in order to delete the frequency from the list.

Short explanation of the example below:
In this example the PTT button is connected to port 2 of the PTT Module. The ground transmitter has the name "Ground Control 1" with the frequency of 121.975 MHz. The PTT function is activated. The LED on the right side of the area "C" is flashing yellow with message "Active". It means that the tower operator is speaking and ground transmitter PTT button is pressed. Consequently the DIO 2 port on the PTT-Module is connected to ground and DF Commander suppress the bearing indication on all channels with the frequency of 121.975 MHz.
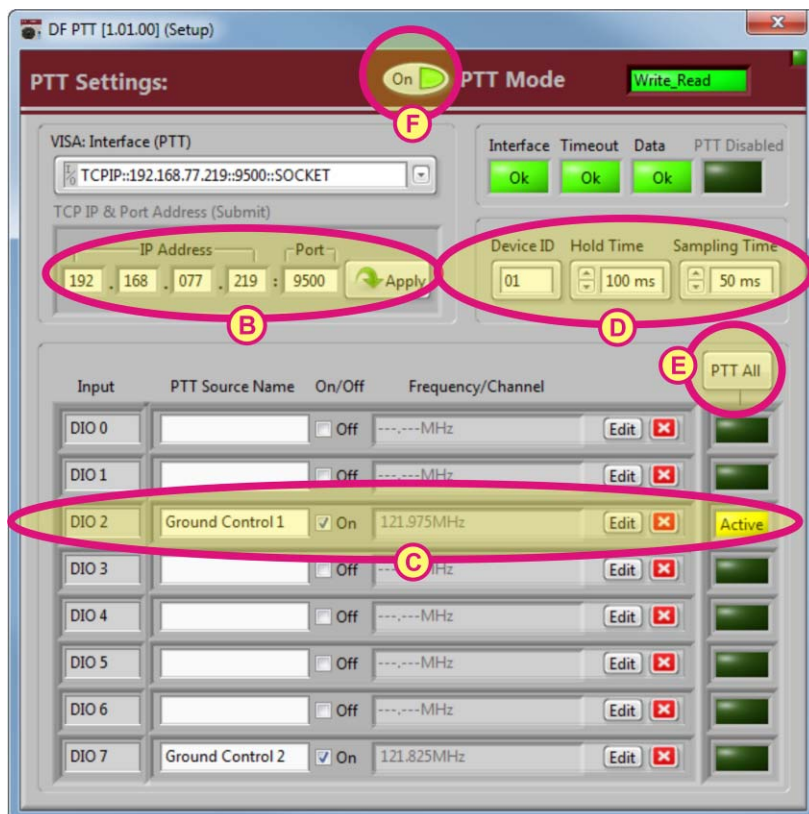

Figure 36: Setting up the DF PTT Module

It is also possible to activate the ground transmitter suppression on all frequencies. In order to do so, click on button "PTT All" (see "E").

Area "D"

It is not recommended to change setting in the area "D".

Device ID: The device ID is the identification number of the PTT-Module. Per default it is set to 01. Changing the device ID in DF-Commander can lead to the interface interruptions between DF-Commander and the PTT-Module.

Hold Time: Hold time is set to 100 ms per default. When the PTT-Button of the ground transmitter is released and the DIO contact is not connected to ground, the bearing suppression of the appropriate frequency stays still active for a certain delay defined by the "Hold Time". This delay is implemented to avoid the bearing to the ground transmitter after the PTT-Button is released. In practice, ground transmitters are still transmitting a certain amount of time after the PTT-Button is released (Switch off delay).

Sampling Time: The sampling time defines the time in which DF-Commander requests the status information of the PTT-Module inputs. This time has a direct impact on PTT reaction time. Setting this time to e.g. 500 ms means that in worst case the bearing on the appropriate frequency will be suppressed after 500 ms. During this time the direction finder will show the bearing to the ground transmitter station. This will lead to short deflection of the bearing arrow. If the tower controller wants to review the last bearing, which should be the bearing to an airplane or ship, by pressing the button "Repeat", so this will be not possible, due to the fact that the last bearing is overwritten to the bearing to ground transmitter.

The following figure shows the impact of the PTT activation in the main display in the "Bearing Main (1C)" page. The message in the area "A" indicates the PTT activation ("PTT active"). The bearing arrow still shows the last bearing to the target.
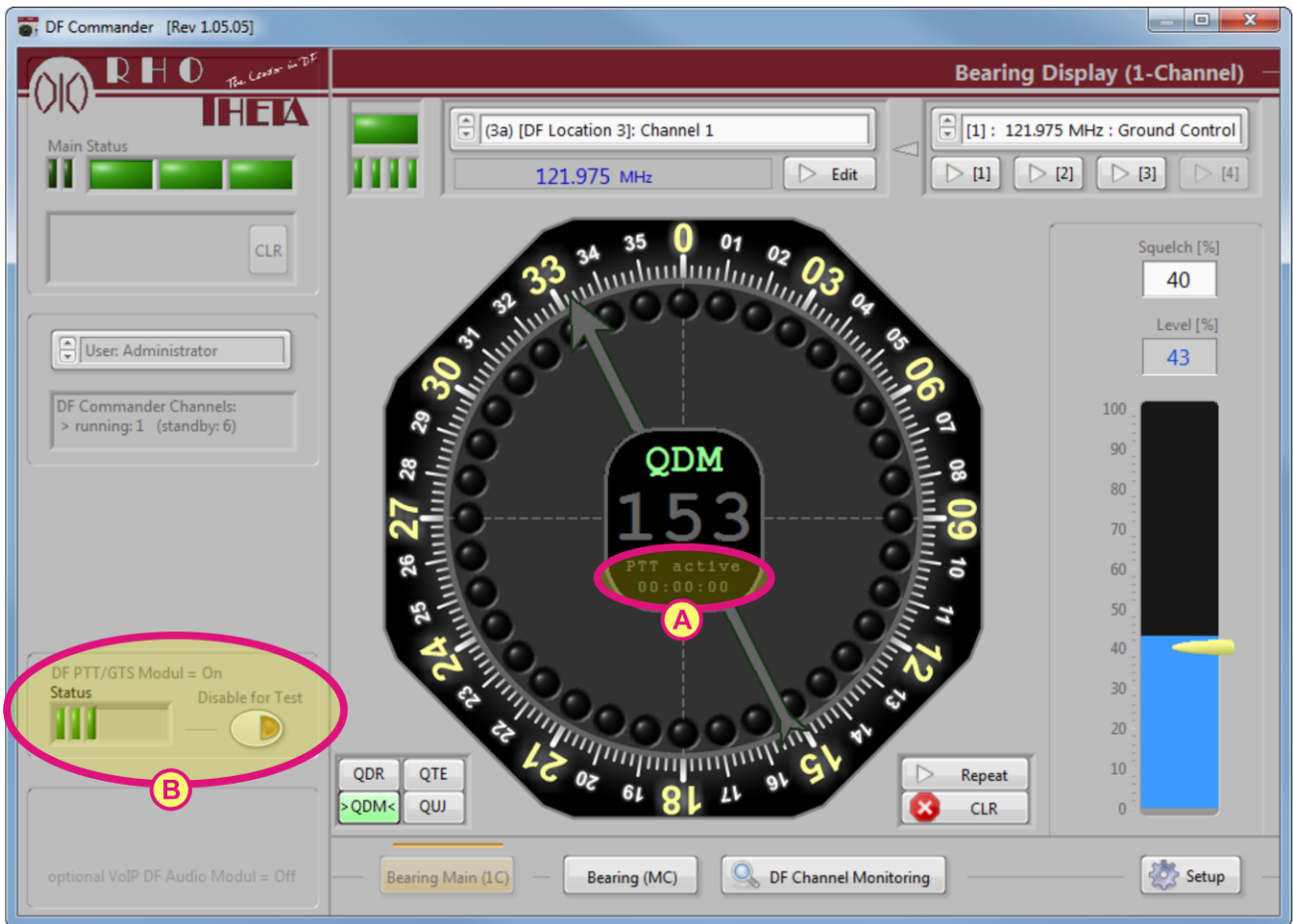

Figure 37: Active PTT function

Area "B"

Indicators:
The hardware and communication status of the PTT-Module is shown in the area "B" in the left bar, which is always visible. If the communication with the PTT-Module interrupts, the status LEDs will turn yellow. The general system warning LED will also turn yellow and will display a system warning indicating the disconnection of the PTT-Module.
The area "B" is not displayed and has no impact on warnings, if the PTT-Mode is generally disabled in "General Settings".

Disable for Test:
In some cases, the tower operator wants to check the correct function of the direction finder system using the ground transmitter. Since the bearing to the ground transmitter is normally well know, the bearing on it is meaningful in order to test the system. Doing so, the ground transmitter suppression can be muted or disabled by clicking button "Disable for Test". While this PTT function is disabled, the main LED in the area "B" will flash yellow and display the message "Mute". The system warning LED on the top of the left bar will also indicate a warning.

5.3.5 Configure the Audio System

If all audio devices are connected to the network and have been configured appropriately, the establishing the audio transmission with the "DF Commander" can begin. Please note the audio In-Streamer devices are the modules which are installed in the cabinet. They digitize the audio signal from DF-Channels and stream it in to the network. This data is received by Ex-Streamer devices which belong to the control and monitoring stations.

Please go to the "Setup" page and click on "General Settings". The following window will be opened:
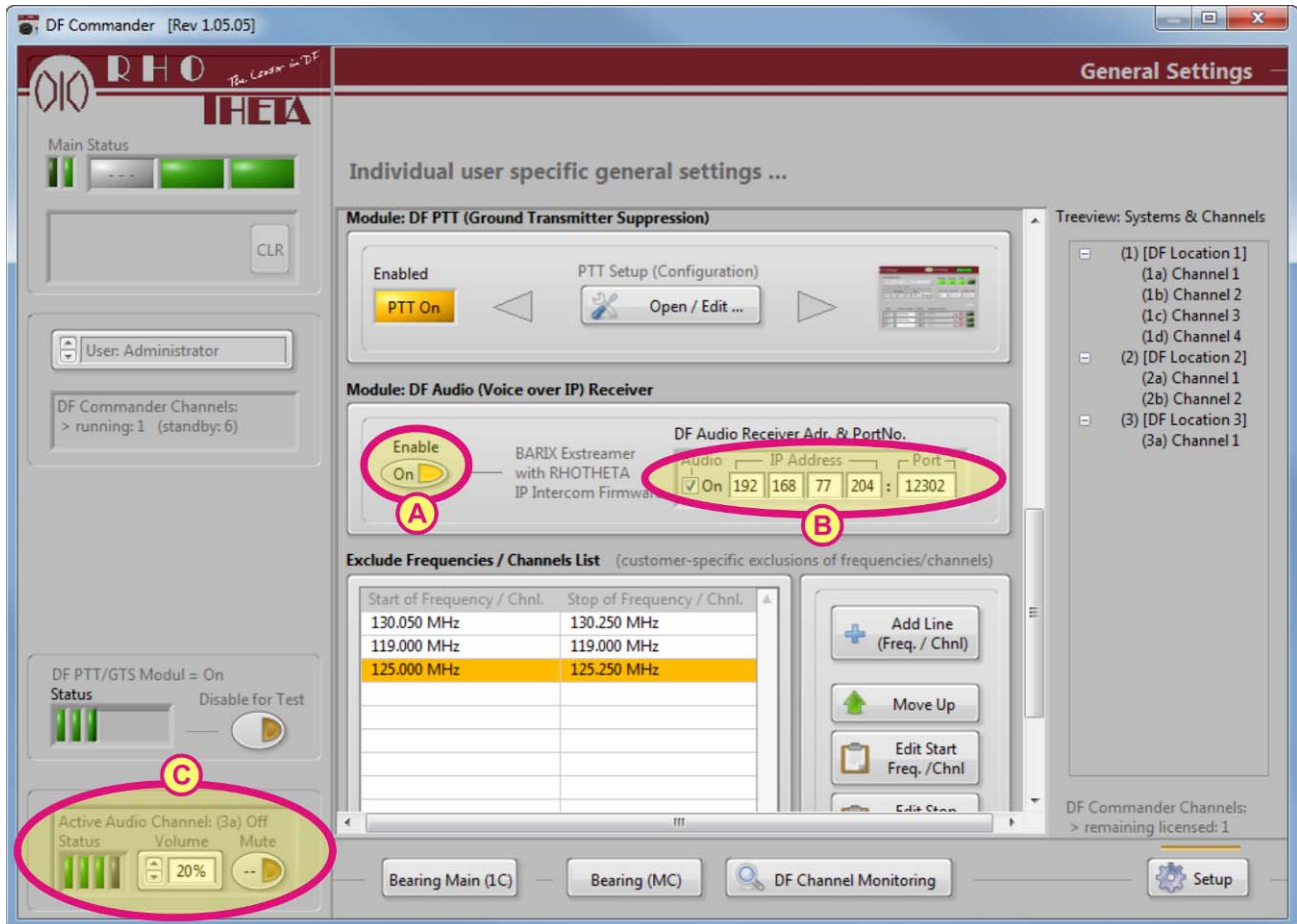
Figure 38: Configuring the Audio System (Exstreamer)

Enabling Audio and Ex-Streamer Configuration
Please click on Enable (see "A") in the panel "DF Audio (Voice over IP) Receiver" to enable the audio system and type the right socket (IP Address and Port) of the audio Ex-Streamer device (see "B"). While the socket information is correct and the Ex-Streamer device is switched on and working correctly, the first three LEDs in the field "C" will light up green.

The LEDs in the field "C" have the following meaning:
1 – Ex-Streamer Interface – Green means the TCPIP Connection is established
2 – Data Timeout – Green means the data comes cyclically
3 – Data – Green means the incoming data of the Ex-Streamer device is correct
4 – Stream Connection – Green means the connection between Ex-Streamer and all In-Streamers is established

The fourth LED lights yellow due to the In-Streamer is not configured yet.

<u>In-Streamer Configuration</u>

Please go to "Setup" page. Then click on "System & Channel Config" and type in the field "Optional: Audio Transmitter Adr&PortNo." the appropriate IP-Address and Port of the In-Streamer which belongs to the DF-Channel (see "D").
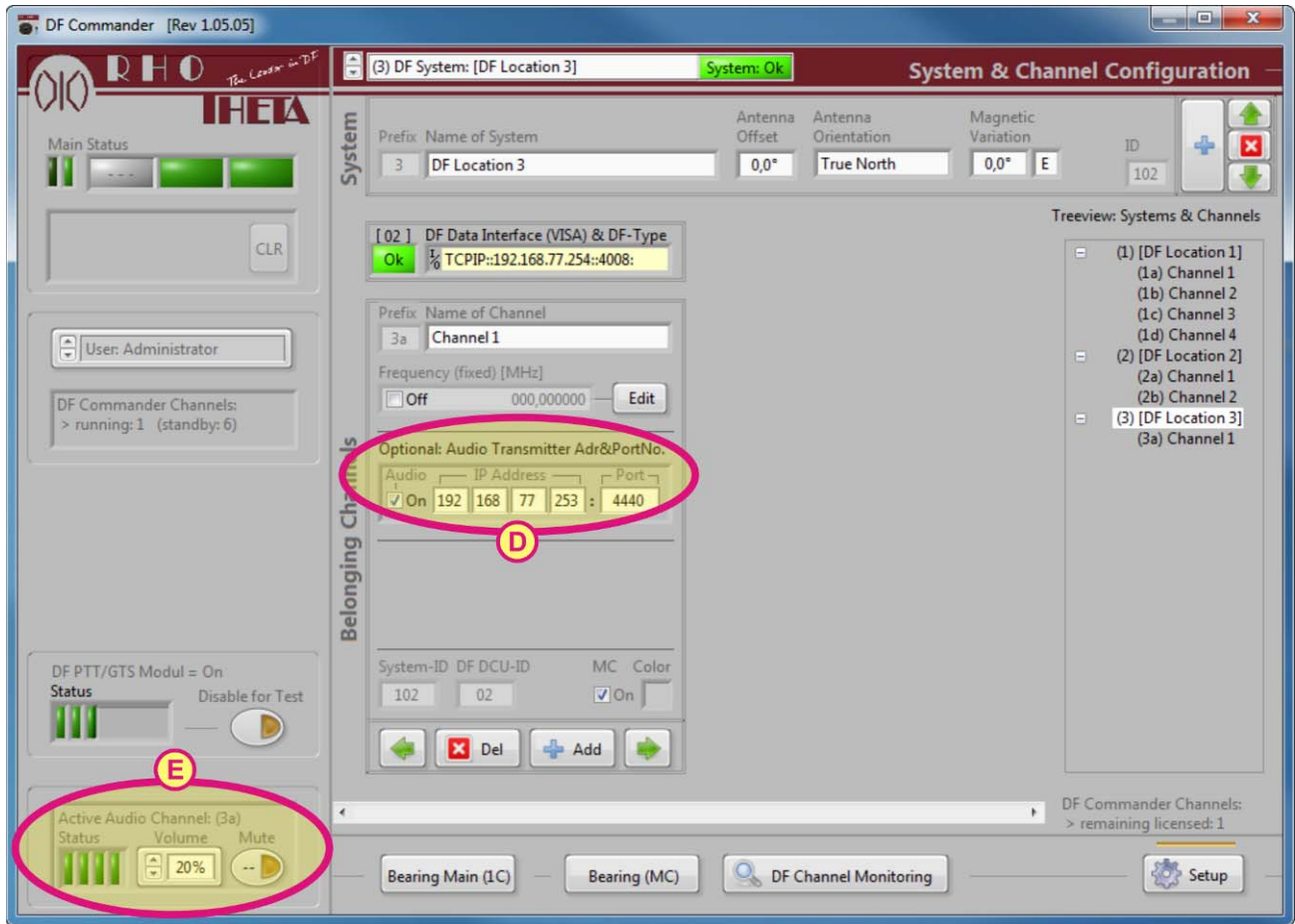

Figure 39: Configuring the Audio System (In-streamer)

If the configuration of the In-Streamer is done correctly, then the connection between Ex-Streamer and In-Streamer will be established. The last LED number 4 will light up green (see "E").

5.4   Display Configuration

The graphic representation of the pages "Bearing Main (1C)" and "Bearing (MC)" can be configured in the "Display Settings" page.
Display settings can only be made by the administrator and technician.
In particular, one can make such settings of the display as display style (for ATC or VTS application), bearing hold time, marker insertion on the compass rose, rotation of compass rose, insertion of a runway into the rose.

To make display settings please go first to the "Setup" page by clicking on button "Setup".
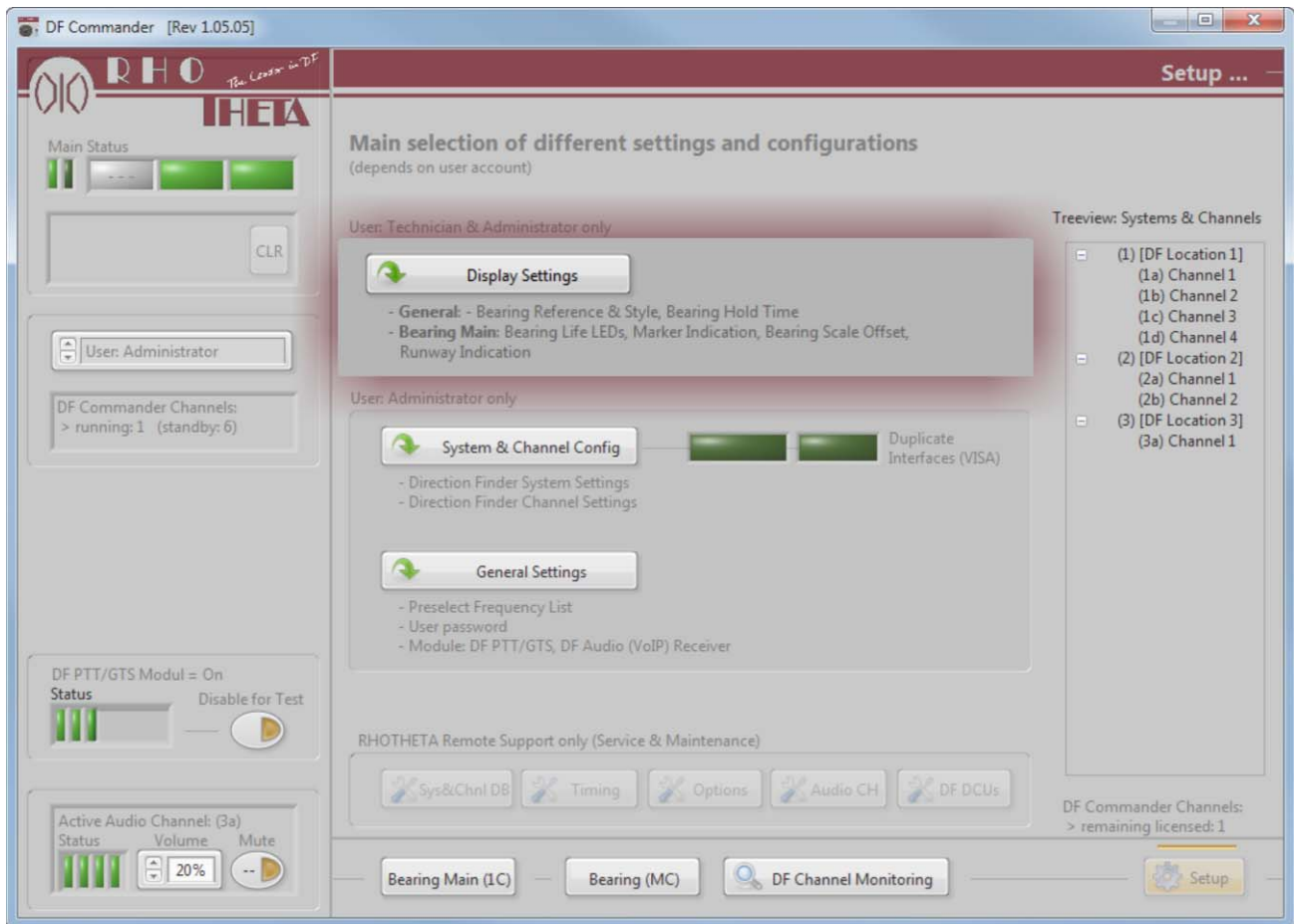
Figure 40: Select of Display Settings Page

Then click on "Display Settings".
As it is shown in the following figure (s. Figure 41), the "Display Settings" page contains of five main areas "A", "B", "C", "D" and "E".

Figure 41: Display configuration

5.4.1 Bearing Reference Direction / Style

Area "A"

Depending on the scope of application one can set the bearing reference direction in this area according to this application. There are three options available: "Automatic", "Std./VTS" or "ATC" – Style (s. Figure 41). Thus it is useful to select e.g. the VTS style, when the Direction Finder is used in the VTS operational range.

If the application area is very wide and includes marine band as well as ATC band, it is advisable to choose the "Automatic" style. In this case, when the frequency is inputted, the system automatically detects whether it is marine or ATC band, and the corresponding bearing reference direction style will be displayed.

The status of the button "User change during operation" defines whether the reference direction can be changed directly from the page "Bearing Main (1C)".

Select "Yes" to allow the direct change from the "Bearing Main" page.
Select "No" to disable the direct change from the "Bearing Main" page.

The following figure shows the automatic recognition of the bearing reference direction style in the "Automatic" style, while entering a frequency of 157.000 MHz.
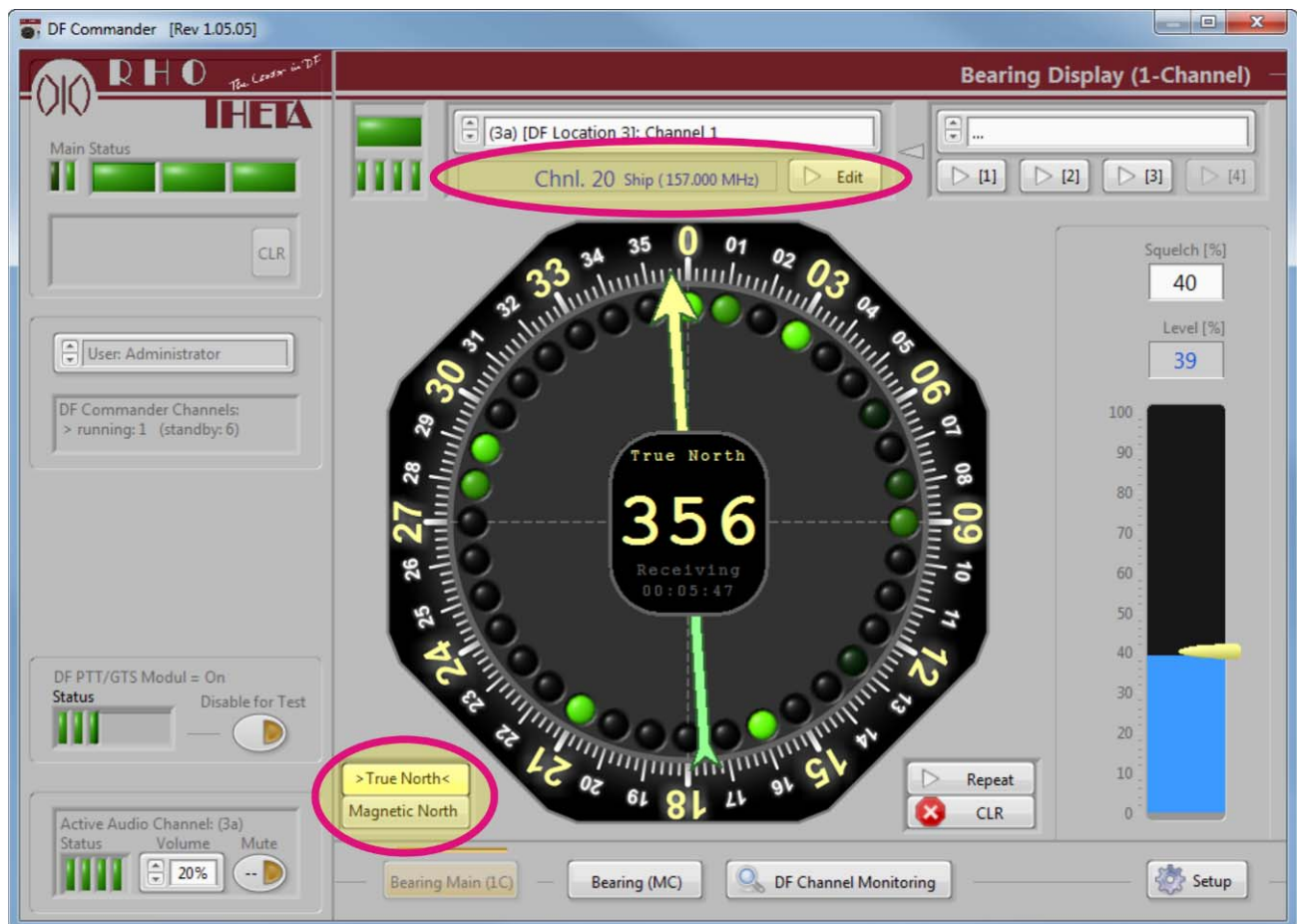

Figure 42: VTS-Style of the Bearing Main (1C) Page

5.4.2 Bearing Hold Time / Life LEDs

Area "B"
The "Bearing Indication Hold Time" is the time where the bearing values will still be indicated after the signal has been lost (s. Figure 41). Please define the hold time by clicking on the dropdown menu "Bearing Indication Hold Time" and select the desired hold time value. The following values are possible: 0 sec, 1 sec, 2 sec, 5 sec, 10 sec, 30 sec, Always (infinitely). By choosing "Always" (infinitely), the last bearing will be indicated until the next signal comes.

Life LEDs in the "Bearing Main (1C)" can be enabled or disabled by clicking on button "Enable" (s. Figure 41).

5.4.3 Marker

Area "C"
Bearing markers can be defined and displayed on the compass rose to provide the tower controller a better detection of aircraft (s. Figure 41). Some known points like bearing on a special way point or bearing on a tower transmitter to test the DF can be defined.
Therefore it is necessary to:
- Set the marker to "On"
- Define the bearing of the marker "Position" in degree.
- Define the name of the marker "Line-1"
- Define the additional marker information "Line-2"
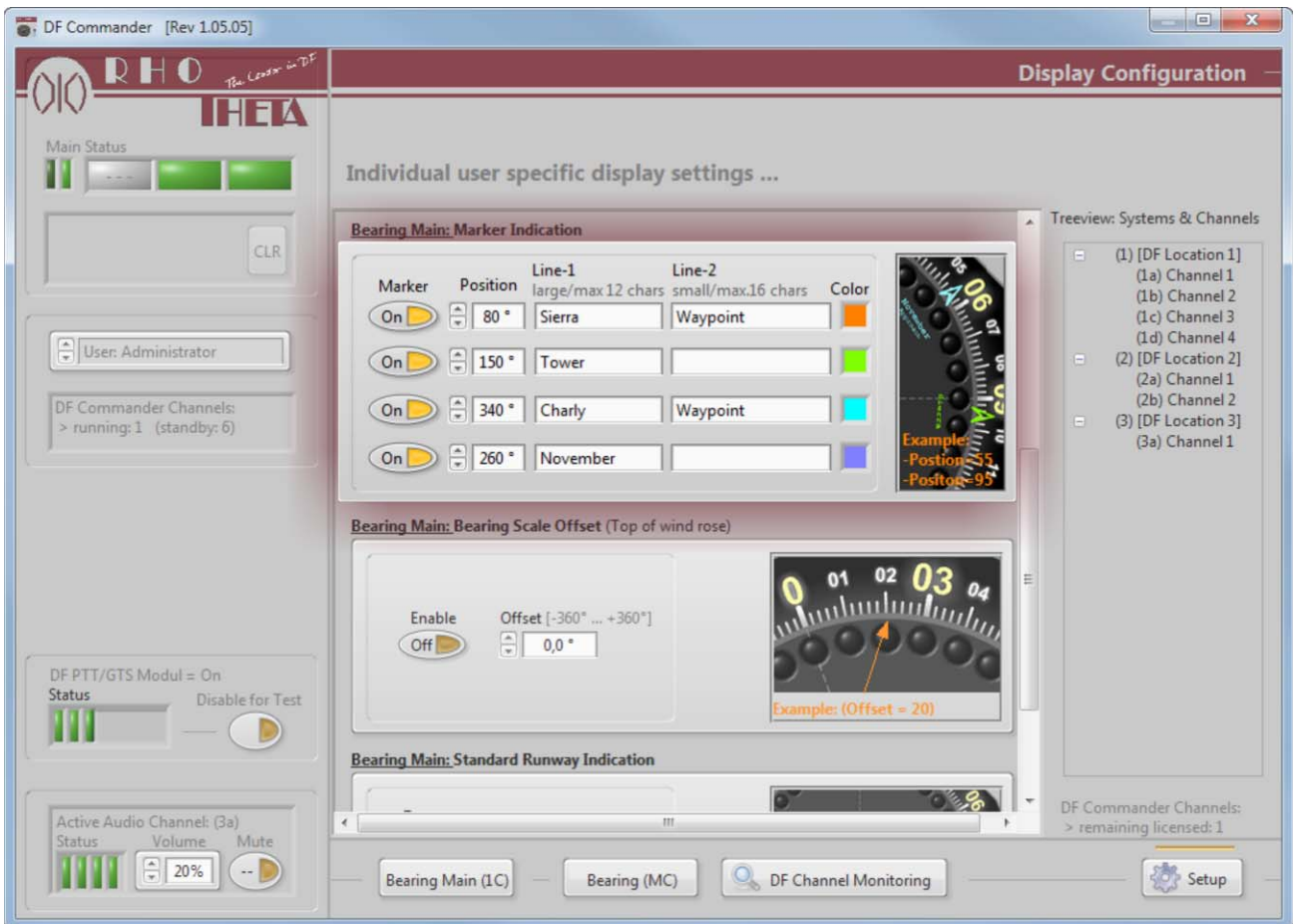- Define the color of the marker

Figure 43: Setting up Markers

A maximum of 4 markers can be placed on the compass rose.

Figure 44: Marker on the compass rose (overview)

Figure 45: Marker on the compass rose (detail)

5.4.4 Compass Rose Rotation / Bearing Scale Offset

<u>Area "D"</u>
Please specify the top of the compass rose (e.g. the compass direction of the tower window view) and enable the rotation by clicking on button "Enable" (s. Figure 41).

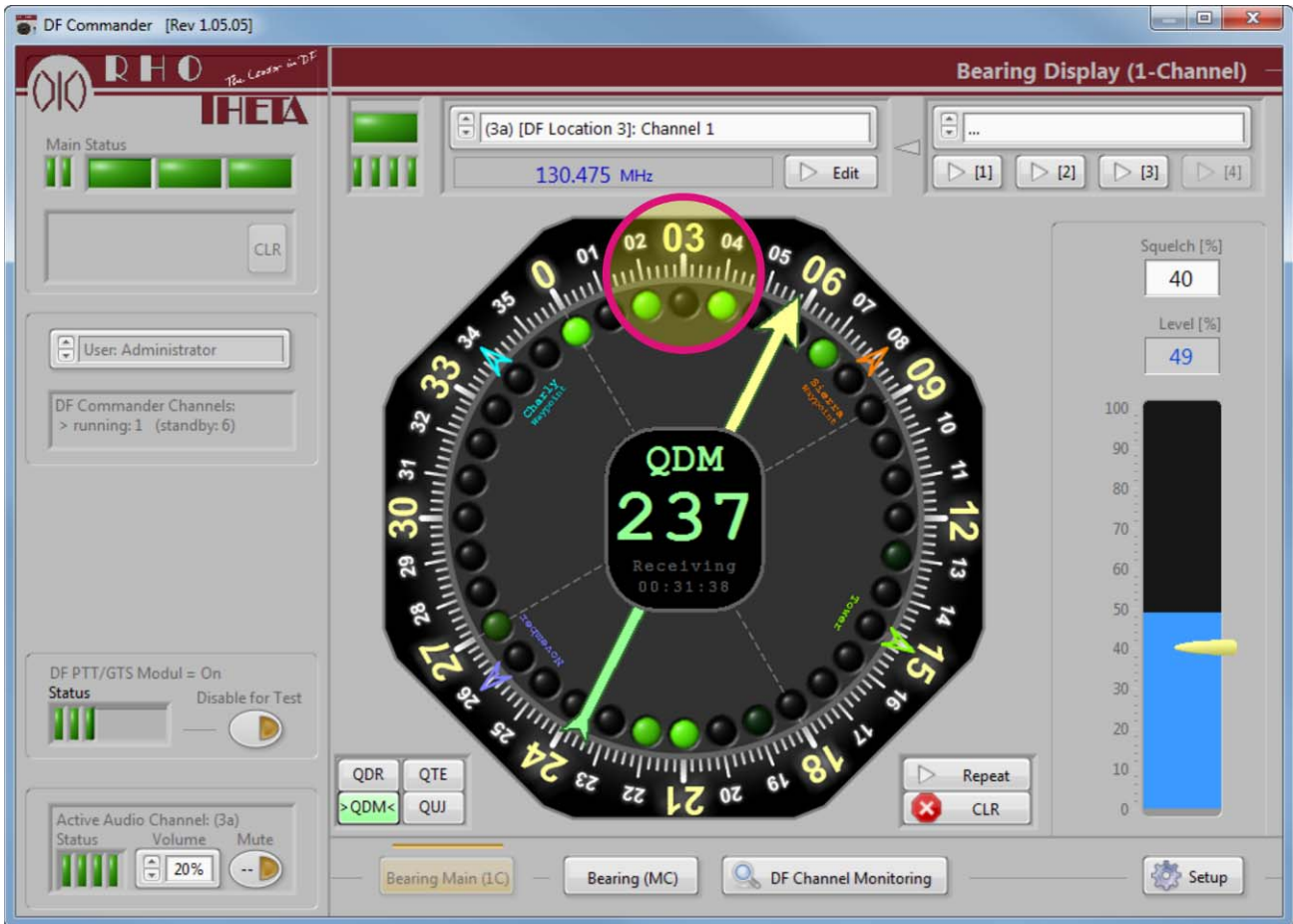Example result for 30° is shown in the following figure (s. Figure 46).

Figure 46: Bearing scale offset

5.4.5 Runway

<u>Area "E"</u>
It is also possible to display a runway on the compass rose, in order to provide the tower controller a better orientation (s. Figure 41).

Please define a runway direction in degrees, and switch on the indication by setting the button "Runway Indication" to "On".

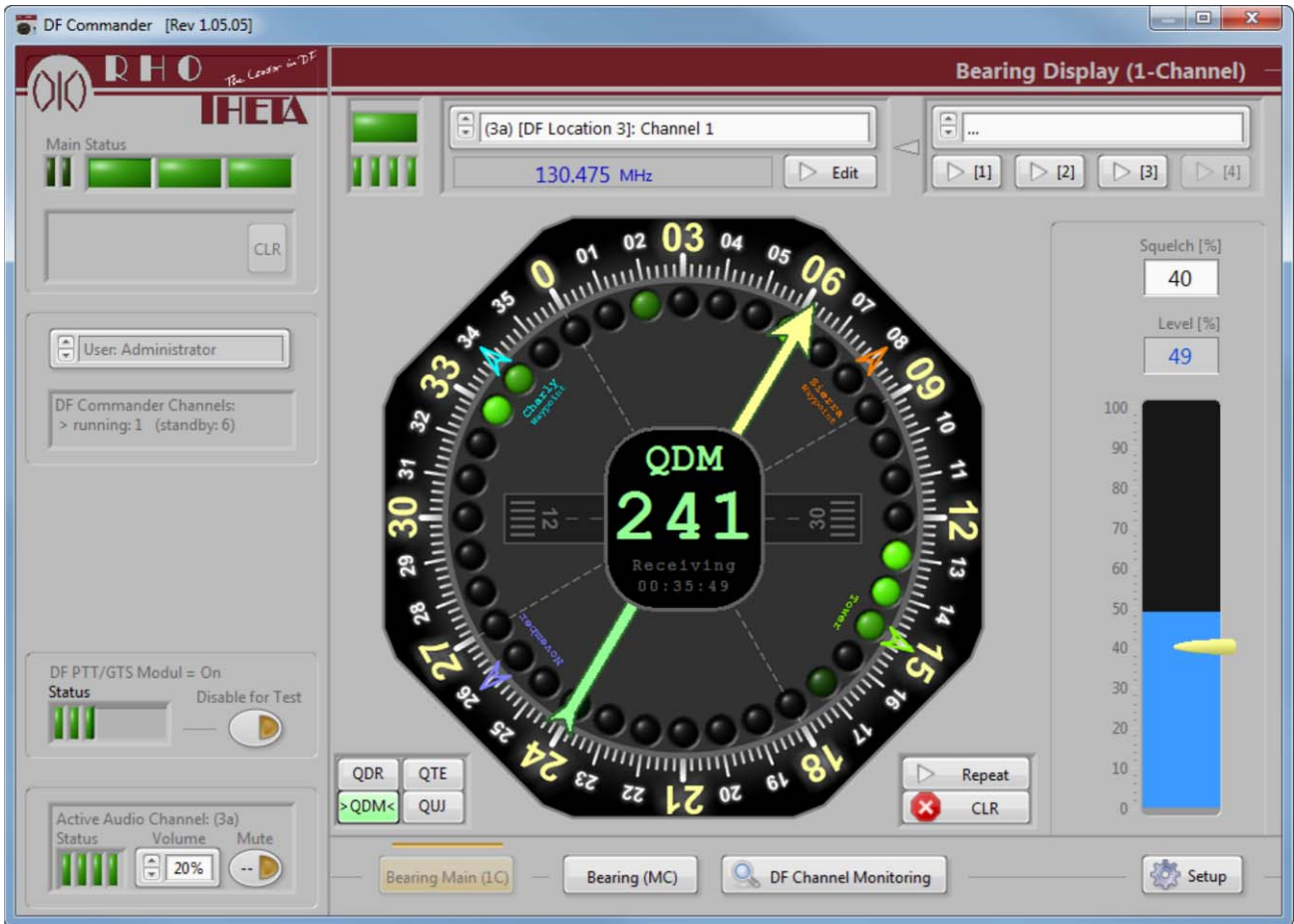Example for the runway with 300° (s. Figure 47).

Figure 47: Displaying a runway on the compass rose

6   Installation

6.1   Minimum PC Requirements

Minimum PC Requirements		
Operating System:	*Windows 7, 8.0, 8.1,* *Windows10 (tested with version 1607)*	
Processor:	*Intel Atom D2550 (2 x 1.86 GHz)*	
Memory:	*4 GB DDR3 1066*	
Interfaces:	*1 x RJ45 (LAN), Interfaces for Mouse and Keyboard*	
Monitor Resolution:	*Minimum:* *Recommended:* *Maximum:* *(The main window is limited to the maximum resolution. The entire monitor space cannot be completely filled with the window.)*	*1024 x 768* *1280 x 1024* *2560 x 1600*
Important Windows Setup:	*Size of text and other items on the screen:* *Follow the* *Control Panel\All Control Panel Items\Display* **Set the checkmark to "Smaller – 100%"** *Use of optional "Classic Mode" ⇔ Windows 7 is not recommended*	

Table 1: Minimum PC Requirement for DF Commander

6.2   Install the Software Package

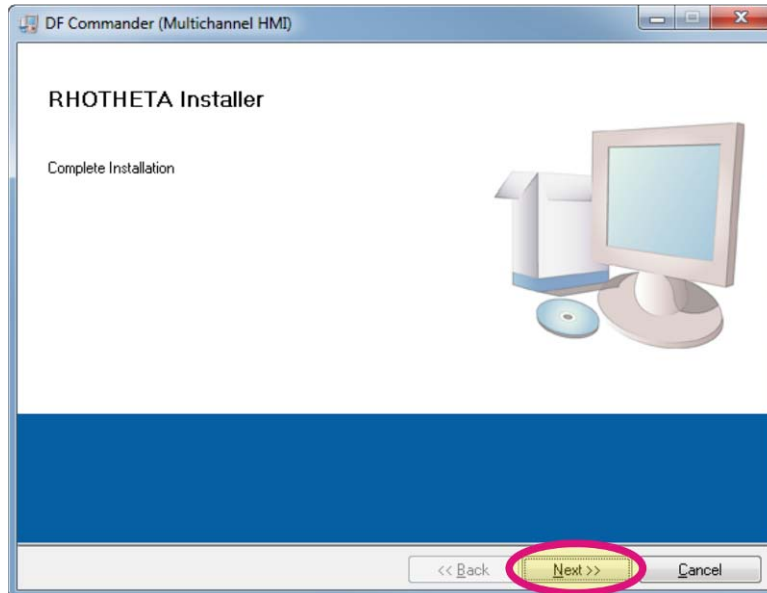Please execute "setup.exe" from the delivered CD.
Click on "Next".

Figure 48: Starting installation of DF Commander

Please define the directory for the software to be installed and click on "Next".
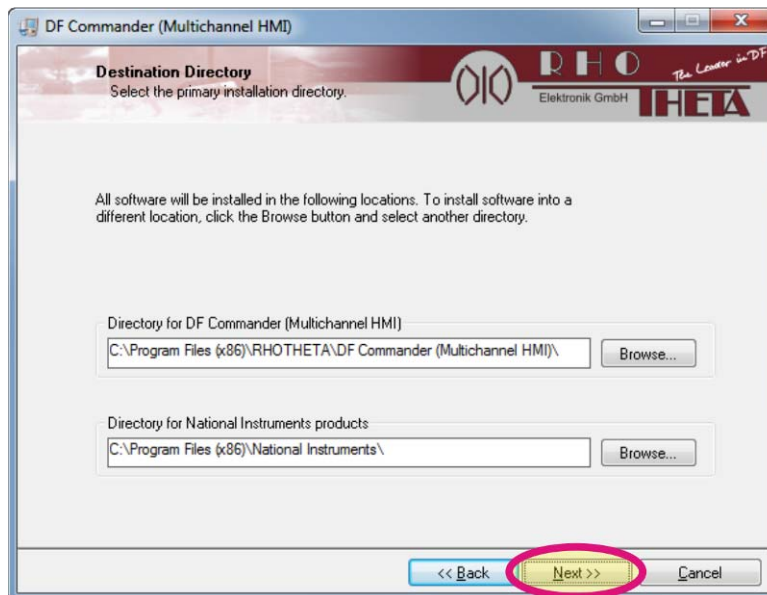

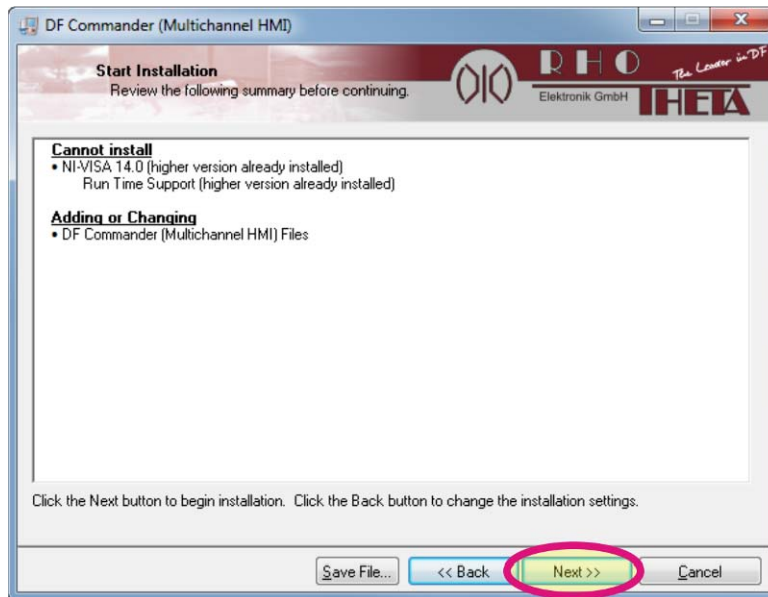Figure 49: Choosing installation folder

Please click on "Next".

Figure 50: Proceeding installation

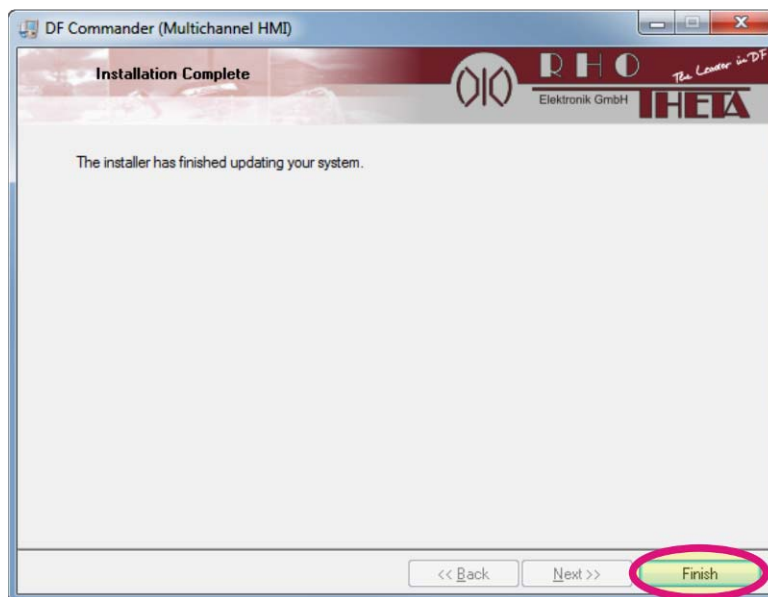Please click on "Finish" to complete the installation.

Figure 51: Finishing installation

6.3 Licensing

Please start the application.

If the license data has been already saved, the software will check the license and start the application automatically.

If the license data does not exist, the following window will be opened:

Figure 52: License Check
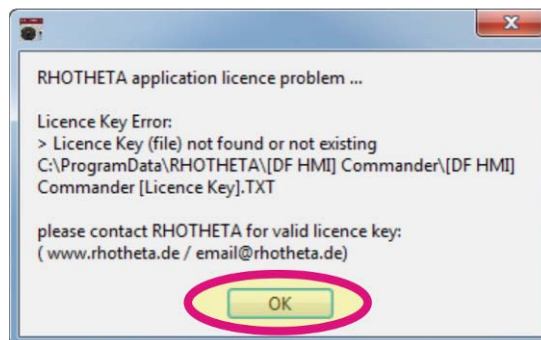
Click on "Ok" button.

Figure 53: No license found

6.3.1   Entering the License Data Manually

The license data (User, Type, Data and License Key) can be entered in the following window (see area "D").

Figure 54: Manual input of license data

If the license information does not exist, please contact RHOTHETA Elektronik GmbH and have the following data prepared:

Area "A"
This is a hardware ID of the PC where the software is running on. The hardware ID is derived from the network adapter of the PC. If more than one network adapters are available, please select one of them. (Attention: The selected network adapter should not be replaced after the installation. The combination of the hardware ID and the license key will be checked during every start procedure of the software.

Area "B"
This is the application name.

Area "C"
This is the revision of the application. The application name (area "B") and the revision of the application (area "C") are important data for the generation of the license key.

Area "D"
Input fields for the license information

Area "E"
- When the DBG is activated, the characters in the license key window are displayed as asterisks.
- "pwd mode" is intended for RHOTHETA special settings and is password protected.

The connection to RHOTHETA can also be established using "Team Viewer".
Please click on the button "start … Team Viewer" in area "F". Using this tool, a RHOTHETA supervisor can manage the entering of the license data and assist during the installation process.

Figure 55: Licensing via Team Viewer

After entering the data please click on "Save and proceed" button (see area "G").
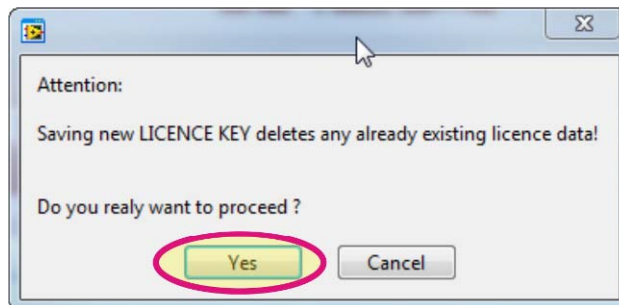

Figure 56: Saving license key

Click on "Yes" button.

The license data will be checked again, and after the license window has been closed, the application will start automatically.

6.3.2   Simple Method to get the License

After the program start, please click on "save and proceed" (see area "H") first to save the hardware ID and the application information to the licensing file.
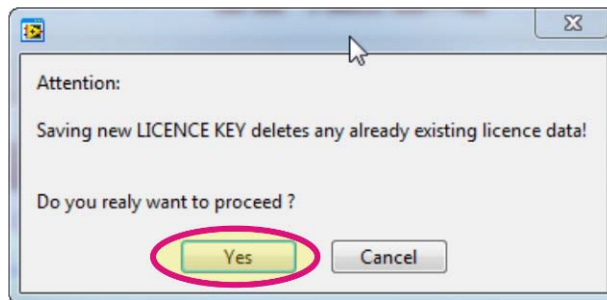

Figure 57: Using license file (step 1)

Figure 58: Using license file (step 2)
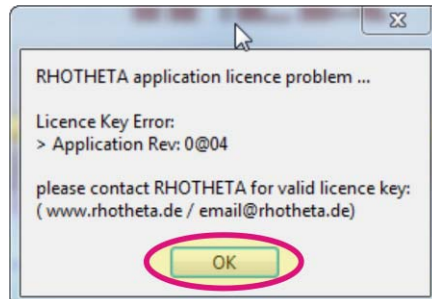
Click on "Yes" button.

Figure 59: Using license file (step 3)

Click on "Yes" button.

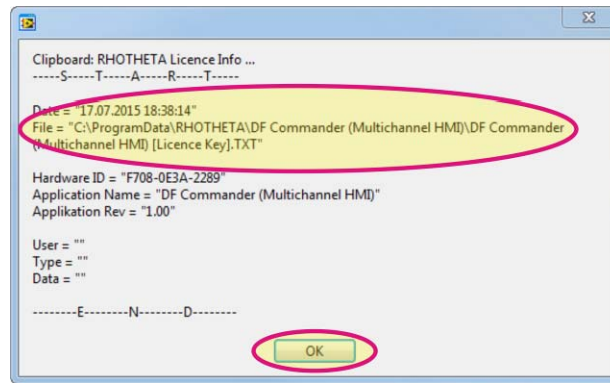Then click on "Clipboard" (see area "I").

Figure 60: Using license file (step 4)

Please find the license file specified in a clipboard or make a screenshot of this window and email it to RHOTHETA. The RHOTHETA supervisor will create a license file based on this data and will send it back. Copy the license file in the desired directory and restart the application.

The following window should be opened while the license check is running.

Figure 61: Using license file (step 5)

7 Abbreviations

Term:	Definition:
ATC	Air Traffic Control
DF	Direction Finder
HMI	Human Machine Interface
ID	Identification
IP	Internet Protocol
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
QDM	magnetic heading to station (without wind)
QDR	magnetic bearing
QTE	line of position (true)
QUJ	true bearing
SAR	Search And Rescue
System	In the context of the DF Commander a "system" is an antenna with at least one direction finder.
PTT/GTS/SBS	Push-To-Talk/ Ground Transmitter Suppression/Self Bearing Suppression
VTS	Vessel Traffic Service

Table 2: Terms and abbreviations

8 Notes