R&S® EB500
Monitoring Receiver
Getting Started

ROHDE&SCHWARZ

This manual describes the following models and options:

- R&S®EB500 Monitoring Receiver 4072.5004.02 (without front control panel)
- R&S®EB500 Monitoring Receiver 4072.5004.03 (with front control panel)

The firmware of the R&S EB500 makes use of several valuable open source software packages. Please refer to the "Open Source Acknowledgement" document (4072.8561.02) for a summary of the packages and the verbatim license texts.
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

The following abbreviations are used throughout this manual: R&S®EB500 is abbreviated to R&S EB500.

Contents

1   Preparation for Use

This section describes the basic steps to be taken when setting up the R&S EB500 for the first time.

1.1   Specific Safety Instructions

⚠ **CAUTION**

General safety instructions

Please follow the basic safety instructions included in this documentation as well as the instructions for setup and connection to prevent personal injury or damage to the R&S EB500. This is of particular importance when you use the R&S EB500 for the first time.

The following safety instructions apply in particular:

- IEC 364
- VDE 0100
- DIN 57100

These safety regulations deal with the following aspects:

- Prevention of accidents
- Protection against overvoltage
- Insulation of equipment
- Grounding
- Characteristics and laying of lines and cables
- Provisions for operational facilities and rooms and systems of a special nature

> ⚠ **CAUTION**
>
> **Setup**
>
> Before turning on the R&S EB500, please make sure that the following conditions are fulfilled:
>
> - Covers are in place and all fasteners are tightened.
> - Fan openings are unobstructed.
> - Signal levels at the input connectors are all within the specified ranges.
> - Signal outputs are correctly connected and not overloaded.
> - The R&S EB500 is dry and shows no condensation.
>
> Non-observance may cause damage to the R&S EB500 or other devices in the setup.

The R&S EB500 is supplied completely assembled except for the handles and mounting brackets, which must be attached by the user.

1.2 Setup

1.2.1 Bench Operation

> **NOTICE**
>
> **Equipment cooling**
>
> Do not expose the R&S EB500 to humidity. Leave at least 50 mm of empty space along both side panels in order to ensure proper equipment cooling.

There are no special requirements for desktop use. To facilitate access to the front panel elements, you should raise the front of the R&S EB500 by folding out its standing feet.

⚠ **CAUTION**

Risk of injury

The feet may fold in if they are not folded out completely or if the R&S EB500 is shifted. The feet may break if they are overloaded. Fold the feet completely in or completely out to ensure stability of the R&S EB500 and personal safety. To avoid injuries, never shift the R&S EB500 when its feet are folded out. The overall load (the R&S EB500's own weight plus that of any devices stacked on top of it) on the folded-out feet must not exceed 500 N. Place the R&S EB500 on a stable surface. Secure any devices stacked on top of it against slipping (e.g. by locking their feet on the top front frame). When the R&S EB500 is standing on its folded-out feet, do not work under it and do not put anything under it as this would pose a risk of personal injury or material damage.
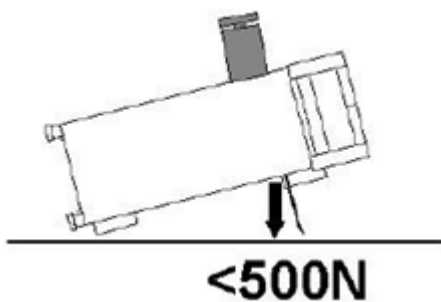
The R&S EB500 can be used in any of the positions shown here.
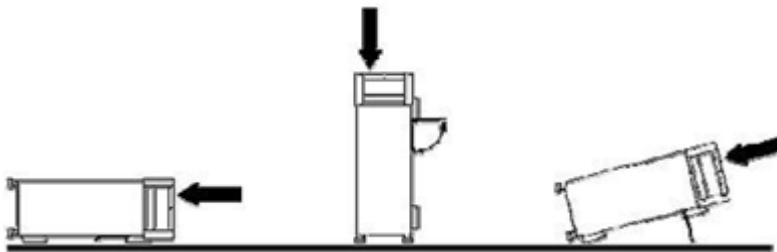
1.2.2 Rack Mounting

> **NOTICE**
>
> **Ambient temperature**
>
> The R&S EB500 should be used in an area where the ambient temperature does not exceed –10 °C to +55 °C (EB500 without front control panel) or 0 °C to 55 °C (EB500 with front control panel), respectively. The R&S EB500 is fan-cooled and must be installed with sufficient space along the sides to ensure a free flow of air. Make sure that there is sufficient space for hot air to escape from the R&S EB500. To ensure sufficient cooling do not attach telescopic rails to the sides of the unit.

1.2.3 In-vehicle Mounting

For use in vehicles, the R&S EB500 can be powered directly from the vehicle's battery via the DC input.

1.2.4 EMI Protective Measures

In order to avoid electromagnetic interference (EMI), the R&S EB500 may only be operated when it is closed and all shielding covers are in place. Use only appropriate shielded signal and control cables with proper termination.

1.2.5 Connecting the R&S EB500 to the Power Supply

Connect the R&S EB500 observing the following sections and instructions for use. The R&S EB500 is suitable only for DC operation.

1.2.5.1 Connecting to the Power Adapter

The R&S EB500 is connected to the AC supply 100 V to 240 V via an external AC/DC power adapter and to the socket X1 (10 VDC to 32 VDC) on the rear panel. Recommended connector: Neutrik® Speakon® NL4FX (see the figure below).

Installing the connector:

1. Insert the Speakon® NL4FX connector into socket X1 on the rear panel.

2. Turn the connector clockwise until it is locked in place and secured by the safety latch.

Removing the connector:

1. Press and chuck back the safety latch of the Speakon® NL4FX connector.

2. Turn the connector counterclockwise and withdraw it.

Fig. 1-1: Speakon® NL4FX

1.2.5.2   Connecting to the DC Source

The R&S EB500 is connected to an external 10 VDC to 32 VDC source (e.g. battery) via connector X1 on the rear panel. Recommended connector: Neutrik® Speakon® NL4FX, see chapter 1.2.5.1, "Connecting to the Power Adapter", on page 8.

> **DC supply voltage**
>
> Make sure that the available supply voltage is between 10 V and 32 V. Observe correct voltage polarity when connecting. Incorrect polarity may blow the fuse on the DC converter inside the R&S EB500 or damage the R&S EB500.

1.2.6   Power On and Off

The DC power connection X1 is located at the top left corner of the R&S EB500 rear panel. With the DC power connected, the R&S EB500 is in STANDBY or READY state, depending on the state of the STANDBY toggle switch at the front panel of the R&S EB500 when it was last switched off. The standby power is below 0.8 W.

1.2.7   STANDBY and READY

The STANDBY key is located at the bottom left corner of the front panel. With the DC power connected, press the STANDBY key briefly to switch the R&S EB500 from the STANDBY to the READY state and vice versa. In STANDBY state, the amber LED on the right will turn on and only the power switch circuit is being powered. In this state, it is safe to remove the DC power and disconnect the R&S EB500 from the AC/DC power adapter. In READY state, the green LED on the left is on. The R&S EB500 is ready for operation. All modules are being powered and the R&S EB500 initiates its startup procedure.

EB500 without front control panel

In the case of EB500 without front control panel, the green Power LED doubles as a 'Fail' status LED. In conditions of failure, the LED will turn red instead of green, as shown in the figures below.
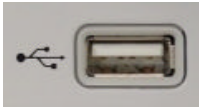
EB500 without front control panel Ready

EB500 without front control panel in Failure mode. Refer to the Troubleshooting section in the Operating Manual for possible actions to take.

1.2.8 Connecting External Accessories

1.2.8.1 Connecting a Mouse or Keyboard (EB500 with front control panel only)

 You can connect a mouse or keyboard to the USB port on the front panel of the R&S EB500. The mouse or keyboard will be detected automatically when connected. If you want to connect both at the same time, you will need a USB hub. It is safe to connect and disconnect the mouse and keyboard during a measurement.

1.2.8.2 Setting up a LAN Connection

 You can connect a LAN cable to the LAN port (X7) on the rear panel of the R&S EB500.

To establish a LAN connection, proceed as described below.

1. Refer to for the steps needed to set the R&S EB500's IP address.

2. Connect a LAN cable to the LAN port. The R&S EB500 has an internal switch which automatically detects the type of LAN cable connected so you can use any standard type of LAN cable to establish a network connection with the R&S EB500 (dedicated or non-dedicated).

Dedicated vs. non-dedicated network connections

There are two methods to establish a LAN connection with the R&S EB500:

* A non-dedicated network (Ethernet) connection from the R&S EB500 to an existing network. The R&S EB500 is assigned an IP address and can coexist with a computer and with other hosts on the same network.

* A dedicated network connection between the R&S EB500 and a single computer. The computer must be equipped with a network adapter and is directly connected to the R&S EB500. The use of hubs, switches or gateways is not required; however, data transfer is still made using the TCP/IP protocol.

Please refer to the Operating Manual for the steps to retrieve the IP address by using the SETUP key.
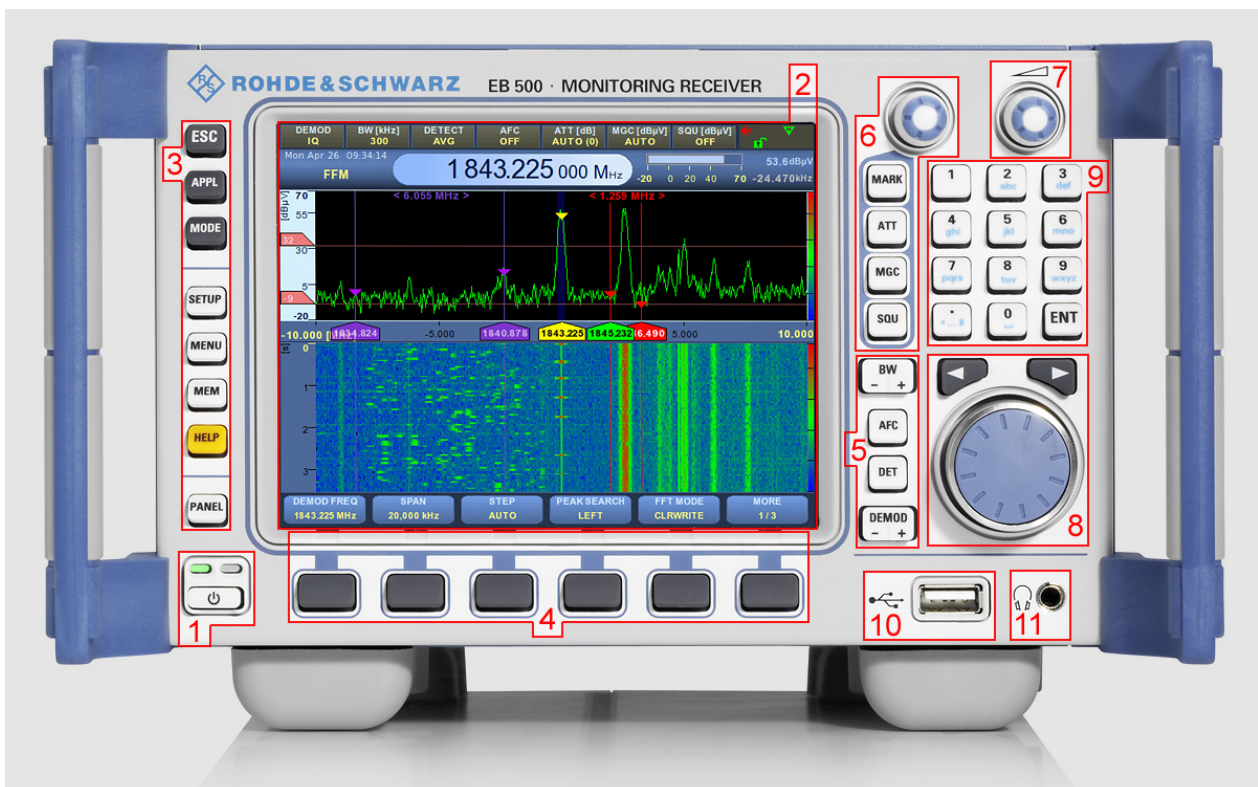
2   Operation

Basic operation of the R&S EB500 will be described in this chapter. An overview of the front panel, rear panel and graphical user interface (GUI) is explained below. This chapter contains most of the information required to access the various configuration options and settings necessary to get you started operating the R&S EB500.

2.1   Front-Panel Tour

2.1.1   EB500 with front control panel

An overview of the front-panel elements of the EB500 with front control panel is given in the paragraphs below.

In the following overview the index numbers refer to the labels in the figure above.

1. Standby key with Ready (green) / Standby (amber) LED indicators.

2. 5.7", 640 x 480 pixels color TFT display.

3. Utility keys.

- ESC terminates an ongoing operation, e.g. by closing a dialog.

- APPL sets the R&S EB500 to a particular application mode -- Receiver, Video, ITU (optional), Decode (optional).

- MODE changes the R&S EB500 from a Fixed Frequency Mode (FFM) to one of the scanning modes.

- SETUP provides access to the setup and configuration dialogs.

- MENU provides access to operational functions "Snapshot", "Record", "Pre-set", "Zoom +", "Zoom -", "Tests", "File" and "Sanitizing".

- MEM provides a shortcut to memory-related dialogs: "Edit", "RCL", "Save" and "Suppress".

- HELP starts the online help system (see chapter 2.3.3, "Online Help", on page 32).

- PANEL toggles between panels to make them active for softkey control.

4. Softkeys.

The function of each softkey is dependent on the softkey bar on the display.

5. Receiver Control Keys.

- BW selects the demodulation bandwidth (between 100 Hz and 5 MHz).

- AFC switches automatic frequency control (AFC) ON or OFF.

- DET selects the level measurement mode (AVERAGE, PEAK, FAST or RMS).

- DEMOD selects the demodulation mode (FM, AM, PULS, PM, IQ, ISB, CW, USB, LSB).

6. Select Rollkey & Control.

- MARK selects the marker function. The rollkey is used to set marker positions with associated softkeys. Pressing the rollkey toggles marker display.

- ATT allows the rollkey to set the RF attenuation level. Pressing the rollkey toggles between AUTO and manually set attenuation values.

- MGC allows the rollkey to set the demodulation level for amplitude related modulation schemes. Pressing the rollkey toggles between AUTO (AGC) and MGC. Gain control has no effect on FM and PM.

- SQU allows the rollkey to set the squelch level. Pressing the rollkey toggles the squelch activation.

7. Volume Control Rollkey.

The volume of the speaker and headphones is adjusted with this knob. Pressing the knob will toggle the speaker mute. Headphones remain active when the speaker is in mute position.

8. Cursor Left/Right & Main Rollkey.

● Cursor LEFT/RIGHT moves the cursor in input fields and scrolls within lists. It also step tunes the frequency by half of the span.

● The main ROLLKEY or ROTARY KNOB is a weighted rotary knob which functions primarily as a tuning knob. In certain menus, the main rollkey serves as up/down key. Pressing the rollkey confirms an entry (equivalent to the ENT key).

9. Data Entry Keys.

● The 0~9 keys allow entry of the corresponding number or alphabet, decimal point or symbol.

● ENT (Enter) activates the editing mode and also confirms an entry.

10. USB 2.0 Port.

Allows a USB 2.0-compliant mouse, keyboard or storage device to be connected.

NOTICE

Maximum current
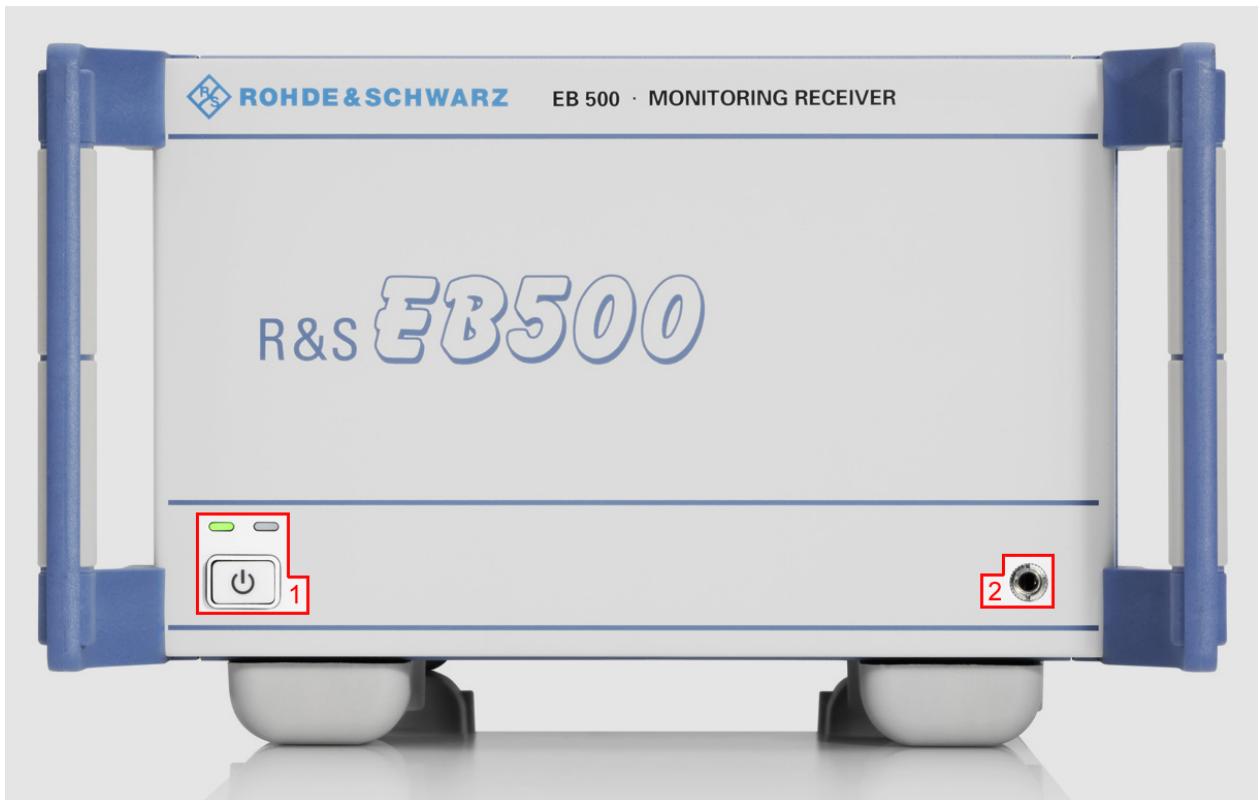
The maximum current for the USB port is 500 mA.

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11. Headphones Jack.

Allows stereo headphones with a 3.5 mm stereo plug to be connected.

2.1.2   EB500 without front control panel

An overview of the front-panel elements of the EB500 without front control panel is given in the paragraph below.

In the following overview, the index numbers refer to the labels in the figure above.

1. Standby key with Ready (green) or Fail (red) and Standby (amber) LED indicators. The Ready LED also serves as Fail LED, as shown in chapter 1.2.7, "STANDBY and READY", on page 10

2. Headphones Jack.

Allows stereo headphones with a 3.5 mm stereo plug to be connected.

NOTICE

GUI for remote access

A GUI for remote access is available for the Windows XP platform and is particularly useful for the EB500 without front control panel because it gives functionality similar to the EB500 with front control panel. Follow the instructions in chapter 4.4, "GUI Installation for Remote Access", on page 63 to install the external GUI software. A Windows XP machine connected to the same network as the EB500 without front control panel, is required.

2.2   Rear-Panel Tour

The various inputs and outputs located on the rear panel of the R&S EB500 are briefly explained in the paragraphs below.
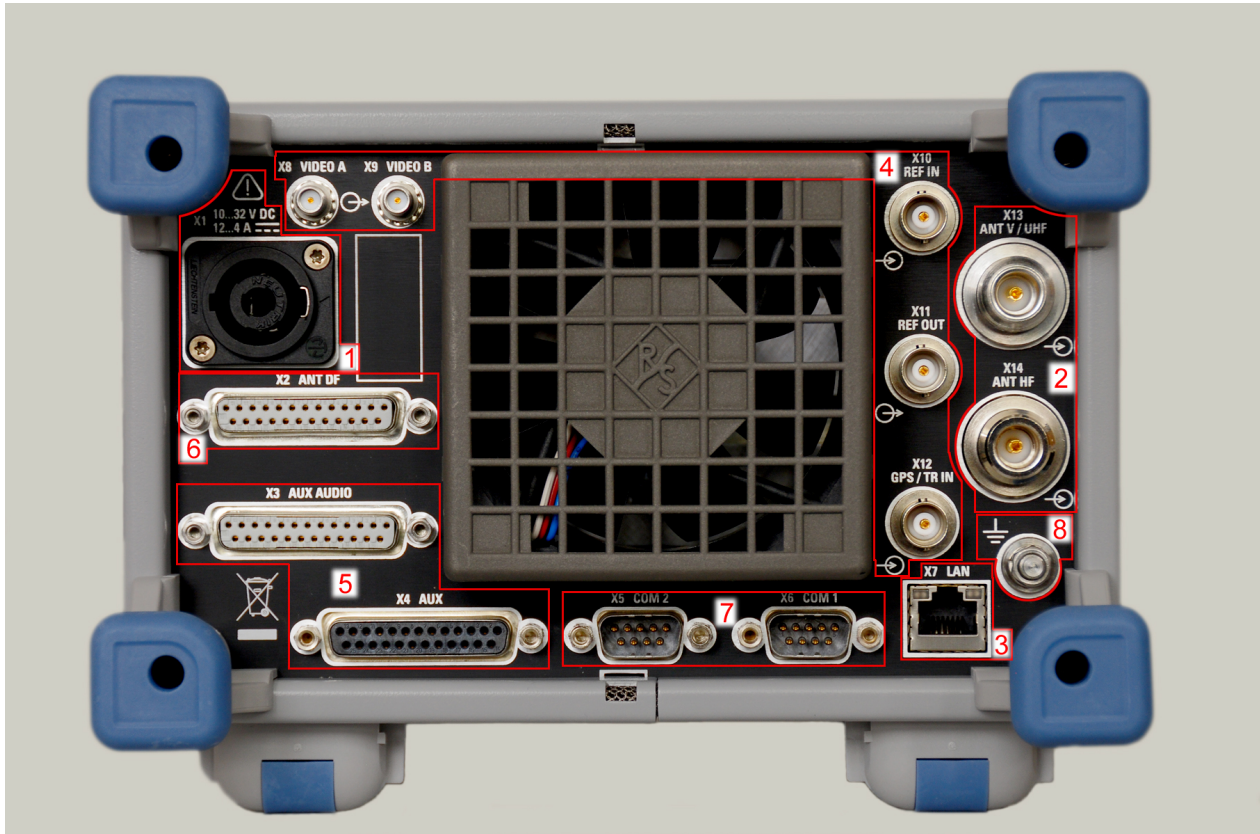
In the following overview, the index numbers refer to the labels in the figure above.

1. X1 Power Supply.

Standard Speakon NL4FX socket for DC power input. Socket accepts 10~32 VDC on pin 1+ and ground on pin 1- of connector. Power requirement as indicated.

2. Antenna Inputs.

- X13 Antenna input for HF/V/UHF bands 9 kHz to 6 GHz.
- X14 Antenna input for HF band 9 kHz to 32 MHz.

3. X7 LAN Port.

A 10/100/1000Base-T port for remote control via LAN.

4. Miscellaneous I/O.

- X8 VIDEO A, X9 VIDEO B SMA outputs provide analog I-Q baseband or AM and FM demodulated signal for further processing. Can also be switched to output-controlled analog intermediate frequency (IF) in two channels with an adjustable carrier frequency of 0 Hz to 70 MHz.

- X10 REF IN BNC input for synchronizing with an external 10 MHz reference frequency normal.

- X11 REF OUT BNC output provides a 10 MHz reference frequency normal for synchronization of other devices. Frequency normal dependent on selected internal or external reference.

- X12 GPS/TR IN BNC input for an external 1 sec trigger pulse, e.g. from a GPS device.

5. AUX / AUX Audio.

- X3 AUX AUDIO is a 25-pin D-Sub female connector with the output of different audio signals.

- X4 AUX is a 25-pin D-Sub female connector for controlling external antenna switching units.

6. X2 ANTENNA DF.

A 25-pin D-Sub female connector for controlling optional direction-finder antennas.

7. Serial Interfaces – EIA 232D Compatible.

- X5 COM2, 9-pin D-Sub male connector.
- X6 COM1, 9-pin D-Sub male connector.

X5 and X6 can be used for:

- Serial GPS devices according to the NMEA0183 standard. Either one of the X5 or X6 connectors can be used for an external GPS device, to determine the location and the exact time of the R&S EB500.

- Serial compass devices according to the NMEA0183 standard. Use this connector for an external compass device to determine the direction of your vehicle. This will mostly be used in combination with direction finding (requires DF upgrade R&S EB500-DF).

8. Grounding Post for Earth / Chassis Ground.

> ℹ **Signal Interfaces**
>
> All I/O, RF, signal interfaces (X2-X6, X8-X14) must be operated with double shielded cables.
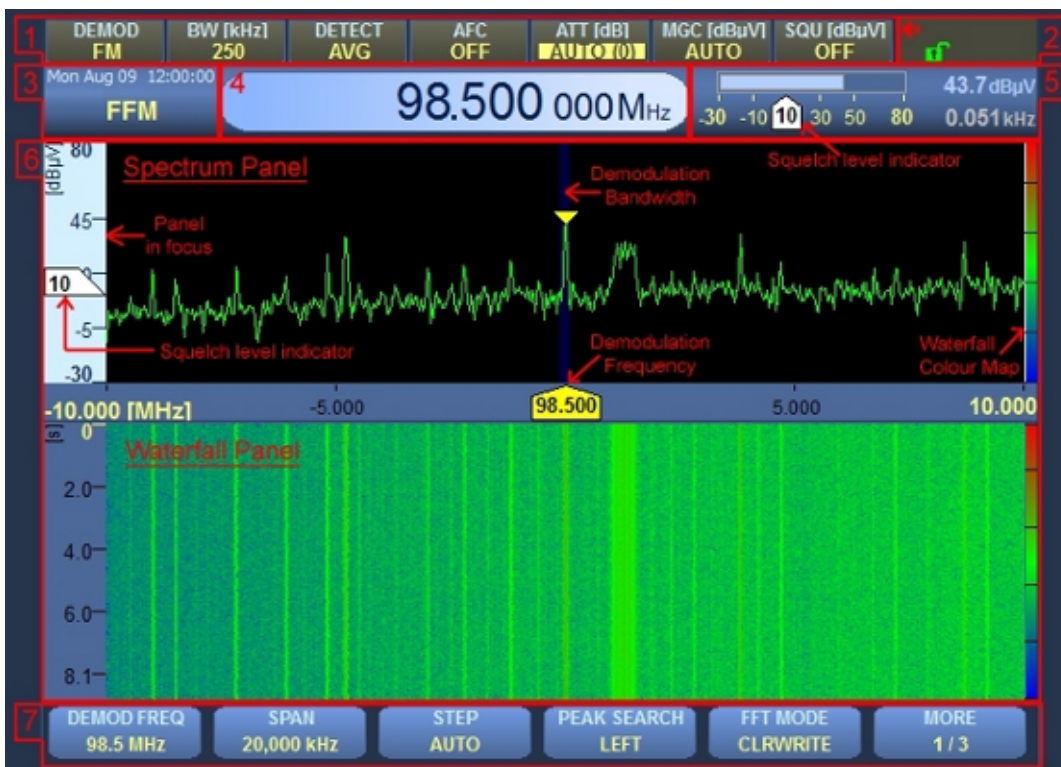
> ℹ **Interface X7 LAN**
>
> A CAT7 LAN cable must be used for this Gigabit capable interface.

2.3   Graphical User Interface (GUI)

This chapter provides a short description of the graphical user interface of the R&S EB500.

2.3.1   GUI Layout

Following is an overview of the layout and individual elements of the graphical user interface.

In the table below follows the description of the different panels, according to the panel number indicated in the figure above.

Panel No.	Description
1	**Basic receiver parameters**
2	**Icons** Shows one or several of the following icons to indicate a specific function or condition of the R&S EB500:
	Compass connected.
	GPS connected.
	Configuration: using external reference.
	Receiver overflow.
	Recording in progress.
	Marker selected.
	Speaker is off.
	Speaker is on.
	Audio signal is available in stereo at current frequency.
	The R&S EB500 is not locked.
	The R&S EB500 is locked by another client. Access is not possible.
	The R&S EB500 is locked. Only the current operator can make changes (exclusive write access).
	A critical error occurred in the receiver. The "Test Points" dialog will provide more information.
3	**Mode** Shows the current receiver mode, e.g. FFM, PScan, FScan or MScan. The current date and time is also shown.
4	**Frequency** Shows the current receiver frequency. As this is the most important parameter, it is displayed much larger than the remaining parameters.

Panel No.	Description
5	**Measurement parameters** Shows the basic measurement parameters (level and frequency offset; numerically and bar graph). The squelch level is also shown by means of an indicating marker in the bar graph.
6	**Panel area** The panel area is used for displaying the various panels of the R&S EB500 (spectrum and waterfall are shown). • The light cyan color of the scale bar indicates that the panel is in focus: softkey operations affect the panel (see below). A marker to show the squelch level relative to the trace level is also displayed. • The dark blue bar around the demodulation frequency marking denotes the band-width being demodulated. • On the right side, the rainbow colored bar indicates the color that is mapped to the corresponding spectrum level for the waterfall display.
7	**Softkeys** Softkeys change their function based on the panel that is in focus. They show panel-dependent parameters, e.g. "SPAN" and "STEP" for IF panel and IF Waterfall panel. Other softkeys are only related to e.g. RF panel, RF Waterfall panel etc. Softkeys can be related to hardkeys: they can e.g. provide selection options in case one of the Utility keys is pressed or in case DET or MARK is pressed. Softkeys can also provide the option for selecting a unit (kHz, MHz etc) e.g. when keying-in a frequency, they can provide additional functionality when editing input fields in dialogs, e.g. backspace or caps lock. Finally they can serve as shortcut keys for navigating through tables in dialogs, e.g. in the "Memory Setup" dialog or through the "Help" pages.

2.3.2   Turning on the R&S EB500 for the First Time

Upon power on, the R&S EB500 is always defaulted into the Fixed Frequency Receiver Mode (reference to Operating Manual). In this mode, the R&S EB500 behaves as a normal receiver with the screen as shown in chapter 2.3.1, "GUI Layout", on page 19. Upon power on the speaker will always be muted.

2.3.2.1   Unmute the speaker

The volume of the speaker and headphones is adjusted with the VOLUME KNOB. Pressing the knob will mute / unmute the speaker. Headphones remain active when the speaker is in mute position.

2.3.2.2 Setting Date and Time
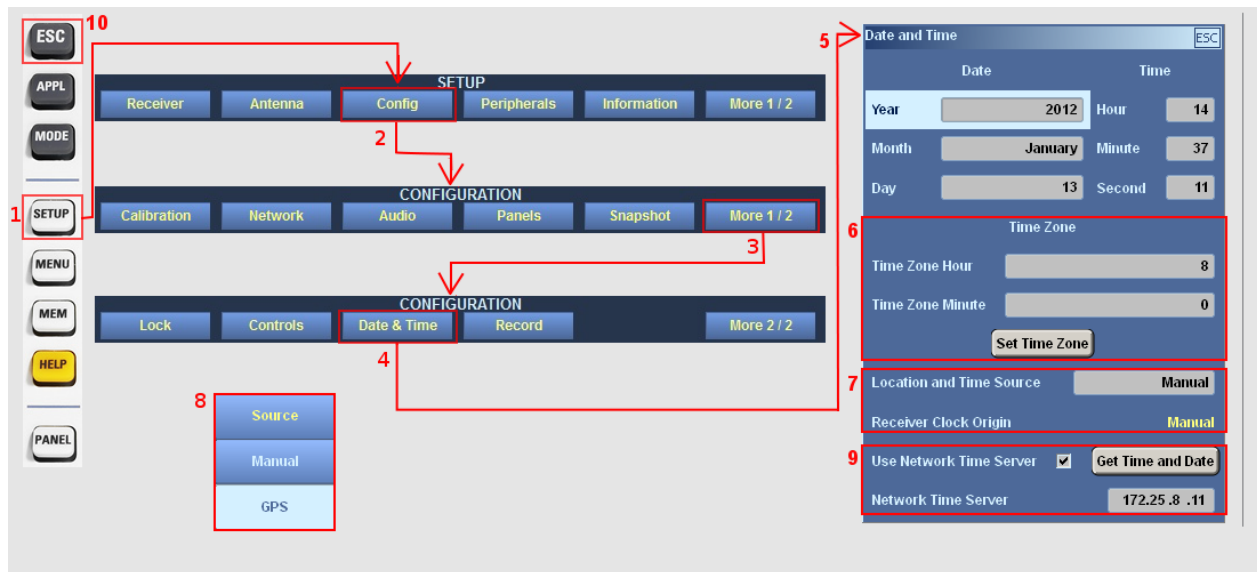
1. Press the SETUP key to open the Setup Menu.

2. Select the "Config" softkey to open the Configuration Menu.

3. Select the "More 1 / 2" softkey.

4. Select the "Date & Time" softkey.

5. The dialog box for setting the date and time will appear. Set the appropriate date and time using CURSOR LEFT / CURSOR RIGHT & ROTARY KNOB. "Backspace" can be found in the softkey bar whenever a field is in the edit mode. When a field is in edit mode (whether it is minutes, seconds, hours etc), it will not be updated. The R&S EB500 time will be set to the new time once the field gets out of edit mode.

6. In the same dialog box there are fields to configure the time zone. Select "Set Time Zone" to activate the newly configured time zone.

7. Next there are fields to set the time source.

8. The internal real-time clock will provide the time source at startup. In case a GPS receiver is connected, the time source can be changed to GPS.

9. The last part of the dialog provides fields to retrieve the time from a Network Time Server. Key-in the IP address of a Time Server, check the checkbox and press "Get Time and Date" in order to get the time provided by the Time Server.

10. Press ESC to return to the previous menu.

> **Softkey fadeout**
>
> When the softkey options in the SETUP menu are not selected within 5 seconds, the menu will timeout and revert to the softkeys for the panel in focus. In this situation, the setup procedure should be repeated from the start.

2.3.2.3   Short and Long Tests

The short and long test sequences are for verifying that the signal paths are functional.

1. Press the MENU key to open the "Menu" softkey bar.

2. Select the "More 1 / 2" softkey to open page 2 / 2.

3. Select the "Tests" softkey to open the "Tests" softkey menu.

4. Select the "Short Test" softkey to run the short test sequence. The short test will take about a second to produce a result. If the test passed, the result is as shown.

5. Select the "Long Test" softkey to run the long test sequence. In the long test sequence, all the RF paths are tested. The test will take about 30 seconds to complete. If the tests passed, the result is as shown. Otherwise, contact qualified Rohde & Schwarz service personnel.

2.3.2.4   Settings – Receiver and Antenna

Before proceeding with the Basic Operation section, it is useful to install a suitable antenna or signal source into the X13 ANT V/UHF connector on the rear panel.
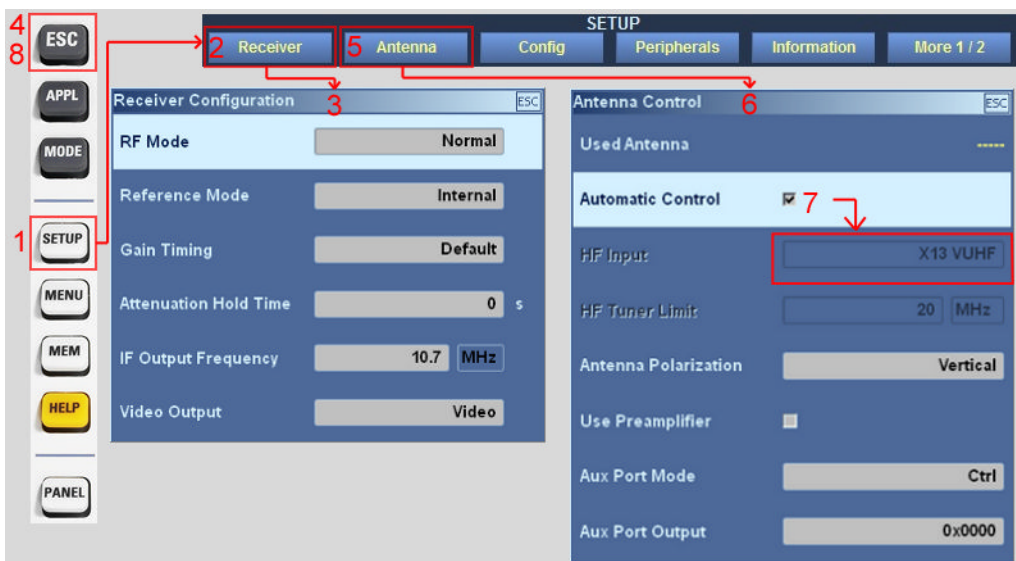
Check the following settings under the Receiver and Antenna submenu to ensure the default settings are in place.

1. Press the SETUP key to open the Setup Menu.

2. Select the "Receiver" softkey.

3. The Receiver Configuration dialog box will appear. Check that "RF Mode" = Normal, "Reference Mode" = Internal. Refer to the R&S EB500 Operating Manual for the detailed description of this dialog box.

4. Press the ESC key to exit the dialog box and return to the Setup Menu.

5. Select the "Antenna" softkey.

6. The Antenna Control dialog box will open.

7. The "Automatic Control" checkbox is checked by default. When it is unchecked, the antenna settings will be available for manual configuration. The Operating Manual explains how this can be done. If HF option is present, HF Tuner Limit sets the upper frequency limit of the direct reception HF tuner. Frequencies above this limit will undergo a 2- or 3-stage heterodyne receiver path.

8. Press ESC to exit the dialog box and again to get to the top menu.

2.3.2.5   Basic Operation - Fixed Frequency Mode (FFM)

Operating in the top menu, the screen and softkeys are as shown in chapter 2.3.1, "GUI Layout", on page 19. Ensure the panel focus is on the Spectrum display (press PANEL until the IF panel gets a light blue y-axis).

1. Tuning the Mid Frequency can be performed via:

   a) ROTARY KNOB – the tuning step is defined in the "STEP" softkey menu.

   b) CURSOR LEFT / CURSOR RIGHT Key – the tuning step is half the "SPAN" width defined in the softkey menu.

   c) Data Entry Keys – Direct entry of the frequency is possible. The Mid Frequency dialog box appears upon keypress and the softkey menu switches into editing mode with different units and backspace.

2. The FFT Mode softkey allows the FFT trace to be displayed in the following modes:-

a) "MINIMUM": the minimum of the FFT trace over time is displayed.
b) "MAXIMUM": the maximum of the FFT trace over time is displayed.
c) "AVERAGE": the average of the FFT trace over time is displayed.
d) "CLRWRITE": the instantaneous FFT is displayed without averaging.

3. The Demodulation Frequency softkey allows a small portion of the displayed IF Span to be selected for demodulation.
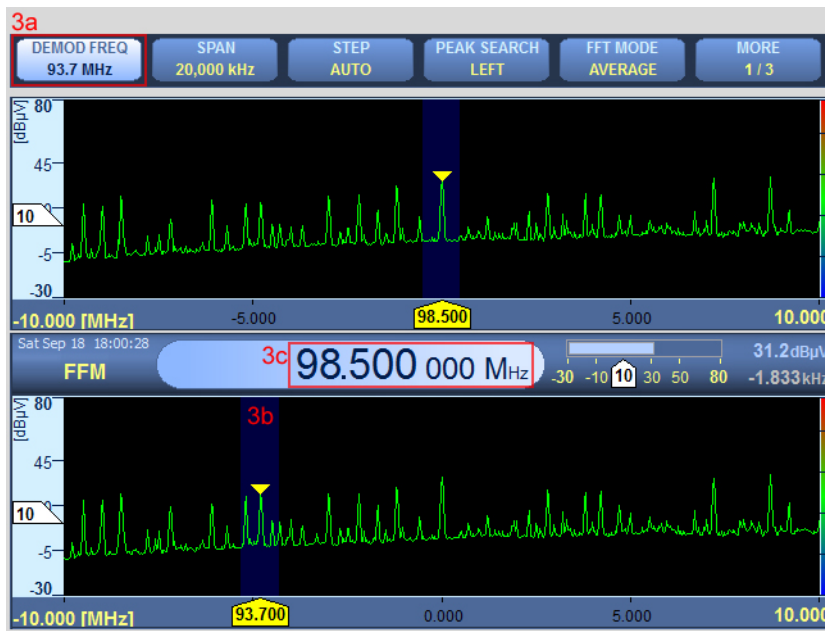
a) Select the "DEMOD FREQ" softkey to highlight it.
b) With the softkey in (3a) highlighted, follow procedure (1) to change the demodulation frequency within the IF span.
c) The Mid Frequency will not change.

4. The Receiver Control Keys (chapter 2.1, "Front-Panel Tour", on page 13 Receiver Control Keys) allow changes to various receiver parameters.
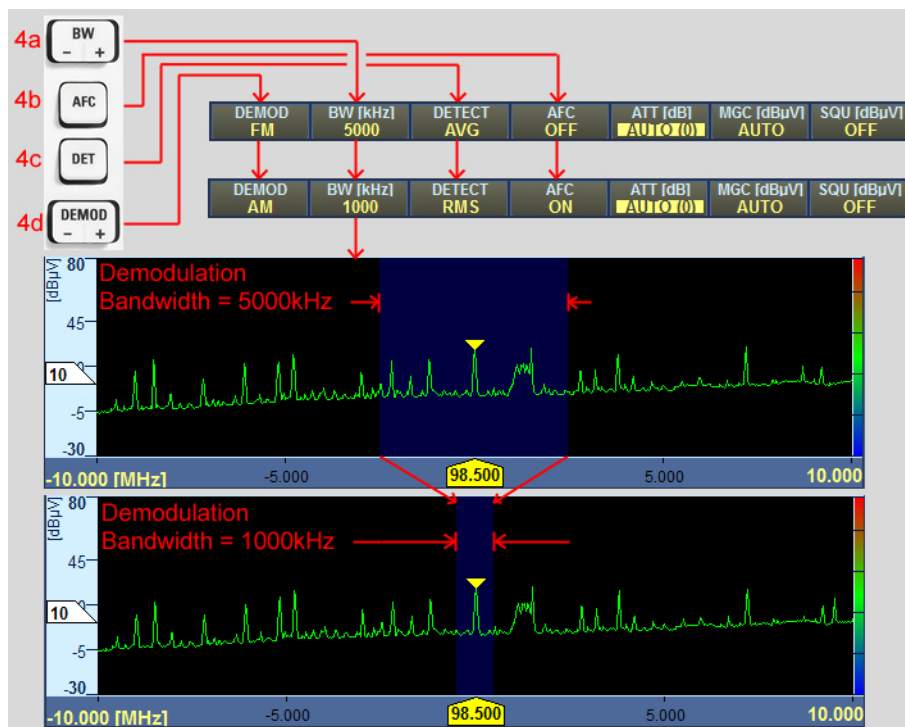
a) The BW +/- key changes the demodulation bandwidth and the dark blue region displays the bandwidth in relation to the IF span.

b) The AFC key toggles automatic frequency control. When a peak is within the demodulation bandwidth (3), AFC helps to track and keep the demodulation frequency tuned to the frequency of the peak. AFC does not function in SSB (USB or LSB) demodulation mode (4d).

c) The DET key changes the level detection mode (Average, Peak, Fast, RMS) of the RF amplitude envelope.

d) The DEMOD +/- key changes the demodulation mode (CW, LSB, USB, ISB, AM, FM, Pulse, PM, IQ). CW, USB and LSB demodulation modes are only available with demodulation bandwidths (4a) of 9 kHz or narrower.

5. The SELECT Rollkey & Control (chapter 2.1, "Front-Panel Tour", on page 13) allows changes to various receiver functions.
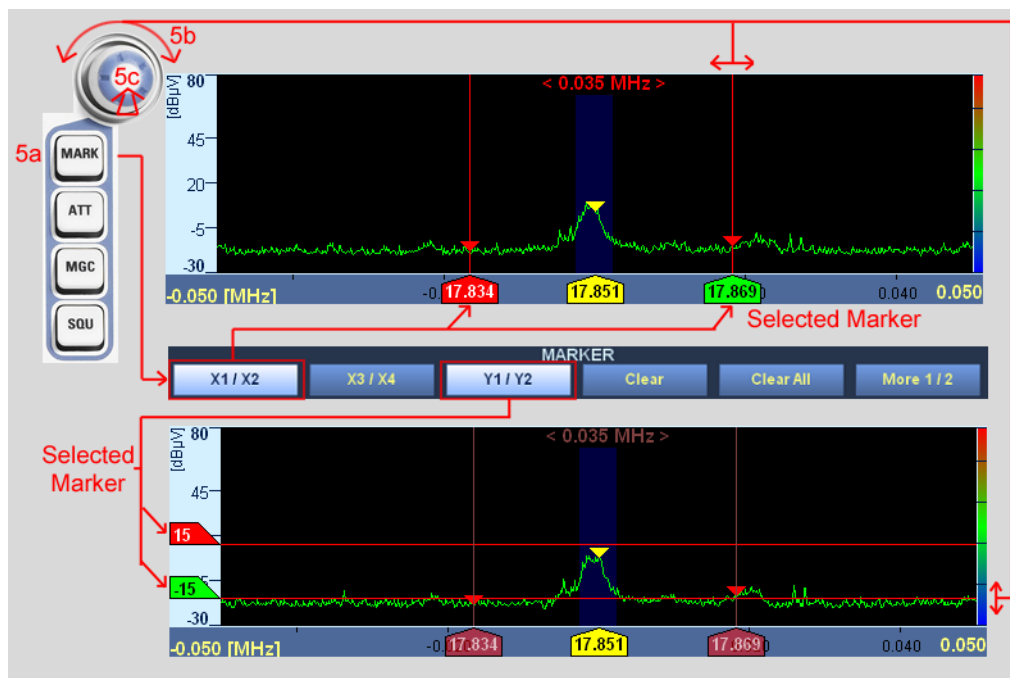
a) The MARK key enables the marker function. The "Marker" softkey bar allows two sets of X markers and one set of Y markers to be set.

b) When the marker set is selected, turning the SELECT rollkey will move the selected marker highlighted in green as illustrated above. The selected marker can be toggled by pressing the "X1 / X2", "X3 / X4" or "Y1 / Y2" softkey.

c) Pressing the SELECT rollkey (5g) toggles the selected set of markers on and off.
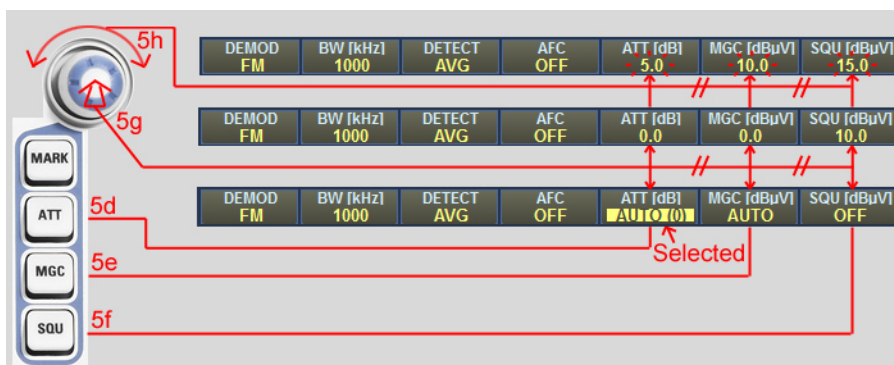
d) The ATT key selects the RF attenuation function. Pressing the SELECT rollkey (5g) toggles between automatic and manual attenuation. When in manual attenuation mode, turning the SELECT rollkey (5h) will allow the manual attenuation level to be set.

   e) The MGC key selects the modulation gain control for amplitude modulated modes. Pressing the SELECT rollkey (5g) toggles between automatic and manual gain control. When in manual gain control mode, turning the SELECT rollkey (5h) allows the manual gain control value to be set.

   f) The SQU key selects the audio squelch control. Pressing the SELECT rollkey (5g) toggles squelch on and off. When squelch is on, turning the SELECT rollkey (5h) sets the squelch level.

The selected field for ATT, MGC and SQU is highlighted in yellow with the text in inverse color as illustrated (ATT set to AUTO).

6. Configuring the display scale for IF panorama.

   a) Select the "More 1 / 4", followed by "More 2 / 4" and "More 3 / 4" softkeys until page 4 / 4 of the menu.

   b) Select the "CONFIG IF PAN" softkey.

c) The IF Panorama dialog box will open. Change some of the settings and observe how the IF Panorama is displayed.
- The first few fields allow to adjust the highest and lowest level to be displayed in the IF panel. Pressing "Adjust Level Range" will perform a autoscaling, optimized for the current spectrum.
- "Hold Max" enables the maximum of the trace to be displayed and held for the specified duration.
- "Show Grid" displays grid lines over the spectrum window.
- "Waterfall Color Set" allows the choice of 4 color palettes for the mapping of the trace level to the color on the waterfall display.
- "Highest / Lowest Level" sets the maximum and minimum of the vertical scale respectively. This changes the scale of the displayed trace and hence also the waterfall color mapping because the color is mapped relative to the window height and not the absolute scale.
- The remaining fields are used to configure the polychrome settings. Please refer to the operating manual to learn more about the polychrome representation of the IF spectrum.

2.3.2.6 Advanced Operation – FSCAN (Frequency Scan)

Frequency scan allows the monitoring of a frequency span greater than the real-time IF spectrum bandwidth.

1. Press the MODE key to open the Mode menu.

2. Select the "SCAN" softkey and select "FSCAN". The panel layout will change so that a RF panorama is included. The softkeys in the Mode Menu will change according to the scan type selected. The mode is also displayed below the current date & time.

3. Press the ESC key to go back to the top menu. Ensure panel focus on the RF Panel. Use the PANEL key to change if required. The softkey menu will be available for the RF Panel and the Frequency Scan function.

4. Use "START", "STOP" and "STEP" or "CENTER", "SPAN" and "STEP" softkeys to define the range and frequency step of the scan. In this example, start and stop frequencies are set to 20 MHz and 200 MHz, respectively, with a step of 100 kHz.

5. The time it takes to acquire a frequency point is determined by the "Dwell Time", "No Signal Time" and "Measurement Time" settings. For details refer to the Operating Manual.

6. The "CONFIG RF PAN" softkey can be used to set the scale as per the "IF Panel Config" softkey in chapter 2.3.2.5, "Basic Operation - Fixed Frequency Mode (FFM)", on page 24.

7. Press the MODE key again to open the Mode Menu.

8. Select the "Run +" softkey to start the frequency scan. The Mode display below the date and time will change from "FScan Stop" to "FScan" to show that FScan is running.

9. The RF spectrum and waterfall display are updated as the frequency sweeps upwards. If "Run -" is selected instead, the frequency will sweep downwards. Some of the parameters in the panel softkey menu (4 / 5) will be grayed out when the scan is running. To stop the scan, press the MODE key and select the "Stop" softkey.

2.3.3   Online Help

All the information from the operating manual can be shown on the display of the R&S EB500 after pressing the HELP key (or F1 for users of an external GUI).

This key is used to open the online help system. The "Help Assistant" dialog supplies context-sensitive help, i.e. information related to the context within which the HELP key is pressed (e.g. if HELP is pressed while scanning, then scan-related help-pages will appear; if HELP is pressed while conducting ITU measurements, then ITU-related help-pages will appear).

The Help Assistant comprises three components:

- The browser (at the right)
- The help navigator (at the left)
- The "look for" field (at the top left)

Navigation in the help system differs from navigation in all other dialogs. Pressing the ENTER key or the main ROLLKEY takes you directly from the activated navigator to the browser. Just like in any other dialog, the focus can be on either one of the components.

Use the PANEL key to move the focus from one component to another component.

ESC will close the dialog.

Browser

The browser (which works like a normal web browser) shows the actual help topics. If the browser is selected but not yet active, it has a normal blue border. To activate the browser, press the ENTER key, the ROLLKEY or click the mouse wheel. An active browser is indicated by a thin blue frame. Use the ROLLKEY to scroll up and down. Use the CURSOR LEFT / CURSOR RIGHT keys to scroll left and right. Step through the page from hyperlink to hyperlink by pressing "Next Link". Pressing ENTER or the ROLLKEY opens the selected link.

Navigator

The Navigator allows you to navigate through the help content. There are three ways in which this navigation can take place: by content, by index and by search, based on a search term. See below for more details.

Look For

The "Look For" field is provided for entering a search term, when navigating in the "Search" mode.

Softkeys

Regardless of which component is selected, you can use the softkeys at the bottom of the display to browse the documentation.

Content	Index	Search	Zoom	Next Link	Back

The left three keys of the softkey bar decide on the type of navigator.

 If "Content" is pressed, the navigator changes to "Content" mode. In this mode, you can browse the table of contents.

 If "Index" is pressed, the navigator changes to "Index" mode. This allows you to browse the documentation by index (index entries are sorted alphabetically, as shown in the figure below).
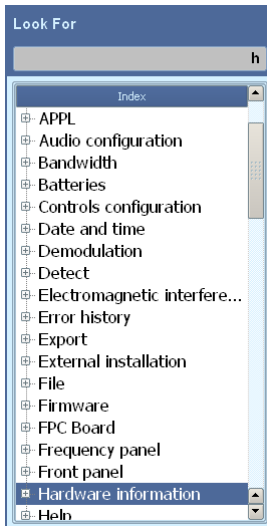
In "Index" mode the "Look For" field can be activated: by entering the first few characters of a index term, as shown above, you can speed-up the search.

 If "Search" is pressed, the navigator changes to "Search" mode. In this mode, the help content can be accessed based on keyword search.

In "Search" mode the "Look For" field must be activated and the keyword should be entered there. Then, by pressing the ENTER key or the ROTARY KNOB, the navigator will list all the pages that have a reference to this keyword.
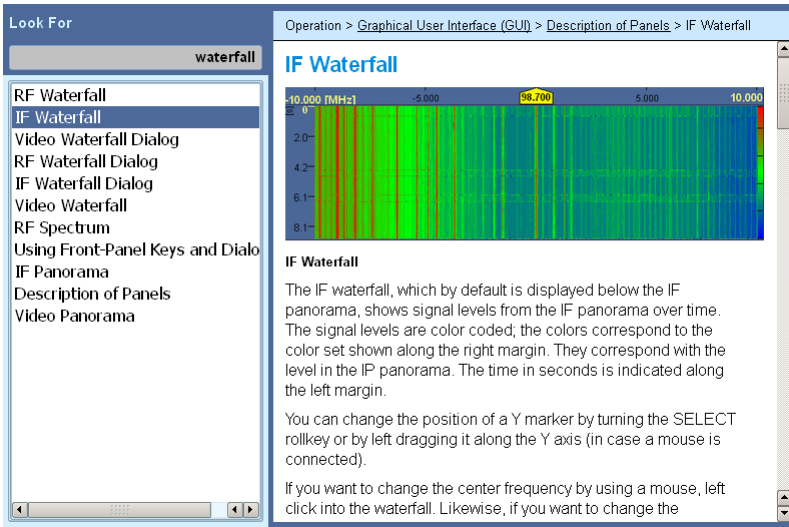
For all three modes, after pressing the ENTER key or the ROTARY KNOB, the browser will show the page that was selected.

 The "Zoom" key provides 5 different zoom levels: by repeatedly pressing the "Zoom" key the browser will display the content from minimum to maximum zoom.
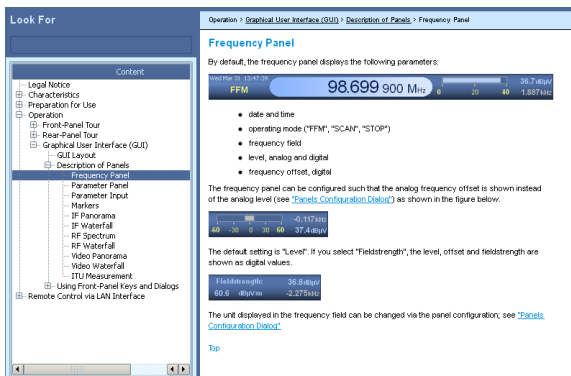
Help Assistant at minimum zoom.   Help Assistant at maximum zoom.
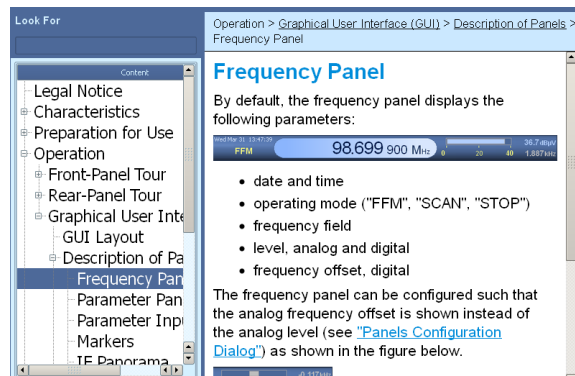
The two keys at the right side of the softkey bar are provided to facilitate the browsing.

 By pressing the "Next Link" key you can step through the browser from one hyperlink to another hyperlink. The focus will immediately switch to the browser once "Next Link" key is pressed. By pressing ENTER or ROTARY KNOB you can browse into the hyperlink just like in a normal web browser.

Back

After browsing through the content by using the "Next Link" you can always go back to any of the previous pages by pressing the "Back" key.

2.4   Options for the R&S EB500

In the R&S EB500, additional features can be enabled by using options and upgrades. Options can be purchased together with the R&S EB500 or at any time after that. Apart from options there are also upgrades. Currently there is only one upgrade available: the DF-upgrade: an existing R&S EB500 can be upgraded to get the same features as a R&S DDF205. A brief description of the available options and upgrades are listed below.

2.4.1   Panorama Scan (R&S EB500-PS)

The R&S EB500-PS "Panorama Scan (PSCAN)" function is used to perform an ultra-quick scan of a user-definable frequency range. It thus provides a quick over-view of the spectrum occupancy. Changes caused by illegal radio services, inter-ferences, transient emissions etc. can immediately be seen at a glance. The R&S EB500 can be switched to "listen" mode simply by pressing a key. The signal of interest can be selected, demodulated and analyzed by using the demodulation frequency.

Refer to the operating manual for a detailed explanation.

2.4.2   ITU Measurement (R&S EB500-IM)

With SW option R&S EB500-IM (ITU-Measurement) installed, the measurement functions "AM modulation index", "FM frequency deviation", "PM phase deviation" and "bandwidth measurement" are available in addition to level and offset mea-surement.

Refer to the operating manual for a detailed explanation.

2.4.3   HF Frequency Range Extension (R&S EB500-HF)

This is a hardware option: it requires a HF preselector board to be installed. With the HF option installed, signals from 9 kHz to 32 MHz can be obtained (which covers the full HF range from 3 MHz to 30 MHz).

Refer to the operating manual for a detailed explanation.

2.4.4   SHF Frequency Range Extension (R&S EB500-FE)

The FE option provides an extended frequency range from 3.6 GHz to 6 GHz.

Refer to the operating manual for a detailed explanation.

2.4.5   Direction Finding (R&S EB500-DF)

In addition to detection, the direction from which the signal originates is also an important criterion in radiomonitoring. When the DF upgrade R&S EB500-DF is added, the R&S EB500 can be used as a single-channel direction finder. The DF upgrade consists of an installation kit for the R&S EB500. The corresponding direction-finding antenna must be selected separately.

Below follows a short explanation showing step-by-step how to achieve the required settings in the configuration when connecting a DF antenna and how to use the direction finder to locate the origin of a signal. Refer to the operating manual for a detailed explanation.

2.4.5.1   Direction Finding Setup and Procedure

In the steps described below, it is presumed that R&S ADD197 and R&S ADD 075 Direction Finding antennas are installed with built-in compass R&S GH150 in a stationary system

DF Antenna and Compass Setup

1. Press the SETUP key.

2. Press "Peripherals" softkey to open the "Peripherals" selectors.

3. Open the Antenna Setup dialog.

4. The dialog shows the DF antenna ADD197. Check "Use Compass" and select the built-in compass GH150. Take note of the compass reading.
    Press "Refresh" if the antenna does not show up in the table.

5. Configure for a fixed system. For this reason use the compass reading to set the North correction. First click "Reset North Correction".

6. After that click "Set North Correction".

7. The compass reading has been transferred to the antenna's North Correction.

8. The fixed system has been configured and the compass will be disabled.

9. Press ESC to close the dialog.

Direction Finding Procedure

Direction Finding operation mode, combined with a direction finding antenna, allows identifying the origin of a signal: the direction from where a signal is transmitted.
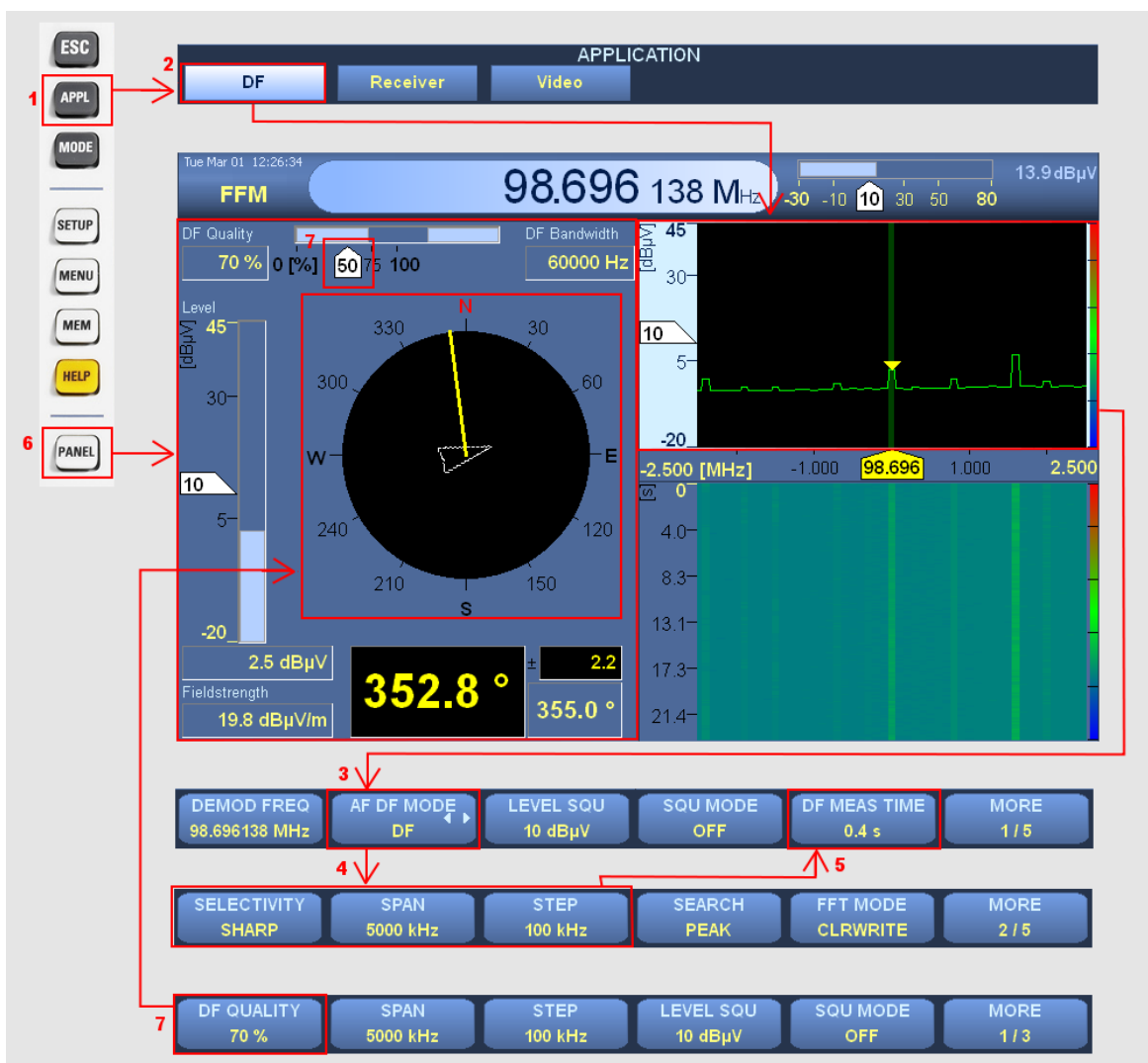
1. Press the APPL key to open the application selection softkeys.

2. Press "DF" to switch the R&S EB500 to DF mode. The panel layout will change to the default direction finding layout with focus on DF IF Panel. Follow the steps as explained in chapter 2.3.2.4, "Settings – Receiver and Antenna", on page 23 to confirm that your DF antenna is installed properly and recognized by the system.

3. Use the main ROTARY KNOB or the numeric keypad to select the frequency for which you want to conduct direction finding as explained in chapter 2.3.2.5, "Basic Operation - Fixed Frequency Mode (FFM)", on page 24. Switch to DF mode.

4. Choose an appropriate combination of "SPAN", "STEP" and "selectivity" in order to optimize the direction finding bandwidth so that it matches the channel spacing of the RF band that is being monitored.

5. Also, choose a sufficiently small DF measurement time so that the measurement can take place within a short time-frame (this is in particular important when the observation is done on a moving vehicle).
   In case the measurement takes place on a stationary system, use the built-in compass to configure North Correction, as explained in "DF Antenna and Compass Setup" on page 38. Alternatively use a standalone compass and manually key-in the North Correction.

6. Use the PANEL key to change the focus to the Polar Panel

7. Set the DF Quality threshold to a value reasonably high so that reliable DF measurement can be achieved for the channel that is being investigated.

8. Now the direction finding will most likely produce reliable bearing results, visible by the stationary position of the yellow bearing arrow in the wind rose. The heading indicator (white-color vane) in the wind rose corresponds with the compass value.

2.4.6   Selective Call (R&S EB500-SL)

The R&S EB500-SL option can be used to decode selective-call methods and to demodulate pagers. The following selective-call methods are supported: CCIR1, CCIR7, CCITT, EEA, EIA, EURO, DCS, DTMF, CTCSS, NATEL, VDEW, ZVEI1, ZVEI2.

Refer to the operating manual for a detailed explanation.

2.4.7   Digital Down Converter (R&S EB500-DDC)

With R&S EB500-DDC the R&S EB500 becomes a multi-channel receiver. In addition to the basic receiver channel, another three receive channels are available. These receive channels are realized with Digital Down Converters (DDCs) within the IF bandwidth. Each DDC can demodulate AM, FM, PM, PULSe or IQ up to a bandwidth of 1 MHz and CW, LSB and USB up to a bandwidth of 9 kHz. An independent audio volume and balance for each DDC as well as for the basic receiver channel enable flexible audio mixing and recording. The DDC frequencies can be set independently or coupled to the basic receiver frequency. The demodulation parameters "Demodulation Mode", "Bandwidth", "Squelch state" and "Squelch threshold" can also be set independently or coupled to the corresponding receiver parameters.

The steps below will guide you through a typical scenario when using Digital Down Converters.

2.4.7.1   Using Digital Down Converters

1. Press the APPL key to open the application selection softkeys.

2. Press "DDC" to switch the R&S EB500 to DDC mode. The panel layout will change to the default DDC layout with focus on DDC Panel.

3. Use the arrow keys to change the focus from one DDC channel to another DDC channel

4. For as long as the DDC Panel has the focus, the MAIN ROLLKEY, BANDWIDTH key, DEMOD key and SQUELCH key will operate on the DDC channel.

5. Use the "Show On" softkey if you want to see the DDC demodulation parameters in the IF Panorama

6. Use the PANEL key to change the focus to the IF Panorama. The DDC bandwidth of the DDC channels are visible by a dark red bar. Note that the DDC channels must be within the span.

7. If you want to couple demodulation mode of a particular DDC channel with the main IF then press the "DEMOD" UNCOUPLED / COUPLED softkey. Take note that not all bandwitdhs and demodulation modes are available for DDC, so the coupling might not work.

8. If you want to couple frequency of a particular DDC channel with the main Frequency then press the "FREQ" UNCOUPLED / COUPLED softkey

9. Use the "Config DDC" softkey to open the DDC configuration dialog. The audio settings of individual DDC channels can be controlled, using the sliders, selectors and check boxes in this config dialog.

2.4.8   Wideband Direction Finding (R&S EB500-WDF)

A prerequisite for the R&S EB500-WDF option is that the DF upgrade must be installed. With the R&S EB500-WDF installed, all the DF-related features are accessible through the WDF application mode.

The Wideband Direction Finding option will give bearing results not only for the center frequency but for all frequencies within the real-time bandwidth. The bearing is shown in an azimuth panel. This is a panel which shows the bearing between 0 and 360 degrees plotted in a gray scale in which older signals appear in darker shade of gray and newer signals in a lighter shade of gray.

WDF Application Mode

All the DF-related features are accessible through the WDF application mode.

Refer to the operating manual for a detailed explanation.

2.4.9   Correction Data (R&S EB500-COR)

Correction data is used to compensate for certain factors which have their origins outside the R&S EB500 and affect the measurement results. The correction data is stored within the flash file system of the R&S EB500.

The R&S EB500-COR can process the correction data for correcting Antenna factors, cable attenuation, azimuth correction and omniphase correction.

Refer to the operating manual for a detailed explanation.

3   Maintenance

3.1   Cleaning

Clean the outside of the R&S EB500 using a soft, lint-free dust cloth.

NOTICE

Damage caused by cleaning agents

Cleaning agents contain substances that may damage the R&S EB500, e.g. solvent-containing cleaning agents may damage the front panel labeling or plastic parts. Never use cleaning agents such as solvents (thinners, acetone, etc), acids, bases, or other substances.

3.2   Storing and Packing

The R&S EB500 can be stored at the temperature range quoted in the specifications (check the "Service" section in the Operating Manual). When it is stored for a longer period of time the R&S EB500 should be protected against dust. The original packing should be used, particularly the protective caps at the front and rear, when the R&S EB500 is to be transported or dispatched. If the original packing is no longer available, use a sturdy cardboard box of suitable size and carefully wrap the R&S EB500 to protect it against mechanical damage.

3.3   Test Points

There are voltage and temperature checks at many test points of the R&S EB500 modules. Some of these test points depend on each other. The error messaging system considers these dependencies and reports only the causal source of errors.

A detailed guideline describing how to read each of the test points can be found in the "Maintenance" section of the Operating Manual.

Test points

The test points are mainly for diagnostic purposes and their interpretation should be left to qualified Rohde & Schwarz service personnel.

4 Software and Firmware Update

4.1 Retrieve Firmware and GUI Versions

The following key sequence allows to retrieve the various firmware revisions of the R&S EB500.
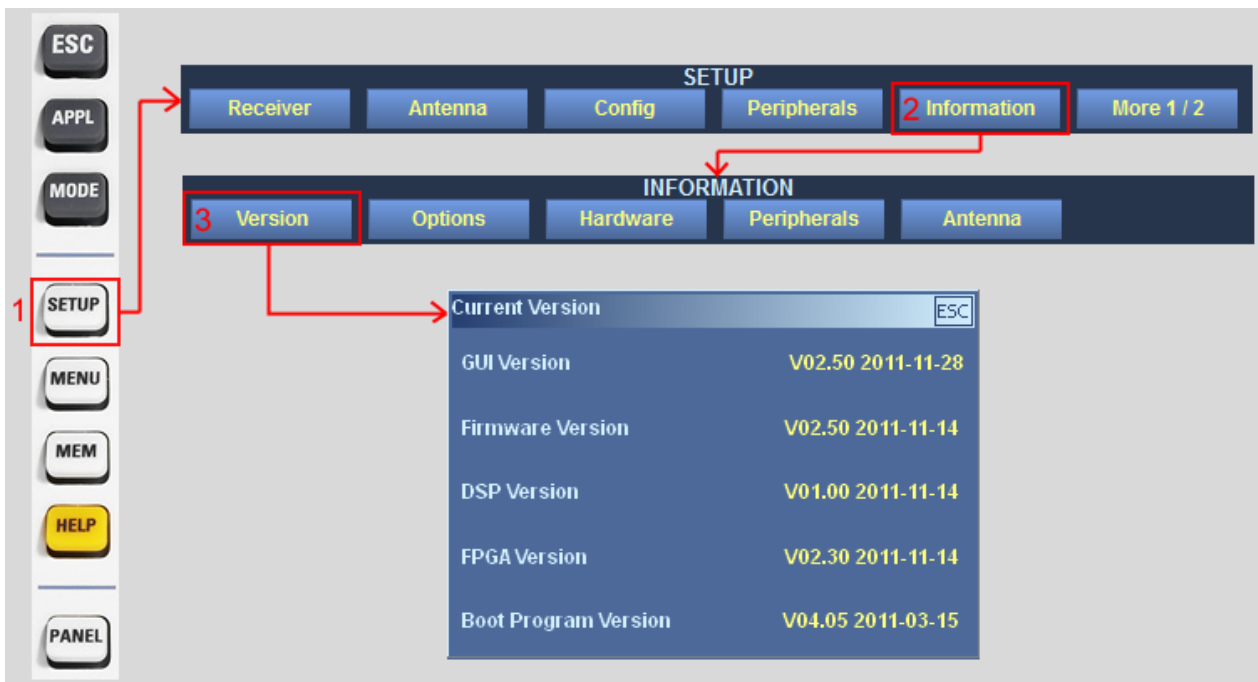
The "Firmware Version" refers to the version of the firmware which runs on the main processor board. It provides the main control functions of the receiver.

The "GUI Version" refers to the GUI software in use:

● If the menu is obtained from the EB500 with front control panel, it refers to the Front Panel GUI.

● If the menu is obtained from Remote Access, it refers to the Remote Access GUI.

The GUI software runs on its own processor on the frontpanel hardware. This processor is different from the one on the main processor board and has its own operating system, which is different from the receiver firmware.

The "DSP Version" and "FPGA Version" are part of the firmware image and cannot be updated separately.

The "Boot Program Version" refers to a stand-alone program whose only purpose is to boot-up the R&S EB500.

For EB500 with front control panel, it is therefore sufficient to update the receiver firmware and GUI software: this will update all the images required for normal operation to the latest versions. The receiver firmware and GUI software will be updated in the same procedure. This keeps the update process simple and prevents any version conflict.

For EB500 without front control panel only the receiver firmware needs to be updated.

CD-ROM and Downloads

The R&S EB500 is shipped together with a "EB500 Software and Documentation CD ROM" which contains the same firmware and GUI versions as in the R&S EB500 at the time of shipment. The latest versions can be downloaded from GLORIS.

The CD-ROM will autostart and launch the opening menu where the various options are available. If the CD-ROM does not autostart or if the files are obtained from the company website, launch the menu by running the `start.htm` in a suitable browser. Recommended is `Internet Explorer 7`.

The next few sections explain the steps needed for updating the receiver firmware and GUI software (for EB500 with front control panel) or only the receiver firmware (for EB500 without front control panel) respectively.

4.2 Receiver Firmware and GUI Update for EB500 with front control panel

The update process for the EB500 with front control panel is a combined procedure which updates the receiver firmware and GUI software in one single process. This process makes it transparent for the user which component is actually being updated and version conflict will be avoided.

4.2.1   Preparations

Required files and accessories

You will need the following files and accessories to perform an update:

- A self-extracting EB500 installation file.

- USB flash drive with at least 256 Mb free space (A new or formatted one is recommended). The MBR (Master Boot Record) of the flash drive will be over-written to make it bootable.

Prepare USB Flash drive

The update process is done from the USB flash drive. The R&S EB500 boots up from the USB flash drive, and the update continues from there.

The following steps are necessary for installing files on the USB flash drive:

- Obtain the R&S EB500 update installation file. This file can be retrieved from either one of the locations mentioned at "CD-ROM and Downloads" on page 48.

- Plug the USB flash drive into a USB port of the PC (or Notebook). Take note of the drive letter assigned to this USB flash drive.

- Execute the installation by clicking on `Receiver Firmware and GUI Installation`. Allow access if there are security warnings. The dialog box shown below will appear. It will ask for the path of the USB flash drive. Check the drive letter before clicking "OK". This must be the drive letter which is assigned to your USB flash drive after plugging it into your Windows host.

SFX image on USB Flash drive

This installer is built as a compressed SFX image. This is a self-extracting image which will install on the storage destination that is given as parameter: here it is the USB flash drive. The image also contains a MBR section so that it can boot-up from the USB flash drive.

Not every USB flash drive can be converted into a bootable drive. If a flash drive still cannot boot-up after following the procedures above then it is advised to change to a different brand USB flash drive.
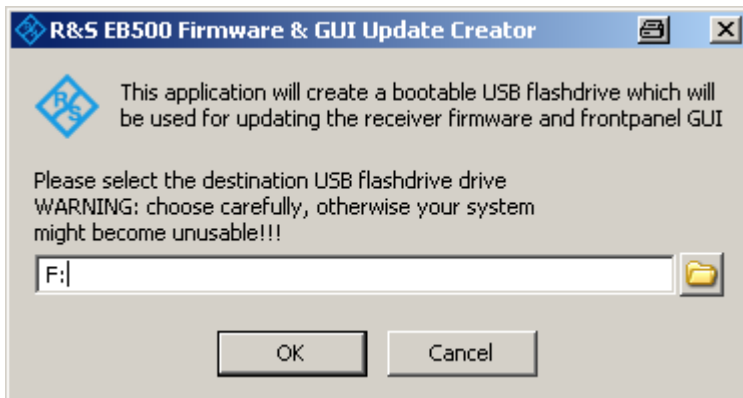
⚠ **CAUTION**

SFX Installer

Be careful to use the correct drive letter that is assigned to the flash drive (e.g. F: or G:). If a wrong drive letter is used (e.g. C:), the boot-loader might get accidentally installed on the host system, which will result in a unusable host.
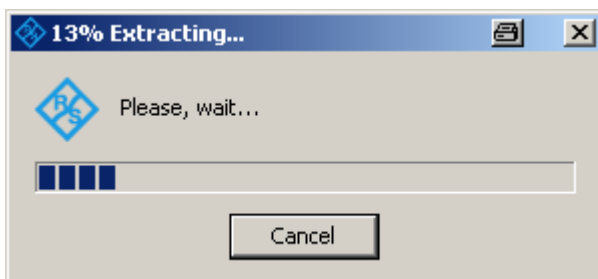
After double-checking the drive letter and clicking "OK", the SFX image will self-extract to the USB flash drive. This process will take less than one minute for a USB 2.0 drive. In case a USB 1.1 flash drive is used it will take much longer.

The last step for the SFX installer is copying the MBR section to the USB flash drive. This is shown in a console window.
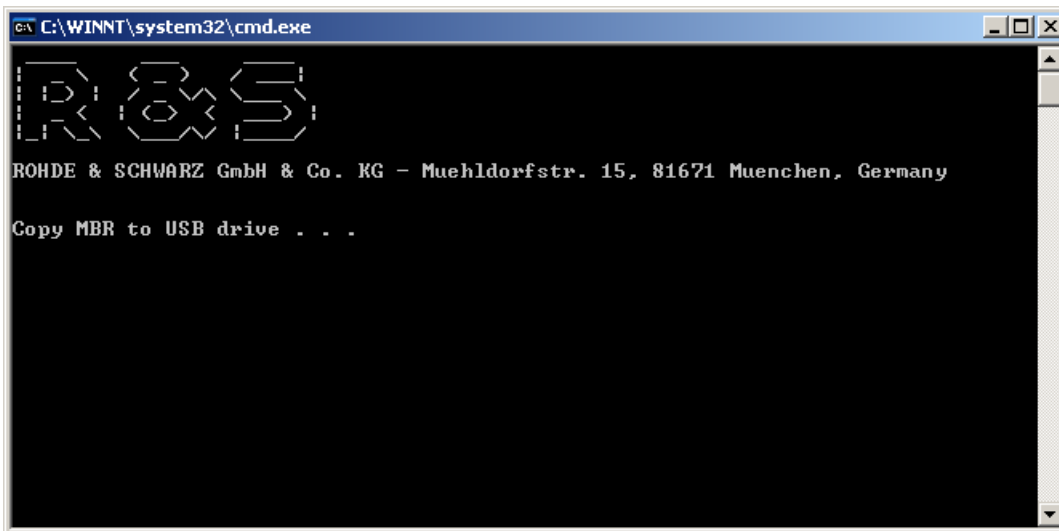
After the console window has closed, the USB flash drive can be removed. It now contains the updated installation file.

4.2.2   Update Procedure

Power off the R&S EB500, plug-in the USB flash drive into the USB port on the R&S EB500 front-panel and restart.

Wait for the R&S logo to appear and press ESC to go into the boot menu. In the boot-up screen that follows, use the arrow keys on the front-panel to move to "Hard Disk" (see screenshot below) and press ENT.
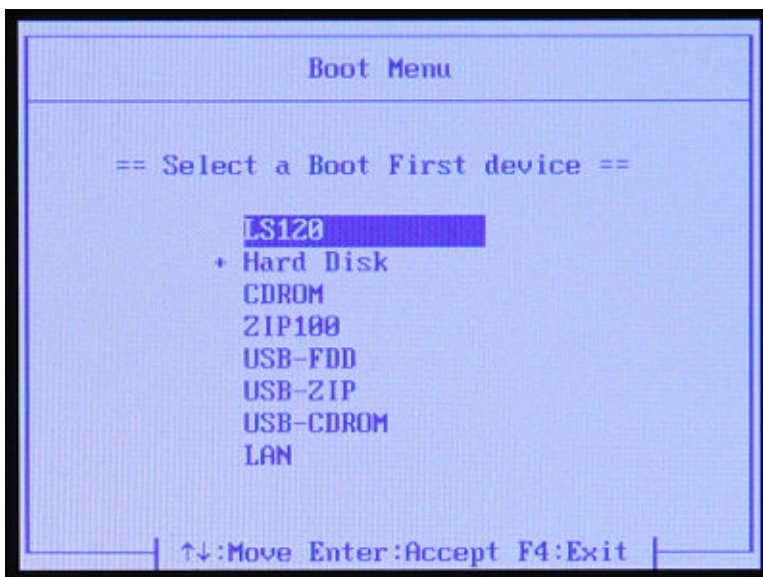
If the USB flash drive can be detected by BIOS, as shown in the screenshot below, select the USB flash drive as the "Boot First" device.

If BIOS does not recognize the USB flash drive, select "Bootable Add-in Cards" and press ENT to enable booting from the USB flash drive.

The first boot device, which starts with "Ch2 S" is the internal drive of the R&S EB500. If this is selected by mistake, the R&S EB500 will start up as normal and the GUI Update procedure should be restarted.
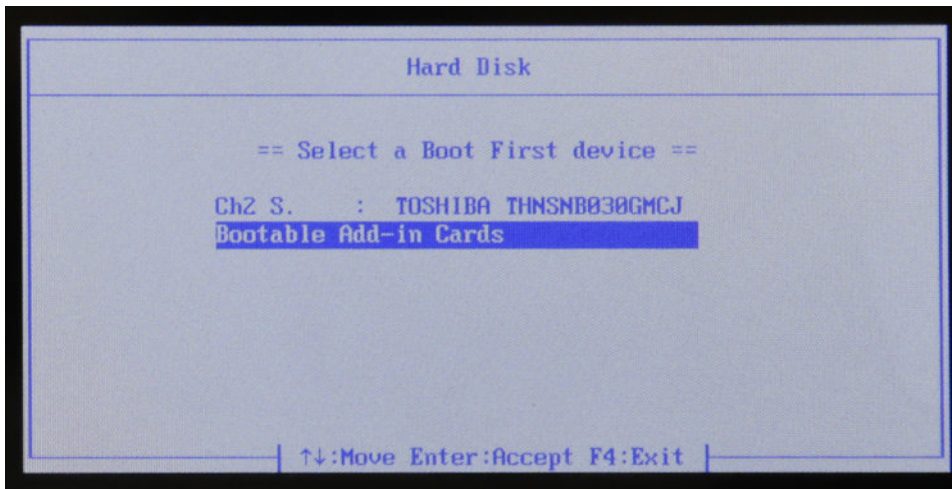
In the next dialog select "Update" using the CURSOR LEFT / CURSOR RIGHT or ROTARY KNOB and the ENT key. See chapter 2.1, "Front-Panel Tour", on page 13.

NOTICE

Erasing the Data Partition

The Update utility also has an option to erase the data partition, according to DoD 5220.22-M standard. This method is irreversible. Refer to the Operating Manual for more details.
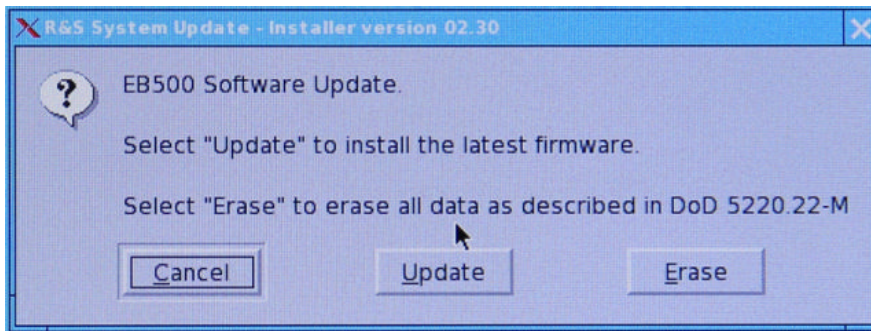

Fig. 4-1: EB500 System Update

> ⚠ **CAUTION**
>
> **Uninterrupted Power**
>
> From this point onwards, ensure that power to the R&S EB500 is not interrupted. Failing to do so might result in a non-functional front panel.

The updater will then check if the FPC2 firmware (for the frontpanel key controller) needs to be updated. FPC2 firmware will only be updated when the version on the USB flash drive is newer than the version currently installed.

> **NOTICE**
>
> **FPC2 Update**
>
> Do not interrupt the updating of the FPC2 firmware (e.g. removing the USB flash drive or resetting the R&S EB500). Keys on the front-panel might become unusable if the updating process were interrupted.
>
> Should the keys on front panel become unusable (not responsive), an external keyboard (and a USB hub) would be needed to redo the FPC2 update.

Finally the actual update of the receiver firmware and the GUI software can start. The update process can cater for more than one image. If the update was installed on a USB flash drive that was previously used for updates, the menu below will show more than one installer image. Use the ROTARY KNOB to select an image and press ENT.

NOTICE

Version of Updater Program

Make sure that the version of the updater program is the same or higher than the version of the firmware image you want to install. The version of the updater program is shown in the dialog title of the first dialog.

If for some reason the version of the R&S EB500 updater program is lower than the firmware you want to install (e.g. because you installed an older version of the firmware), just copy again the update installation file to the USB flash drive, following the steps explained in This will overwrite the original updater program so that both the firmware and the updater program have the same version on the USB flash drive.
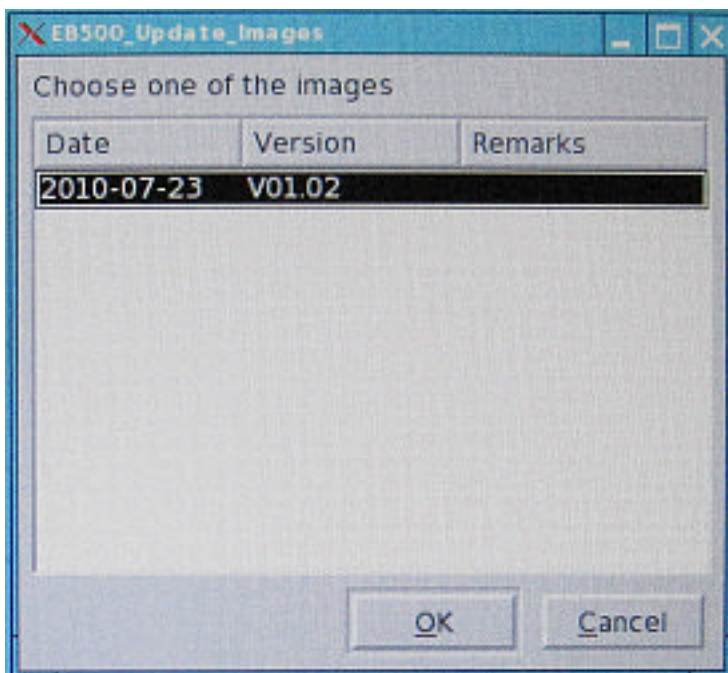

One image will contain an updated version of the receiver firmware as well as the GUI. The receiver firmware will be updated first. The firmware will be copied from USB flash drive to EEPROM on the processor board. The EEPROM needs to be erased first, after which the program code will be downloaded and the checksum calculated.

Flash erase and update

While updating a R&S EB500, portions of the flash memory will be erased. This erase process may take up to two minutes, after which the new firmware will be loaded. This will usually take about one minute. The update progress is visualized by means of notification dialogs and progress bars.

Then, while the receiver resets, the GUI will be updated. The GUI runs on a dedicated processor (IPS1) and has its own operating system. This processor also needs to reboot once the update completed.
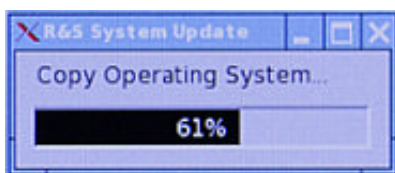
At the end of the process, when the dialog below is shown, press ENT to reboot. Now both the receiver firmware and the GUI are updated with the latest version. This can be verified after reboot by following the steps shown in chapter 4.1, "Retrieve Firmware and GUI Versions", on page 47.
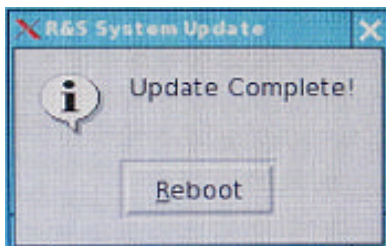
NOTICE

If update procedure fails.

If the update procedure fails, simply switch off the R&S EB500 and restart the update procedure.

Updating the EB500 without front control panel

The EB500 without front control panel cannot be updated with this method. In order to update the receiver firmware of a EB500 without front control panel, you will need the Update32 tool. The method of updating by using the Update32 tool is described in chapter 4.3, "Receiver Firmware Update for EB500 without front control panel", on page 56.

Remote GUI on Notebook / desktop PC

If you want to install the GUI for use on a notebook or desktop PC, you should follow the procedure described in chapter 4.4, "GUI Installation for Remote Access", on page 63.

NOTICE

If the R&S EB500 cannot reboot

Due to the fact that the R&S EB500 also can be updated using the Update32 Tool (see "Updating the EB500 with front control panel" on page 63), there is a chance that the R&S EB500 cannot reboot. Follow the steps described in "If the R&S EB500 cannot reboot" on page 63 to deal with this problem.

4.3   Receiver Firmware Update for EB500 without front control panel

This model requires a different update method which makes use of the LAN interface of the R&S EB500 (X7 on the rear panel). The method uses the "Update32" tool, which runs under Windows NT, Windows 2000 and Windows XP.

Retrieve Update32

The firmware required for the update can be retrieved from either one of the locations mentioned at "CD-ROM and Downloads" on page 48.

Click on `Firmware Update Program` and `File Explorer` will be launched into the directory `Update32XP`. The `Update32` tool can be installed by clicking on `Setup`. If your browser does not launch `File Explorer`, you should launch it manually and navigate to the `Update32XP` directory on the CD-ROM where you can run `Setup`.

NOTICE

Flash erase and update

While updating a R&S EB500, portions of the flash memory will be erased. This erase process may take up to two minutes, after which the new firmware will be loaded. This will usually take about one minute for the R&S EB500. The update progress is visualized by the progress bar of the "Update32" tool.

⚠ WARNING

Interrupted Power to R&S EB500

Switching off the power supply during the update procedure is not recommended but will not harm the R&S EB500 as the "bootprog" is still available for subsequent firmware update of the system.

4.3.1 Preparations

Checking the R&S EB500 firmware version number

Refer to the section chapter 4.1, "Retrieve Firmware and GUI Versions", on page 47 to obtain the current version of the firmware in the R&S EB500, if necessary.

System requirements

For a firmware update you need:

- An IBM-compatible PC running Windows NT, Windows 2000 or Windows XP with LAN interface.
- A standard LAN cable with RJ45 connectors.
- The "Update32" tool for Windows XP requires a WinPcap installation. Installing the latest version of the tool will also install the version of WinPcap that is compatible with the version of the tool (please note the disclaimer and the information in WinPcap's "About" box).

Connecting the R&S EB500

Proceed as follows to connect the R&S EB500:

- Use the LAN cable to connect the Ethernet port of your PC directly to LAN inter-
  face X7 of the R&S EB500 or

- Use the LAN cable to connect the LAN interface X7 of the R&S EB500 to a
  network hub which is in the same LAN network as your PC.


Network adapters

If you have more than one network adapter in your computer, the "Update32"
tool will take the first as the default adapter and try to use it for the update. To
change the network adapter, select "Network Adapter" in the "Config" menu
of the "Update32" tool.

4.3.2   Firmware Update Using Update32 Tool

First steps

- Power off the R&S EB500. It has to be switched on later in the update procedure.

- Make sure the R&S EB500 and the PC running the "Update32" tool are con-
  nected either directly using a LAN cable or through the same network switch/
  hub. It is NOT recommended that the PC and the R&S EB500 be connected
  across different routers when performing firmware update with "Update32"
  because special network packets required by the process may be discarded by
  the router.

- Run the "Update32" tool by clicking on `Firmware Update Program`. Allow
  access if there are security warnings. Below is a screenshot of the Update32
 application.
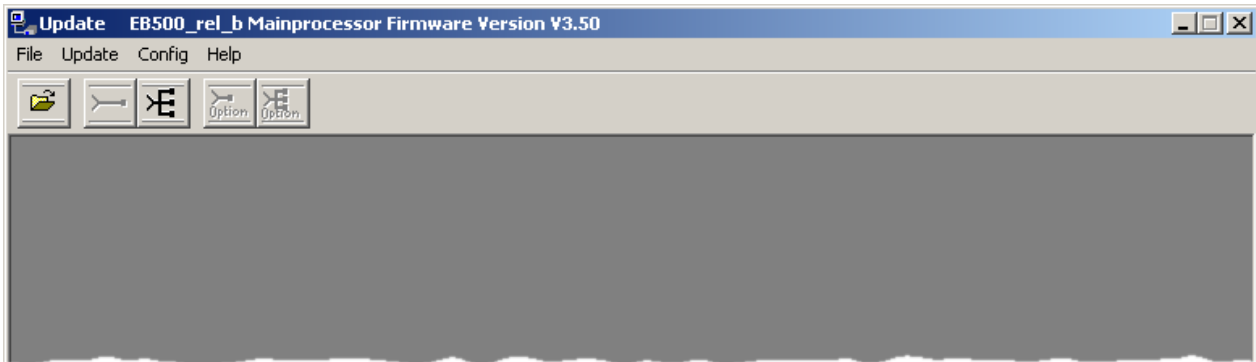
Selecting the configuration file

● To update a R&S EB500, the correct update configuration file has to be selected. Click on the following button to open the corresponding dialog:

● Navigate to the folder that contains the configuration files under the "Look in:" field. Next, select the desired configuration file in the upper portion of the dialog and click the "ACCEPT" button.
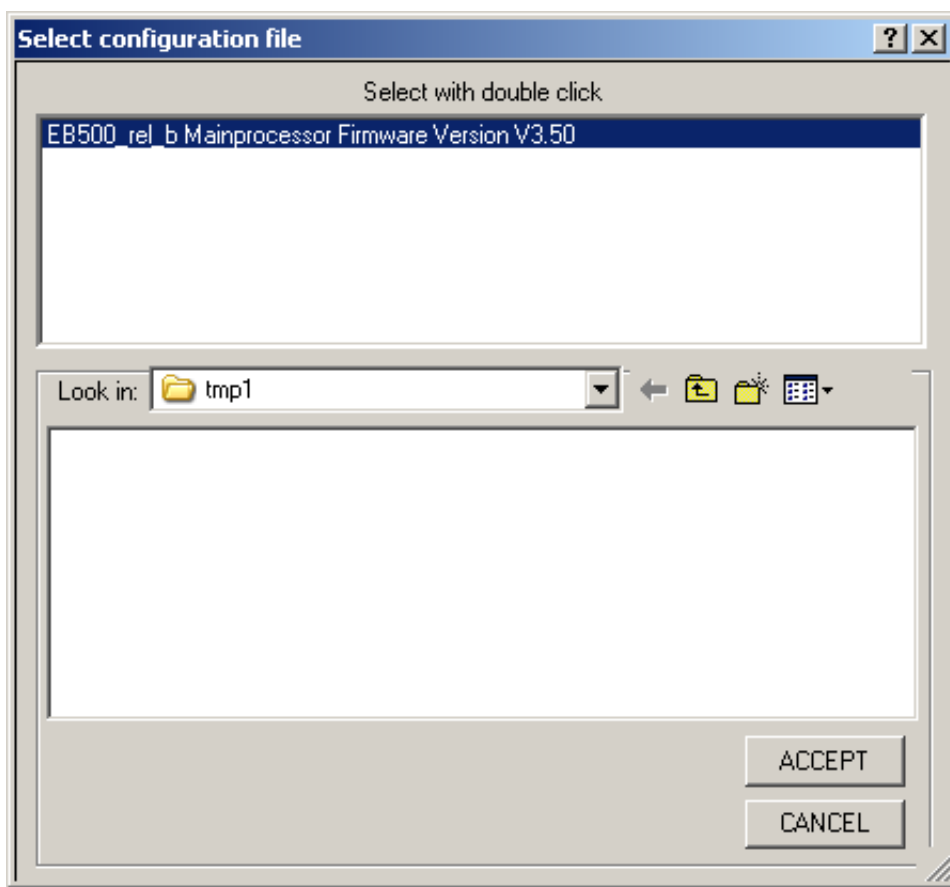
Starting the update

- Click on the "Update" button:

and the following dialog will appear.
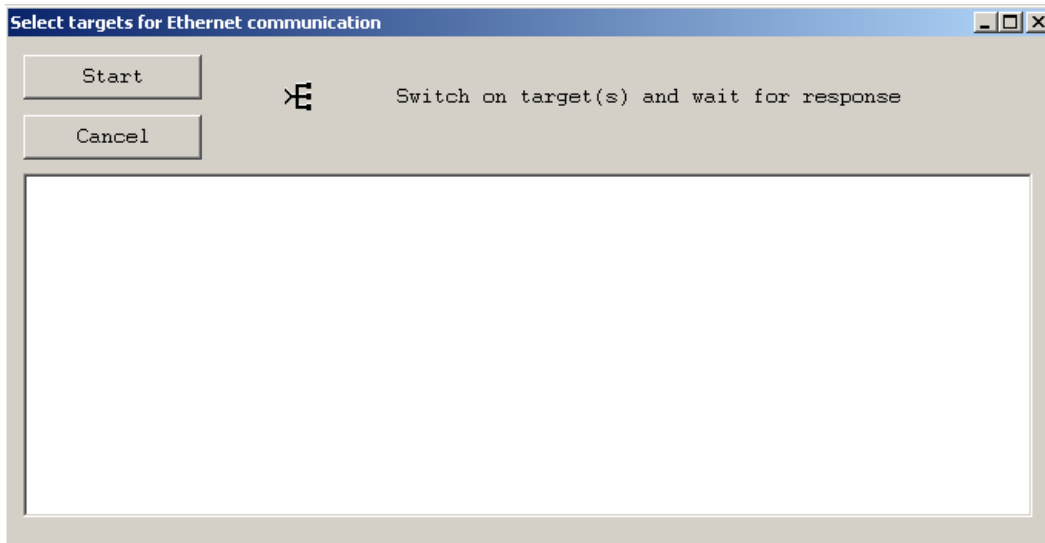
- Switch ON the power to the R&S EB500 ("target") to be updated. After a short period a new entry will be shown in the list of targets as shown in figure below.
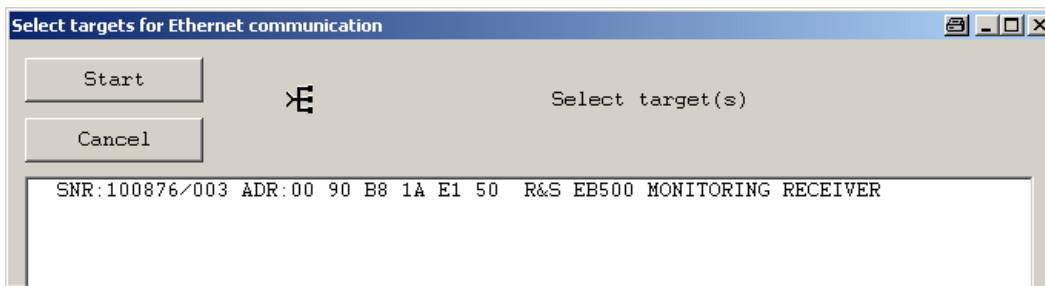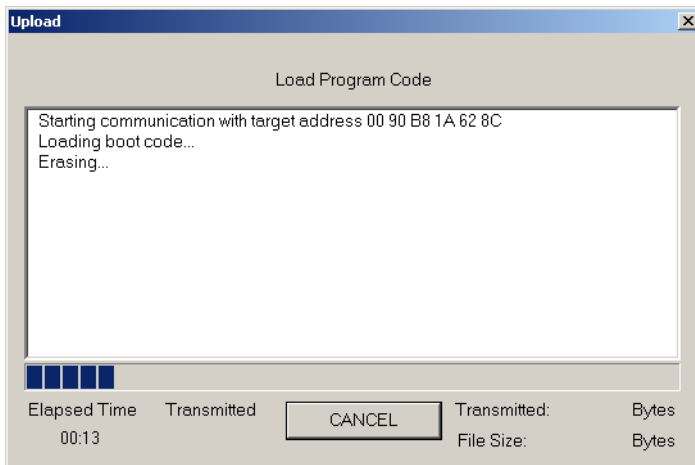

Fig. 4-2: List of targets for Ethernet Communication

- Select the desired target and click the "Start" button.

Updating process

The following dialog appears when the update starts. In the process, the flash is being erased and then the new firmware is loaded into the flash.

Receiver Firmware Update for EB500 without front control panel

Completing the update

After the update is completed, close the dialog by clicking on the "OK" button. The R&S EB500 will restart automatically.
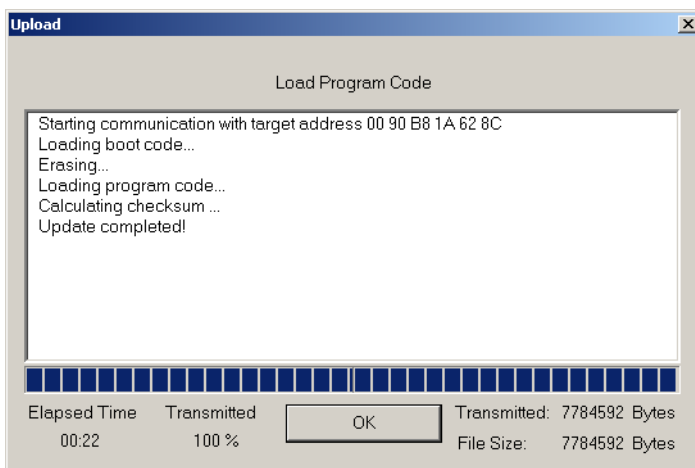
If update procedure fails.

If the update procedure fails, simply switch off the R&S EB500 and restart the update procedure.

> **Updating the EB500 with front control panel**
>
> The EB500 with front control panel can also be updated using the method with the Update32 tool. Please take note that this method cannot update the GUI. This might cause version conflicts between receiver firmware and GUI. For updating the EB500 with front control panel, use the method described in chapter 4.2, "Receiver Firmware and GUI Update for EB500 with front control panel", on page 48.

⚠ WARNING

If the R&S EB500 cannot reboot

Because the Update32 Tool performs its firmware updates over the LAN, there could be a conflict if another user is running the tool in the same network. The R&S EB500 might "hang" after a reboot because the bootloader gets "trapped" by this Update32 on the network. In such cases the best advise is: unplug the network cable during boot-up and find out who else is running Update32 on the corporate network.

4.4   GUI Installation for Remote Access

This section explains how to install the Remote GUI for use on a notebook or desktop PC.

> **Internal installation**
>
> If you want to install the GUI on the R&S EB500, follow the procedure described in chapter 4.2, "Receiver Firmware and GUI Update for EB500 with front control panel", on page 48.

4.4.1   Preparations

Required files and accessories

The Remote Access GUI can be retrieved from either one of the locations mentioned at "CD-ROM and Downloads" on page 48.

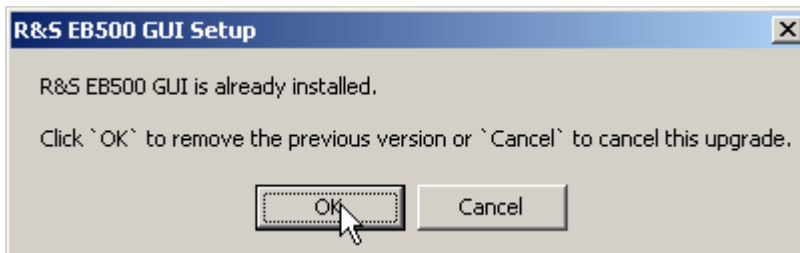> **Retrieving the IP address of a R&S EB500**
>
> It is more convenient to use DHCP with the serial number of the R&S EB500. For example, if the serial number is 100.001-002, the DHCP name will be "rs-eb500-100001-002". If DHCP is unavailable, it is advisable to run the "Update32" tool as explained in: chapter 4.5, "Changing the IP Address", on page 68 and assign a static IP address.

4.4.2   Installation Procedure

Execute the Remote Access GUI installer by clicking on `GUI Installation for Remote Access` on the html menu. Allow access if there are security warnings.

**Uninstalling an earlier version of the GUI**

If an earlier version of the GUI exists, it must be uninstalled before the installation of a new GUI can proceed. A dialog will appear first, which requests to uninstall this earlier version:

R&S EB500 GUI Setup

R&S EB500 GUI is already installed.

Click `OK` to remove the previous version or `Cancel` to cancel this upgrade.

[OK]   [Cancel]

Click OK and wait for the uninstall to proceed.

Once uninstall is completed, the installation can go ahead. The first step is to key-in the IP address and port number of the R&S EB500. You can find it under "Current IP Address" and "Current Port" after opening the "Network Configuration" dialog (SETUP > "Config" > "Network") on the front panel.

If your local network has a DNS server and you know the serial number of the R&S EB500, it can be more convenient to use DHCP with the name under which the R&S EB500 is known: for a R&S EB500 with serial number e.g. 100001-002 the DHCP name will be: "rs-eb500-100001-002".
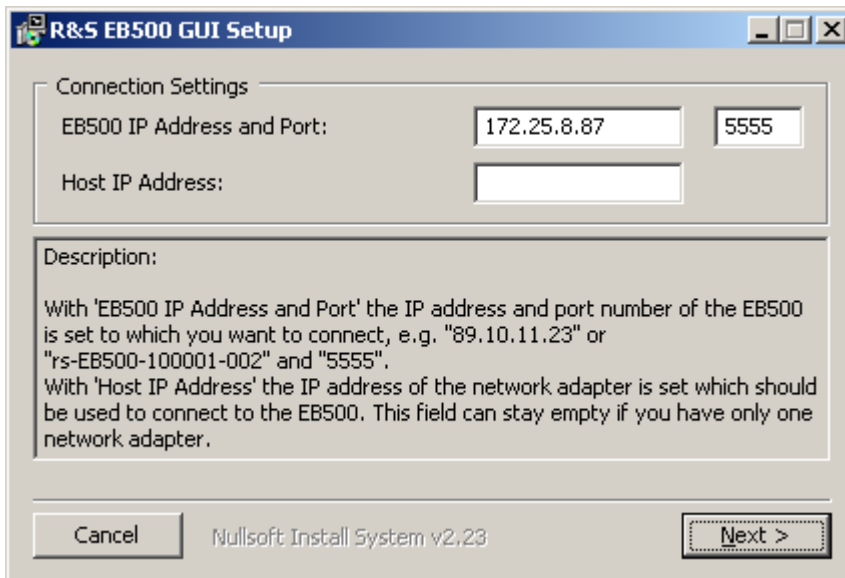
In the next step, choose the display resolution. Note that the resolution refers to the panel resolution. When the emulated front panel buttons are included, the resolution of your PC monitor must be higher than the size stated in the settings below, otherwise the buttons might not fit in the screen. A resolution of 800x600 will fit on most monitors.
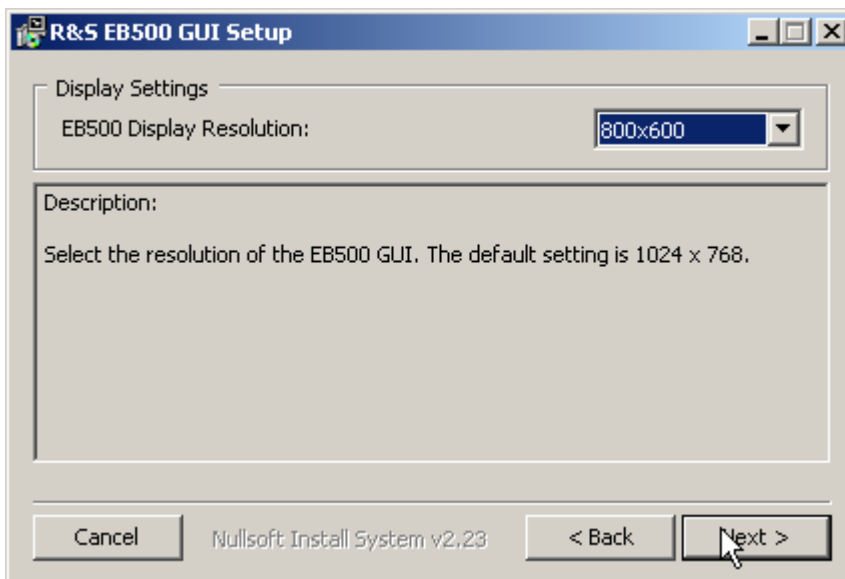
Finally configure the installation folder.
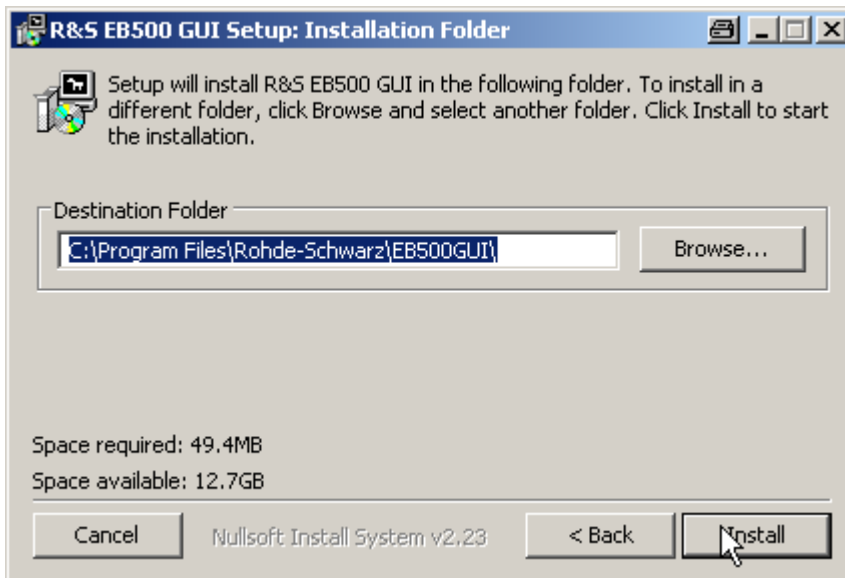
Installation will take a few minutes. Click "Next" when completed.
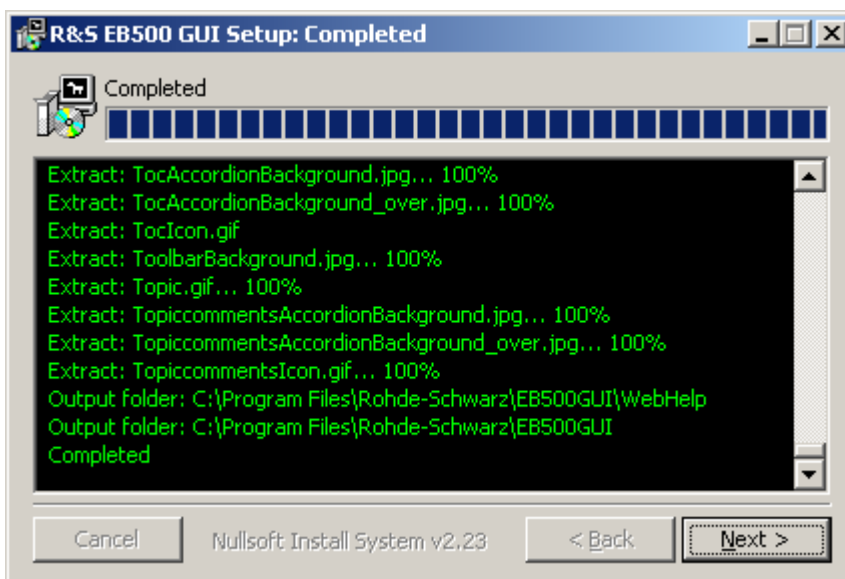
The Remote Access GUI requires an additional "Redistributable" package, distributed by Microsoft for the deployment of certain software built for the Windows operating system. It is included in the installation file as well, so there is no need to download it from the Microsoft website.

Click OK to install the "Redistributable" package. Installation will take a few minutes.
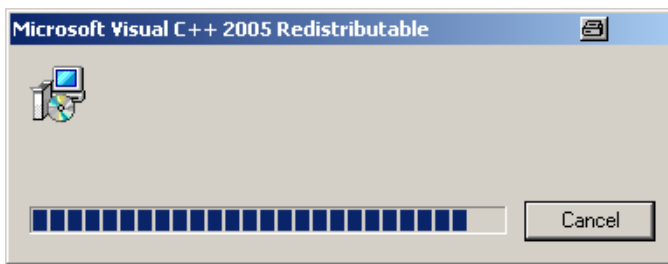
Start the Remote Access GUI via "Start" -> "Programs" -> " R&S EB500 GUI". The following dialog may appear due to the Windows Firewall. Click on "Unblock" to allow the traffic to/from the R&S EB500

As a last step, you may have to change the Windows Firewall settings to enable the network traffic of the R&S EB500 GUI. For this reason, start the GUI via "Start" -> "Programs" -> " R&S EB500 GUI". When the GUI is displayed, the following dialog may also appear.

Click "Unblock" and the Windows Firewall is set to enable the network traffic of the R&S EB500 GUI.
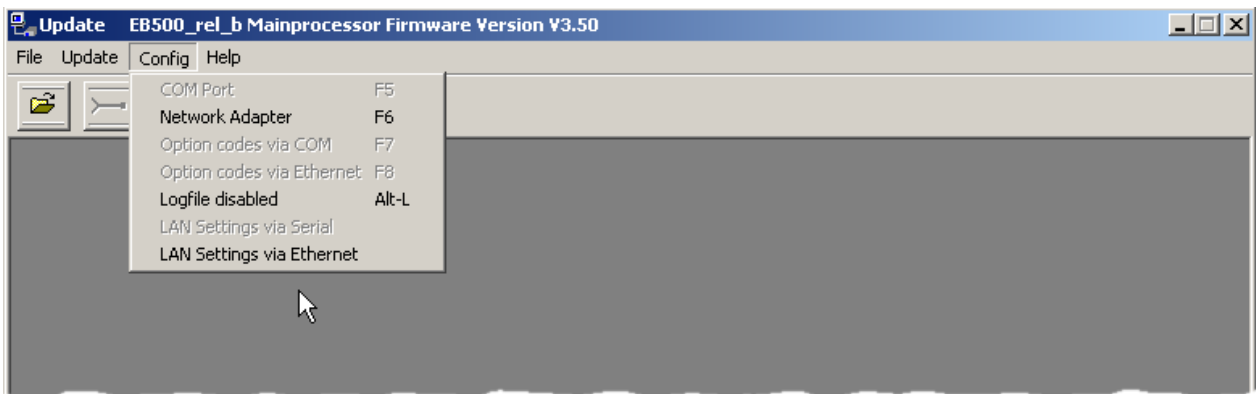
4.5 Changing the IP Address

4.5.1 Using Update32 Tool

The IP address of the R&S EB500 can be changed using the "Update32" tool. By default, the R&S EB500 is shipped with DHCP enabled.

Refer to "Retrieve Update32" under chapter 4.3, "Receiver Firmware Update for EB500 without front control panel", on page 56 to read the steps for retrieving and running the "Update32" tool.

Starting the procedure

Run `Update32` and allow access if there are security warnings. If a configuration is not loaded previously, refer to "Selecting the configuration file" under "Selecting the configuration file" on page 59 to select an appropriate configuration file. Select "Config" -> "LAN Settings via Ethernet" as shown below:


Selecting the target R&S EB500

The R&S EB500, for which you want to update the IP address, needs to be switched on. Make sure there is a LAN connection between the R&S EB500 and the PC. After a short period, a new entry will be shown in the list of targets as shown in figure 4-2. Select the appropriate target and press the "Start" button.

Changing the IP address

Make the desired changes in the LAN settings dialog as shown below. Select "DHCP" if the R&S EB500 is to be connected to a DHCP server.

> **Address conflict**
>
> The IP address should NOT be set to "192.168.255. 252/253/254/255". This IP address is already occupied for internal use.
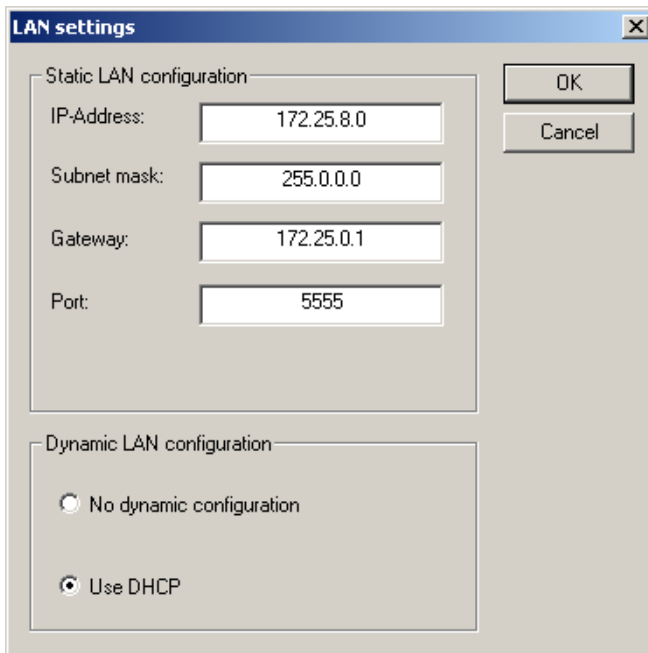
After a successful change of the IP address, a dialog (shown below) with the option to update the program (firmware) code appears.
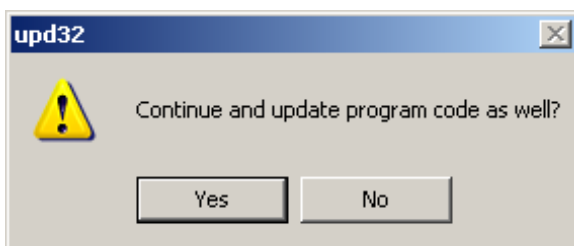
Selecting "No" will reset the R&S EB500, such that the new IP address will take effect.

Selecting "Yes" will continue with the update of program (firmware) code as defined in the configuration file. Refer to chapter 4.3, "Receiver Firmware Update for EB500 without front control panel", on page 56 for details.

4.5.2   Using GUI (EB500 with front control panel or Remote Access GUI)

The IP address of the R&S EB500 is needed during the GUI Installation for Remote Access. This can be obtained from the front panel of the EB500 with front control panel with the key sequence SETUP -> "Config" -> "Network". Refer to the Operating Manual for more details.