CHAPTER 5

OPERATING

CONTENTS

1   Operating Options

The transmitter is controlled by the NETCCU$^®$. The NETCCU$^®$ can be operated in the following manners:

– Locally via the display and menu keys on the front panel of the NETCCU$^®$
– Via a Web browser

If the unit is operated via the Web browser of an attached PC/client computer, two modes are possible:

– Direct operation via a PC
– Remote operation via a distant network client

1.1   Local Operation

Menu keys

Fig. 1 *Menu operation*

Key	Meaning/function
MENU	Access the menu control (activation from system overview): call a context menu (activation from menu)
BACK	Cancel an entered value if not confirmed with **OK**; goes back one step in menu
HOME	Return from menu tree to system overview.
FUNCTION	Call a context menu for current menu entry
OK	Confirm an entry or selection

Key	Meaning/function
STATUS	Display the system logbook (when activated from system overview); display the status screen for a system component (when activated after selecting a system component from the menu)
CURSOR KEYS ⇦ ⇨ ⇧ ⇩	Move through the menu structure and highlight menu elements; select entries

Operating structure

To navigate within the menu system:

1. Press the **MENU** key.

    The menu is called up.
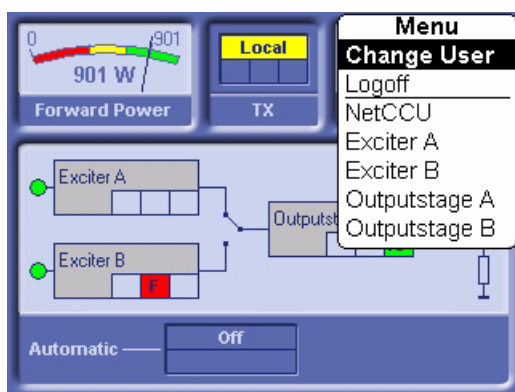
2. Select the menu you want and confirm with **OK**.

    The overview of the selected menu will open (here NETCCU®).
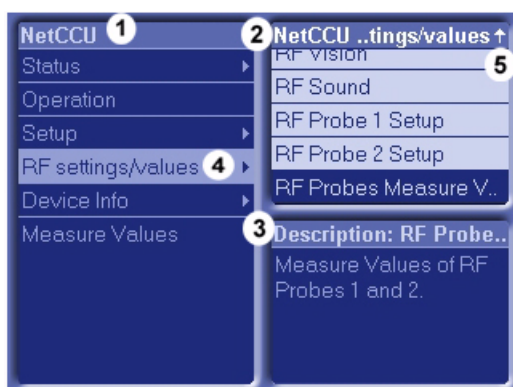
1)   *Window and title bar for main menu*
2)   *Window and title bar for submenus (submenus of the main menu selected in the window at the left)*
3)   *Window and title bar for describing the menu currently selected*
4)   *The menu contains additional submenus (no arrow symbol: a menu window will open)*
5)   *Not all available menus are displayed (use cursor keys to scroll up/down)*

3. Using the cursor keys, select a menu from the left part of the window and confirm with **OK**.

    The left window now shows the next menu level; the right window shows the submenus of the entry selected at the left.

4. Using the cursor keys (up/down), select another menu or menu window from the right side of the window and confirm with **OK**.

    Using the cursor keys (up/down), select an entry from the menu window and confirm with **OK**.
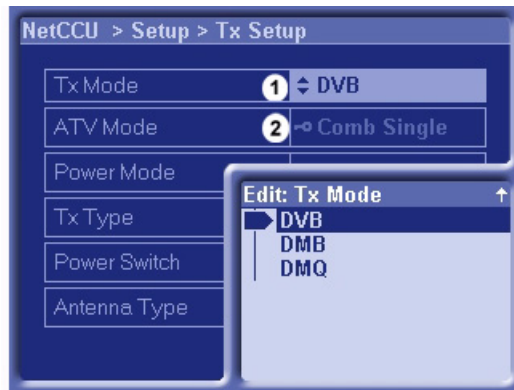
1)   The entry can be edited.
2)   The entry cannot be edited under the current authorization (Login).

5. Using the up/down cursor keys, select an entry **or** Using the left/right cursor keys, select the value to be changed and change it using the up/down cursor keys.

6. Confirm the selection/change with **OK**.

7. Using the **HOME** key, return to the system overview.

By using the **MENU** or **FUNCTION** key, you can call up a context menu at any position.
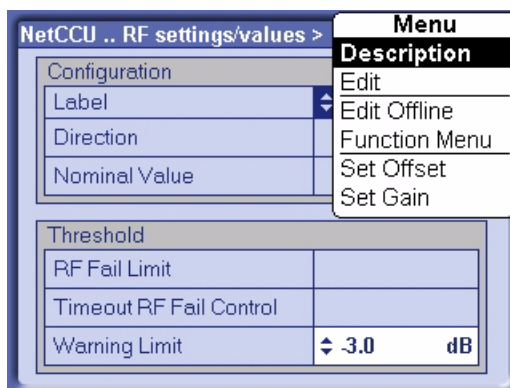
The context menus usually contain default entries or special functions about the selected menu/menu window/menu entry.

Use the **BACK** key to go back one step in the menu structure (even from the Help window): you can also use **BACK** to cancel an entered value as long as you have not already confirmed it with **OK**.

Use the **HOME** key to exit the menu structure and return to the system overview.

1.2 Operation from a PC or via Remote Control

You need a Web browser in order to operate the system from a PC or via remote control.

Note   *Depending on their rights, logged-on users can monitor the transmitter in question or control all of its functions. There is no difference between PC control and remote control with respect to this functionality.*

The NETCCU® comes equipped with the components necessary for PC or remote control operation:

- ❍ Network port (10/100 MBit)
- ❍ Network card (RJ-45)
- ❍ RJ-45 crossover cable

1.2.1 Installation and Configuration

Connecting a PC/client

1. Connect the NETCCU® to a local PC with the aid of an RJ-45 crossover cable attached at the Ethernet socket on the front panel of the unit.
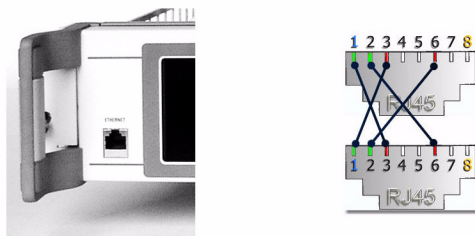
Fig. 2 *Ethernet link using a crossover cable connection*

or

Connect the NETCCU® to your network with the aid of an RJ-45 1:1 cable attached to the **NETLINK** socket (Ethernet NetLink **X5**) on the rear panel of the unit.
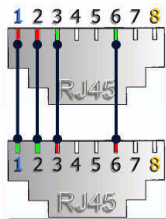
Fig. 3 *Link to a network using an RJ-45 1:1 cable connection*
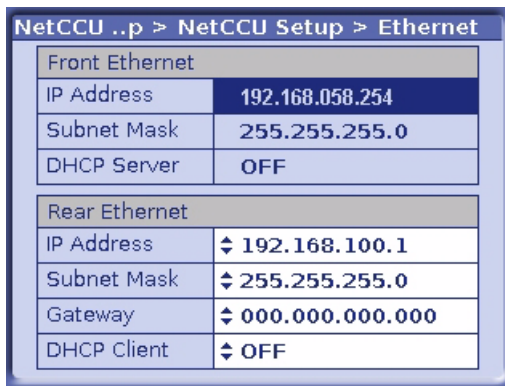
Entering an IP address on the NETCCU

Before you can use your browser to communicate with the NETCCU® via the NETCCU® rear panel, you first have to enter the IP address for the login into the NETCCU® front panel or opt for the IP address to be automatically determined.

The parameters for connecting to the NETCCU® via the front panel are permanent settings and cannot be modified.

Note   *For automatic address assignment, the NETCCU® contains an integrated DHCP client. For automatic integration into a network, the network must contain a DHCP server.*

1. Select the **NetCCU** > **Setup** > **NETCCU Setup** > **Ethernet** menu from the front panel of the NETCCU®.

Fig. 4 *Entering the IP address*

2. From the context menu, select the **Edit Offline** mode.

3. To determine the required IP address data automatically, select the **ON** switch position from the **Rear Ethernet** part of the panel at **DHCP Client**.

   or (for manual entry)

   Select the **OFF** switch position from the **Rear Ethernet** part of the panel at **DHCP Client** and enter the **IP Address**, **Subnet Mask** and **Gateway** parameters in their respective parts of the panel.

4. From the context menu, select the **Submit Changes** entry.

   The changes will be made.

Configuring the browser

Before you can operate the NETCCU® via your browser, the following conditions must be satisfied:

– Setting of cookies must be enabled
– Scripting of Java Applets must be activated
– "Java Platform Standard Edition" must be installed and activated.

The next section uses Microsoft Internet Explorer to explain how you can check whether these conditions have been met or what changes you need to make.

Note   *Please note that the settings described here need not necessarily match your current browser settings one hundred percent.*

ATTENTION!
Please note that the modified settings described here may adversely affect the security of your Internet connections.

All necessary changes and settings can be found in the **Tools > Internet Options** menu on your Internet Explorer.

Checking and adapting the settings for cookies:

1. Select the **Data Protection** tab and click on the **Default** button if available.

2. Set the security level via the slider (right the way down) to **Accept All Cookies**.

Checking and adapting the settings for Java applets:

1. Select the **Security** tab.

2. For the Internet zone select the option **Custom Level**.

3. In the tree structure go to **Scripting > Scripting of Java applets** and select the **Enable** option.

Installing Java (Sun) JRE if necessary; checking and adapting the settings

1. Select the **Advanced** tab.

2. Check whether the entry **Java (Sun) JRE ...** is present and enabled.

3. If necessary download "Java Platform Standard Edition" (including standard installation) from the Sun web site "www.java.com".

4. Then select the Internet Explorer's **Advanced** tab again and check whether the software is installed and enabled.

Starting the program

1. Start the browser on your PC or client.

2. Enter the same IP address as the one you entered on the NETCCU®. The Login screen will appear.

The following authorizations will be available to you:

Authorization	Password
Calibration (authorization to calibrate transmitter components, e.g. exciters)	1234
Configuration (authorization to set basic transmitter parameters, e.g. Setup)	1234
Maintenance (authorization to perform maintenance tasks, e.g. software updates)	1234

Operation (authorization to make settings   1234
that directly affect transmitter operation)

Query (read-only authorization)   1234

3. Log in under the authorization you want and confirm with **OK**.

The appropriate input screen will appear.

1.2.2   Browser-Based Operation

After you log on, the following entry screen will appear.

1) *System Overview: current transmitter status*
2) *Measure Values: Display of the forward and reflected power*
3) *Navigator: display and navigation through the transmitter menus*
4) *System Overview ...: display of the menus selected in the navigator*
5) *Control panel: elements for navigating within the menu system and displaying and editing menu entries*

System Overview

The System Overview window provides an overview of the current status of the transmitter and its components.
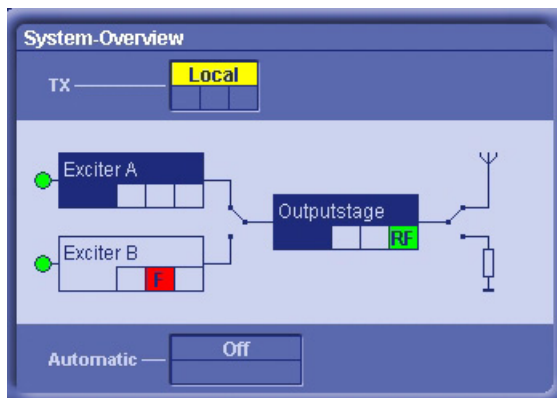
Measure Values

The current forward power and reflected power are displayed in the **Measure Values** window.
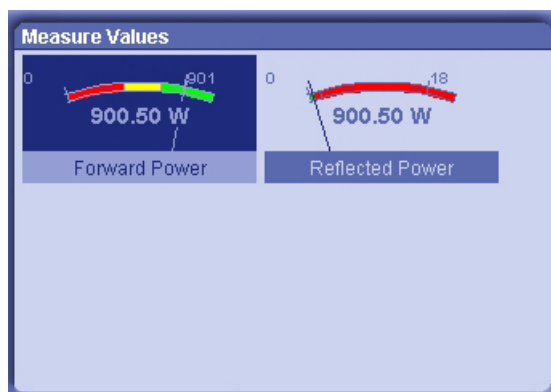
Navigator

The Navigator shows the menus of all system components. You can open the individual folders or menus by double-clicking them with the mouse. The selected menus are displayed in the **System Overview** window (menu window).
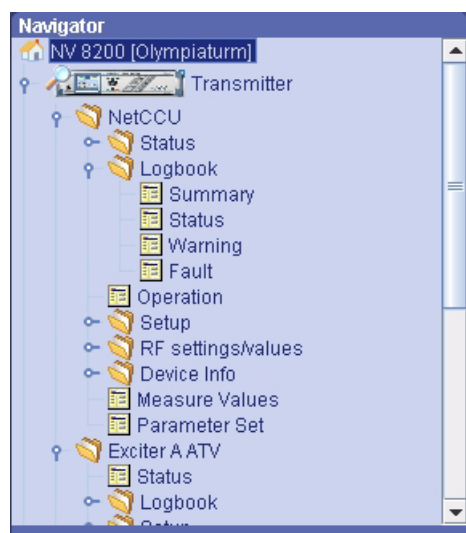
1) Folder
2) Menu

System Overview (menu window)

The **System Overview** window (menu window) displays the menu selected from the **Navigator** window.

1) Double-arrow symbol: Entry can be changed

Control panel

You can use the control panel to navigate within the menu structure and menus and change settings. You can activate the individual control elements with the mouse or keyboard.

1) For switching between menu entries, accessing editable values and entering numeric values; each click of the cursor keys (up/down) increments or decrements a number correspondingly
2) For editing (switch to edit mode) and confirming settings (corresponds to entry key on the keyboard)
3) Corresponds to up and down cursor keys (legend 2)

4) *For quickly switching between menu entries, for quickly accessing editable values, and for quickly entering numeric values*

5) *Primarily for taking one step back in the menu structure; also used to cancel settings that have not yet been confirmed with OK*

6) *Return to home menu*

7) *For displaying context menus for current menu window (standard context menus: Description: help texts; Open: opens menu or menu entry; Edit: for editing entry; Edit Offline: for editing entry without immediately incorporating change; Submit Change: entry edited offline is accepted in system)*

8) *Not enabled in this software version*

2   NETCCU Menus

2.1   Overview of Menus
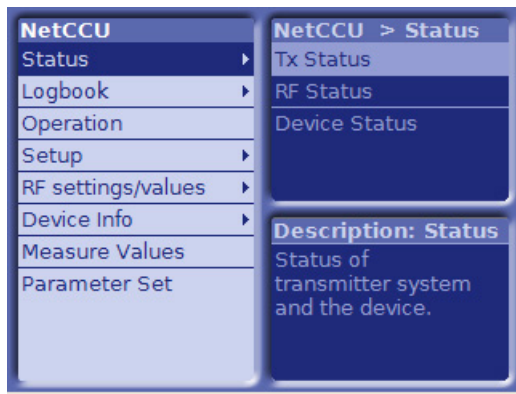
Menu Structure of the NETCCU®		
Level 1	**Level 2**	**Level 3**
Status		
	Tx Status	
	RF Status	
	Device Status	
Logbook		
	Summary	
	Status	
	Warning	
	Fault	
Operation		
Setup		
	TX Setup	
	NetCCU Setup	
		Common
		SW Maintenance
		Ethernet

Menu Structure of the NETCCU®		
		SNMP
RF settings/values		
	RF Vision	
	RF Probe Forward	
	RF Probe Reflected	
	RF Probes Measure Values	
Device Info		
	NetCCU	
	Mainboard	
Measure Values		
Parameter Set		

2.2   Login

Various authorization levels protect against nondeliberate access of critical system settings from the home menu. You can change the authorization level from any menu by using the CHANGE USER context menu.
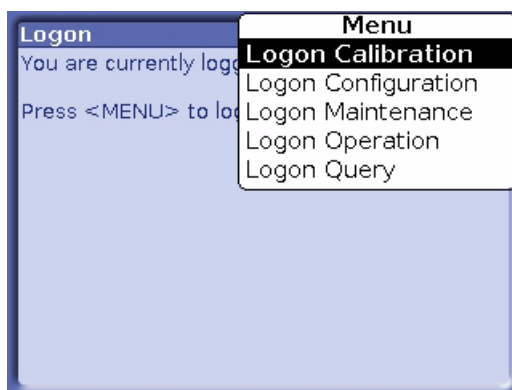
The following levels are available:

Authorization	Description
Calibration	Authorization to calibrate transmitter components, e.g. exciters
Configuration	Authorization to set basic transmitter parameters, e.g. Setup

Authorization	Description
Maintenance	Authorization to perform maintenance tasks, e.g. software updates
Operation	Authorization to make settings that directly affect transmitter operation
Query	Read-only authorization

Note　　　*To use the menus via the Web interface, you must enter the password "1234".*

2.3　Status Menu

The **Status** menu provides an overview of faults, warnings and status messages relating to the individual components and functions of the transmitter.

2.3.1　Tx Status Menu Window

The **TX Status** menu window provides an overview of faults, warnings and status messages about the transmitter's communication and standby status.

The **Logbook** menu window is divided into three parts (reading from top left to bottom right):

– General fault / local mode
– Exciter status messages
– Output stage status messages (rack/amplifier)
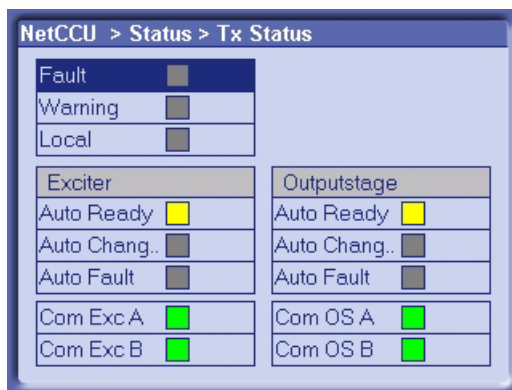
Display	Description
Fault	Red: a fault has occurred in the transmitter system
Warning	Yellow: the transmitter system has issued a warning message
Local	Yellow: the NETCCU has been switched to local operation

Display	Description
Exciter	
Auto Ready	Green: the automatic exciter switchover unit is ready Yellow: the automatic exciter switchover unit is not ready
Auto Chan.	Yellow: switchover to the standby exciter has occurred; Auto Ready display shines yellow
Auto Fault	Red: a fault occurred during switchover to the standby exciter
Comm Ex. A	Red: communications error between NETCCU and exciter A
Comm. Ex. B	Red: communications error between NETCCU and exciter B
Output stage	
Auto Ready	Green: the automatic amplifier switchover unit is ready Yellow: the automatic amplifier switchover unit is not ready
Auto Chan.	Yellow: switchover to the standby amplifier has occurred; Auto Ready display shines yellow
Auto Fault	Red: An error occurred during switchover to the standby amplifier.
Comm. OS. A	Red: Communications error between NETCCU and exciter A
Comm OS. B	Red: Communications error between NETCCU and exciter B

2.3.2   RF Status Menu Window

The **RF Status** menu window provides an overview of the transmitter's RF status.
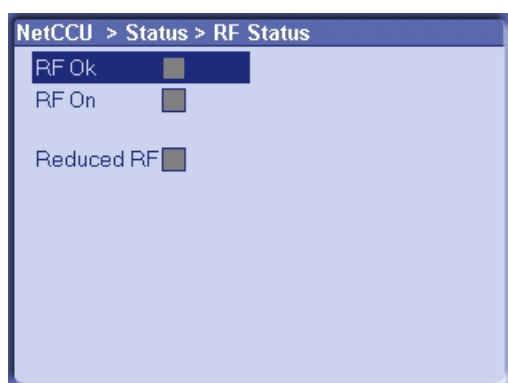
Display	Description
RF OK	Green: antenna output power above the warning threshold that has been set
RF On	Green: Antenna output power above the fault threshold that has been set

Display	Description
Reduced RF	Yellow: transmitter has reduced its output power

2.3.3   Device Status Menu Window

The **Device Status** menu window provides an overview of faults, warnings and status messages about the NETCCU®.
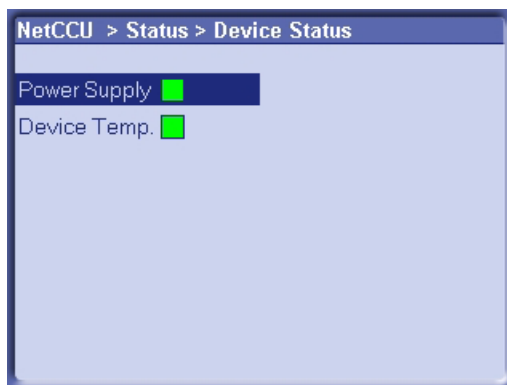
Display	Description
Power Supply	Red: internal power supply of the NETCCU failed; otherwise, green
Device Temp.	Red: temperature inside the NETCCU too high; otherwise, green

2.4   Logbook Menu

You can use the **Logbook** menu to query status and error messages about the NETCCU®. The Logbook menu windows provide an overview of status messages, warning messages and fault messages about the NETCCU®.

Note   *You can call up Logbook entries via the **Summary**, **Status**, **Warning** and **Fault** windows. The structure of the four windows is identical.*

2.4.1 Summary Menu Window

Fig. 5 *Logbook > Summary Window*

The following table explains the meaning of the columns:

Column	Description
No	Consecutive entry number
Message	Message
Time	Time the message was received
Date	Date the message was received

The arrows in the second column have the following meanings:

Arrow direction	Arrow color	Description
Up		The event has just occurred.
Down		The event is no longer current or relevant.
	Red	Fault
	Yellow	Warning
	Green	Status: In order

2.5 Operation Menu Window

You can use the **Operation** window to make settings for standby behavior and for the exciter and amplifier.
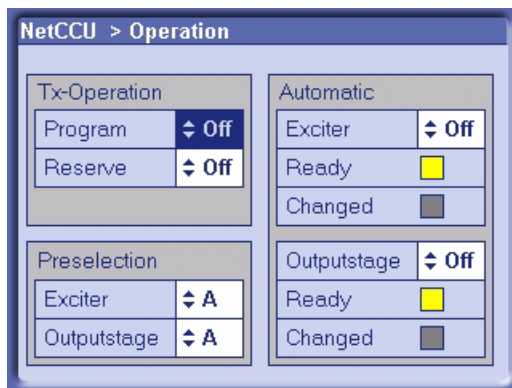
Display	Description
TX operation	
Program On/Off	On/off command for transmitter (exciter and output stage); corresponds to the hard key on the front panel
Standby On/Off	On/off command for standby transmitter (all components that are not on an antenna)
Preselection	
Exciter A/B	Selection of the active exciter
Amplifier A/B	Selection of the active amplifier
Automatic	
Exciter On/Off	Switches the automatic exciter switchover unit to active or not active
Ready	Status of the automatic exciter switchover unit: Green: Automatic switchover unit ready for operation Yellow: Automatic switchover unit ready for operation
Changed	Yellow: switchover to the standby exciter has occurred; Ready display shines yellow
Output stage on/off (only if passive output stage standby = passive PA)	Switches the automatic amplifier switchover unit to active or not active
Ready	Status of the automatic amplifier switchover unit: Green: Automatic switchover unit ready for operation Yellow: Automatic switchover unit not ready for operation
Changed	Yellow: switchover to the standby amplifier has occurred; Ready display shines yellow

2.6   Setup Menu

You can use the **Setup** menu to configure the transmitter system's hardware.

2.6.1   Tx Setup Menu Window

You can use the **TX Setup** menu window to define standby behavior and to make additional system-specific settings.

Setting item	Description
TX Mode	Selection of the transmitter standard – FM: analog sound broadcasting standard – ATV: analoger TV standard – DVB: digital TV standard
ATV Mode	Selected only when setting ATV under TX Mode – Comb Single: picture signal and sound signal are transmitted via one amplifier (same channel) (single = 1 sound carrier) – Comb Dual: picture signal and sound signal are transmitted via one amplifier (same channel) (dual = 2 sound carriers)
Power Mode	Setting for medium-power transmitters – Medium
TX Type	For setting the standby behaviour: – Single TX: standby system (see below) – Dual Drive: standby system (see below)
Power Switch	Setting of the hardware configuration for antenna switchover. The following options are available: – "Manual" for switching over the antenna manually – "Automatic" for switching over the antenna electronically
Antenna Type	Country-specific setting for the antenna type; the default setting is Full

Basic setting of the transmitter standby systems

Transmitter standby system	Setting: TX Type	Setting: Power Switch
Single transmitter system	Single TX	Manual
2 exciters / 1 amplifier stage	Dual Drive	Manual

2.7 NetCCU Setup Menu

You can make basic system settings in the **NetCCU Setup** menu.

2.7.1 Common Menu Window

You make make general settings for the system in the **Common** menu window.
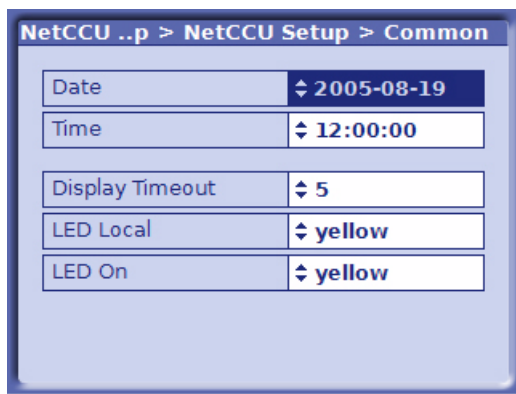
Selection	Description
Date	Date
Time	Local time
Display Timeout	Time in minutes after which the display switches off (standby)
LED Local	Color of the Local LED on the front panel of the NETCCU (yellow, green)
LED On	Color of the On LED on the front panel of the NETCCU (yellow, green)

2.7.2　SW Maintenance Menu Window

You can use the **SW Maintenance** menu window to carry out software updates for the NETCCU® and the connected exciter.

To perform a software update, you must connect the NETCCU® with a PC that contains the required updates and update software.

Before you call the update software on the PC, the NETCCU® must be set to update mode via the **Start NetCCU Update** context menu. After you call the update software on the PC, the software automatically analyzes which updates must be installed. The update procedure is started from the PC by means of the update software.

Updates for the NETCCU® are installed straight away. In a further step, updates for the exciter(s) must be started from the NETCCU® via the **Start Exciter A/B Update** context menu.

Note　　*The whole update procedure is described in detail in the Maintenance section of the NET-CCU® manual.*
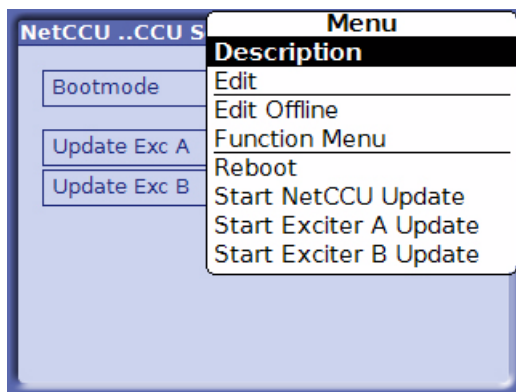
Selection/display	Description
Boot mode	Setting of the boot mode – warm: for booting after a reconfiguration, for example; the NETCCU boots using the parameters currently set
Update Exc A	Display showing the progress of the software update installation
Update Exc B	Display showing the progress of the software update installation
Start NetCCU Update (context menu)	The available software updates for the NETCCU are installed.
Start Exciter A Update (context menu)	The available software updates for Exciter A are installed.
Start Exciter B Update (context menu)	The available software updates for Exciter B are installed.

2.7.3   Ethernet Menu Window

You can use the **Ethernet** menu window to make the settings necessary for connecting the NETCCU® in the following ways:

–   to a PC or laptop via the Ethernet interface on the front panel (cross cable),
–   to a LAN/WAN via the Ethernet interface on the rear panel.

The parameters for the front panel connectors are permanent settings; you can modify the parameters for the rear connectors manually to suit your requirements or let them be determined automatically. The NETCCU® contains a DHCP client for automatically determining the parameters.

Note   *To automatically determine the network data required for the rear-panel connection, a DHCP server is must be present in the network.*
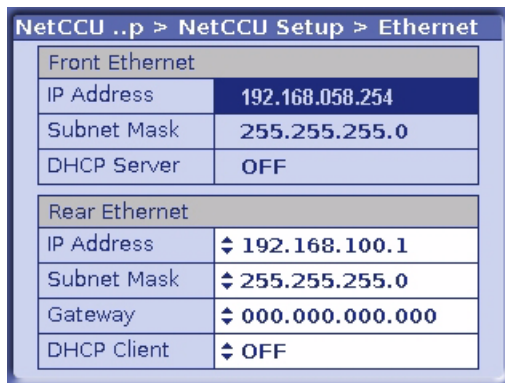
Selection	Description
Front Ethernet	
IP Address	The IP address (192.168.58.254) of the NETCCU is factory-set and cannot be changed. To make an external connection to a PC/Laptop the appropriate address must be entered: The first three segments (of the above IP address) stay the same, but a value < 250 must be entered for the last block of numbers.
Subnet mask	The setting for the NETCCU subnet mask is factory-set and cannot be changed. For an external connection, this same setting must also be entered on a PC or laptop.
DHCP Server	This function is not implemented in this version.
Rear Ethernet	Manual settings should only be entered in Offline mode (context menu: Edit Offline) and should then be activated by means of Submit Changes (context menu).
IP Address	Entry of a valid IP address. The IP address 192.168.058.254 is not to be used.
Subnet mask	The setting for the NETCCU subnet mask is factory-set, but can be changed if necessary. For an external connection, this setting must be defined in the network.

Selection	Description
Gateway	Entry of a gateway address (assigned by the network administrator).
DHCP Client	ON: The IP address is automatically retrieved from the net. OFF: The IP address has to be entered manually (see above).

2.7.4   SNMP Menu Window

You can use the SNMP menu window to configure the SNMP connection.
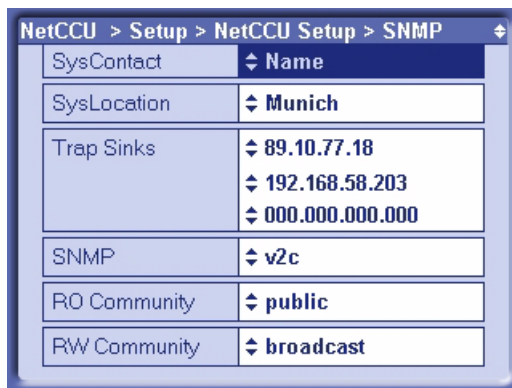
Display	Description
SysContact	Name (e.g. the last name of a contact person)
SysLocation	Location of the transmitter equipment that will be addressed via NetLink (e.g. a town or city)
Trap Sinks	The IP address (e.g. 89.10.63.43) to which traps will be sent if a fault occurs on the transmitter
SNMP version	The SNMP version in use (e.g. SNMP1)
Read Only Community	Public (default setting); term and values can be replaced
Read Write Community	Broadcast (default setting); term and values can be replaced

2.8   RF settings/values Menu

You can use the **RF settings/values** menu to enter and read results for the transmitter system, the standby system and the output power.

2.8.1 RF Vision Menu Window

You can use the **RF Vision** menu window to enter the nominal value for the picture forward power.
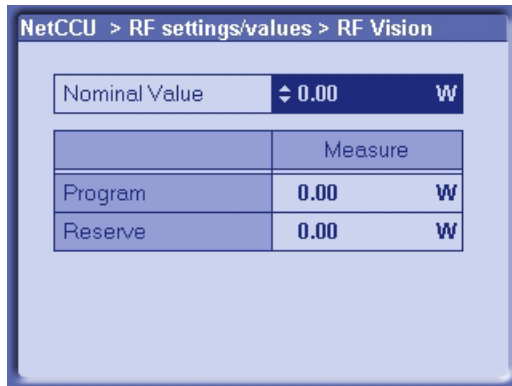
Entry/display	Description
Nominal Value	Entry of the nominal value for picture forward power
(Measure) Program	Current output power at the antenna test point of the active transmitter system (output stage)
(Measure) Reserve	Current output power at the antenna test point of the standby transmitter system (output stage)

2.8.2 RF Probe Forward Menu Window

You can use the **RF Probe Forward** menu window to define the nominal values for the output power and to define the lowest level of deviation at which error messages are to be output. Two test points are available for measuring the RF power (RF Probe Forward and RF Probe Reflection). Each test point has two RF rectifiers so that you can measure both the forward and reflection power. In principle the forward power is measured with the aid of the first test point (RF Probe Forward).

The left window of the NETCCU® status screen shows the forward power and the right window shows the reflection power, in accordance with the values entered here.

Note   *You can calibrate the measuring system and the zero point via the context menu.*

Entry/display	Description
Configuration	Defining and setting a nominal value for forward power
Label	User-defined name for the "RF Probe" test point
Direction	Display of signal direction (forward power)
Nominal Value	Entry of the nominal value, determined if necessary my external measurement of the forward power
Threshold	Setting upper and lower thresholds for forward power; warnings and error messages are issued if these thresholds are crossed.
RF Fail Limit	Selection of a dB value at which a fault message will be output if power drops below it
Timeout RF Fail Control	Selection of the duration of the violation of the lower threshold of the forward power specified under RF Fail Limit at which an error message will be output. For example, if a value of 3 dB has been entered under FR Fail Limit and the actual value falls below that level for 8 seconds (example setting for Timeout for RF Fail Control), an error message will be output
Warning Limit	Selection of a dB value for forward power at which a warning message will be output if power drops below it
Set Gain (Context Menu)	Calibration of the internal measuring system. The internal result for the entered (measured) nominal value can be stored by selecting Set Gain.
Set Offset (Context Menu)	Calibration of the zero point at which the externally measured power is displayed. The zero point is calibrated by selecting Set Offset.

2.8.3   RF Probe Reflected Menu Window

You can use the **RF Probe Reflected** menu window to define the nominal values for the output power and to define the lowest level of deviation at which error messages are to be output. Two test points are available for measuring the RF power (RF Probe Forward and

RF Probe Reflection). Each test point has two RF rectifiers so that you can measure both the forward and reflection power. In principle the reflected power is measured with the aid of the second test point (RF Probe Reflection).

The left window of the NETCCU® status screen shows the forward power and the right window shows the reflection power, in accordance with the values entered here.
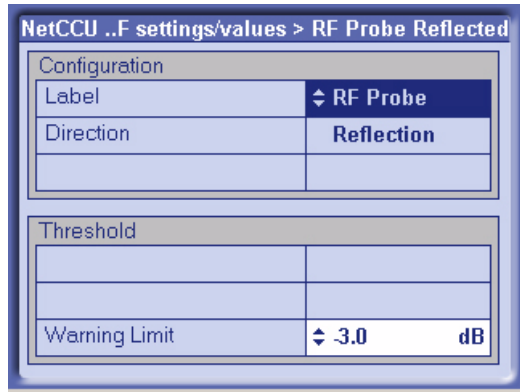
Note　*You can calibrate the measuring system and the zero point via the context menu.*

Entry/display	Description
Configuration	Defining and setting a nominal value for reflected power.
Label	User-defined name for the "RF Probe" test point
Direction	Display of signal direction (reflected power)
Threshold	Setting of upper and lower thresholds for forward/reflection power at which warning and error messages are output if they are crossed.
Warning Limit	Selection of a dB value at which a warning message will be output if power drops below it
Set Gain (Context Menu)	Calibration of the internal measuring system. The internal result for the entered (measured) nominal value can be stored by selecting Set Gain.
Set Offset (Context Menu)	Calibration of the zero point at which the externally measured power is displayed. The zero point is calibrated by selecting Set Offset.

2.8.4　RF Probes Measure Values Menu Window

The **RF Probes Measure Values** menu window displays the values set in the RF Probe Forward/Reflection menu window.
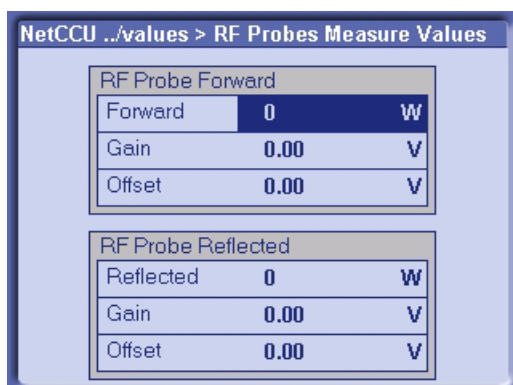
Display	Description
RF Probe Forward	Values for antenna test point 1 (forward power)
Forward	Measured forward power (output power at the antenna)
Gain	Internal result corresponding to the measured output power
Offset	Internal value starting at which the externally measured forward power is displayed.
RF Probe Reflected	Values for antenna test point 2 (reflection power)
Reflected	Measured reflection power
Gain	Internal result corresponding to the measured reflection power
Offset	Internal value starting at which the externally measured reflection power is displayed.

2.9 Device Info Menu

You can use the **Device Info** menu to display detailed product information about any hardware or software component of the NETCCU[®].

2.9.1 NetCCU Menu Window

The **NetCCU** menu window gives you general information about the NETCCU[®] hardware and software.

Context menu

The context menu provides additional information about the specific component.

2.9.2 Mainboard Menu Window

The **Mainboard** menu window gives you general information about the hardware and software on the NETCCU$^®$ motherboard.

Context menu

The context menu provides additional information about the specific component.

2.10 Measure Values Menu Window

The **Measure Values** menu window displays the current results for the transmitter test points.
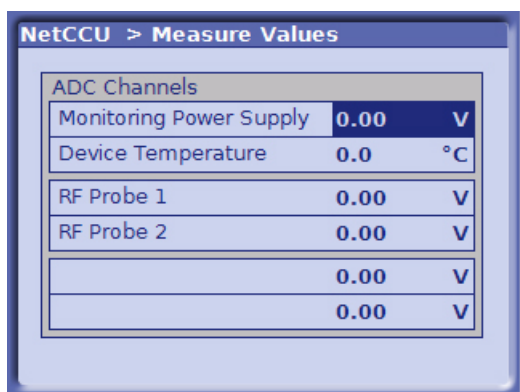
Display	Description
Monitoring Power Supply	Internal voltage value of the NETCCU power supply
Device Temperature	Internal temperature of the NETCCU
RF Probe 1	Voltage of the internal result for the output power at antenna test point 1 (forward power)
RF Probe 2	Voltage of the internal result for the output power at antenna test point 2 (reflection power)

2.11 Parameter Set Menu Window

You can use the **Parameter Set** menu window to create, load and save parameter sets for the settings in the NETCCU and the components it controls. Then if the operating environment changes (e.g. there is a change of frequency) you can access complete parameter sets instead of having to set each individual value. You have eight memory locations available in addition to the current memory location (i.e. the parameter set currently loaded).
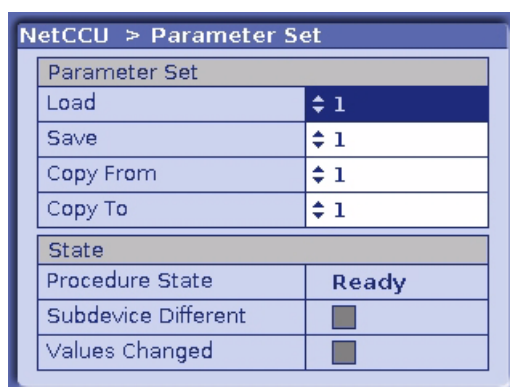
Entry/display	Description
Parameter Set	
Load	Selecting a parameter set as the current parameter set; the currently loaded parameter set acts as an independent copy of the stored parameter set.
Save	Saving the current (and in some cases newly defined) parameter set at the selected memory location.
Copy From	Selecting a parameter set that you wish to save to another memory location. This procedure should only be carried out in Offline mode (context menu: Edit offline).
Copy To	Selecting a memory location to which you wish to copy the parameter set selected (i.e. copied) above. This procedure should only be carried out in Offline mode (context menu: Edit offline). Having completed the procedure, implement any changes via the context menu (Submit changes).
State	
Procedure State	Display showing the status of the action that is being carried out (Ready, Loading, Saving, Copying)
Subdevice Different	Yellow: One of the transmitter components controlled by the NETCCU contains set values that differ from the parameter set that is currently set.
Values Changed	Yellow: The values in the current parameter set no longer agree with those in the stored original.
Context menu	
Reload	This reloads the parameter set selected at Load as the current parameter set (current values are overwritten).
Resave	This saves the current parameter set again at the memory location selected at Save (the values already stored at this memory location are overwritten).
Recopy	This is a repetition of the "Copy From / Copy To" procedure. The values at the memory location to which the copied parameter set is written are overwritten.
Save Changes	Changes made to the current parameter set are saved.

3   Exciter A/B Menus

You can use the Exciter A/B menus to operate and configure the exciter concerned and to call up information.

Note   *The Exciter B menus and menu windows are identical to the Exciter A menus and menu windows.*

3.1   Overview of Menus

Level 1 >	Level 2 / 3>	Parameters
Status >		Displays: – Sum Fault – RF – Exciter On – Loop – Input OK – Input 1 connect – Input 2 connect – Reference – 1 PPS – Sum Warning – Output open – Board Error – Temperature – Fan – Active Input – Wrong Datarate – Mute – Test
Logbook >	Summary >	Logged information: – No – Message – Time – Date – Set or reset (for warnings and error messages only)
	Status >	
	Warning >	
	Fault >	

Level 1 >	Level 2 / 3>	Parameters
Setup >	DVB >	Setting items: – Digital Standard – Network Mode – TPS Source – Cell ID Enable – TX Address – TX Automatic – Amplifier Control
Input >	Input Config HP >	Setting items for Input HP 1 or Input HP 2 as appropriate: – Presel. Mode Displays for Input HP 1 or Input HP 2 as appropriate: – Packet Length – Meas. Data Rate [bps] – Req. Data Rate [bps] – Active Mode
Input >	Input Config LP >	Displays for Input LP 1 or Input LP 2 as appropriate: – Presel. Mode Displays: – Packet Length – Meas. Data Rate [bps] – Req. Data Rate [bps] – Active Mode
Input >	Input Automatic >	Setting items: – Preselect Input – Autoswitch – Seaml. Switching – Priority – Check Time Forward – Check Time Back – On Input Fail Displays: – Seamless switching
DVB Parameters >	TPS >	Setting item – TPS Source Displays: Active / Setting items: Manual: – Bandwidth – FFT Length – Guard Interval – Constellation – Alpha – Cell ID – Interleaver – Code Rate [HP/LP] – Time Slicing [HP/LP] – MPE FEC [HP/LP] Display: Active – Req. Data Rate [HP/LP]
DVB Parameters >	SFN Delay >	Setting items: – Static Delay – Max Leap in Time Displays: – Processing Delay – Dynamic Delay – Network Delay – TX Offset Delay – Maximum Delay – Total Delay

Level 1 >	Level 2 / 3>	Parameters
DVB Parameters >	Test Signals >	Setting items: – PRBS Insertion – Test Signal Insertion – Carrier 1 – Carrier 2

Precorrection >		Setting items:
		– Nonlinear Correction
		  – Amplitude
		  – Phase
		  – Nonlinear Frequency
		  – Point 1
		  – Point 2
		– Linear Correction
		  – Amplitude
		  – Group Delay

RF >	Synthesizer >	Setting items: – Frequency – Frequency Offset – Reference – OCXO Adjust
RF >	Output >	Setting items: – RF Output – Regulation – Manual RF Level – Output Attenuation – RF Slope – Modulation Slope Displays: – AGC Regulation
RF >	IQ Adjust >	Setting items: – I/Q Testsignal – Bias Coarse [I/Q] – Bias Fine [I/Q] – Gain [I/Q] – Phase Displays: – Auto I/Q Adjust – LO1 Frequency
Reference		Setting items – Reference – OCXO Adjust – Mute on PPS Fail – Mute on Ref. Fail – Fail Delay Time
Device Info >	Exciter >	Displays: – Part Number – Variant – Product index – Serial Number – Product Date – Software Number – Software Version – Operating hours – Power up cycles

Level 1 >	Level 2 / 3>	Parameters

Device Info >	Boards >
	
	   Mainboard >
	
	   Input Interface >
	
	   RF Board >
	
	   Synth 1 >
	
	   Synth 2 >
		Displays:
		– Part Number
		– Variant
		– Product index
		– Serial Number
		– Product Date
		– BIOS Version (mainboard only)
		– Operating hours
		– Power up cycles

3.2   Status Menu

The **Status** menu summarizes the current status of the exciter. Color coding (green, yellow and red) is used to indicate status information, warnings and error messages. In addition, some basic settings are shown.
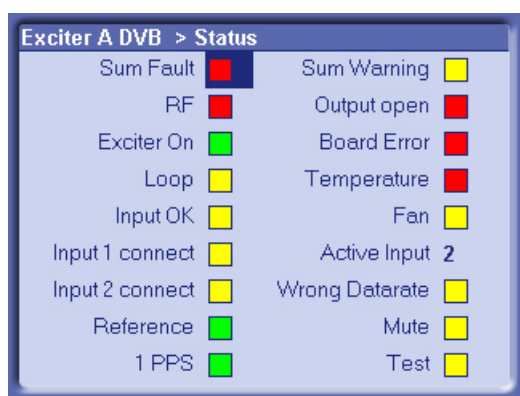
Display/LED	Color	Description
Sum Fault	Red	Sum Fault: One or more errors occurred
RF	Green	The RF level at the exciter output is OK
	Red	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	There is no RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter On	Green	The RF output of the exciter is enabled There are several options for enabling the RF output: – In the RF menu with the RF Output setting item – On the NETCCU® using the **ON** button – On the exciter using the **ON** button (if there is no NETCCU® or it is inactive)

Display/LED	Color	Description
Loop	Yellow	RF protective loop not closed
	Green	RF protective loop closed
Input OK	Green	Valid transport stream present on the active input *In the case of hierarchical coding* the input is OK if valid transport streams are present on both active inputs for HP Stream and LP Stream.
	Yellow	Invalid transport stream on the active input
Input 1 connect	Green	– Input signal present on input **TS 1 IN** or – *In the case of hierarchical coding*: Input signal present on **TS 1 IN** (HP Stream) and **TS 2 IN** (LP Stream)
	- OFF -	– No input signal on input **TS 1 IN** – *In the case of hierarchical coding*: No input signal on **TS 1 IN** and/or no input signal on **TS 2 IN**
Input 2 connect	Green	– Input signal present on input **TS 3 IN** or – *In the case of hierarchical coding*: Input signal present on **TS 3 IN** (HP Stream) and **TS 4 IN** (LP Stream)
	- OFF -	– No input signal on input **TS 3 IN** – *In the case of hierarchical coding*: No input signal on **TS 3 IN** and/or no input signal on **TS 4 IN**
Reference	Green	External reference frequency present and OK
	- OFF -	External reference frequency not present or not OK
1 PPS	Green	External 1-PPS source present and the internal signal processing is synchronized with the 1 PPS
	- OFF -	External 1-PPS source not present or the internal signal processing is not synchronized with the 1 PPS
Sum Warning	Yellow	One or more warnings are active
Out Open	Red	The cable-break sensor has reported that the RF output is not terminated.
HW Error	Red	A hardware error occurred in one or more modules of the exciter
Temperature	Red	At least one module is overheating
Fan	Yellow	A fan has failed; overheating can possibly occur
	Red	Both fans failed; there is a high risk of overheating
Wrong Datarate	Yellow	Wrong data rate on the active input *In the case of hierarchical coding* the LED is illuminated if an incorrect data rate is present on the active input for the HP Stream and/or on the active input for the LP Stream.
Mute	Yellow	Output signal from signal processing disabled

Display/LED	Color	Description
Test	Yellow	Exciter is set to test mode

Display	Status	Description
Active Input	1 / 2	Display of the currently active input *In the case of non-hierarchical coding*: – 1 = **TS 1 IN** – 2 = **TS 3 IN** *In the case of hierarchical coding*: – 1 = **TS 1 IN** (HP Stream) + **TS 2 IN** (LP Stream) – 2 = **TS 3 IN** (HP Stream) + **TS 4 IN** (LP Stream)

3.2.1 Status Displays, Warnings and Error Messages

Signal colors and their meaning

When warnings and error messages occur, this usually means that transmission operation is impaired. Different signal colors are used to distinguish the severity of an impairment or the "quality" of the defect. The following applies:

Green.....................................There is no impairment.

Yellow ....Although the exciter is functional, it is possible that external influences are disrupting transmission operation.

Red...A severe error has occurred so that transmission operation is generally impossible.

Indications with and without memory effect

Status displays (green) and warnings (yellow) always reflect the current status of the exciter. On the other hand, error messages (red) remain active even after the reason for the error has passed or the error has been corrected. If the error has been corrected, you can reset the error display with the RESET key.

3.3 Logbook Menu

The logbook is used to record state changes (events) affecting the exciter.

The menu windows

The **Logbook** menu leads to the following menu windows:

– **Summary**: Complete logbook with all recorded data
– **Status**: Partial logbook with recorded status changes
– **Warning**: Partial logbook with recorded occurrences of warnings
– **Fault**: Partial logbook with recorded occurrences and resets of error messages

3.3.1 Logbook > Summary/Status/Warning/Fault

The complete logbook and the partial logbooks are uniformly structured. The messages are numbered sequentially and contain the following information:

– Indicator for the occurrence ⇧ or disappearance ⇩ of an event (only for warnings or error messages)
– Message: Brief description of the event
– Time: Time of day of the event
– Date: Date of the event

3.3.2 Logbook Contextual Menu

Additional contextual functions are available in the menu windows for the complete logbook and the partial logbooks:

Function	Description
Clear logbook	Clears all entries in the current logbook. Note that it is not possible to clear individual entries. *When you clear the complete logbook, the partial logbooks are also cleared.*
Restore logbook	Restores the cleared entries in the current logbook. *When you restore the complete logbook, the partial logbooks are also restored.*

3.4   Setup Menu

3.4.1   Setup > DVB

The **DVB** menu window is used to enter the basic settings for signal processing.
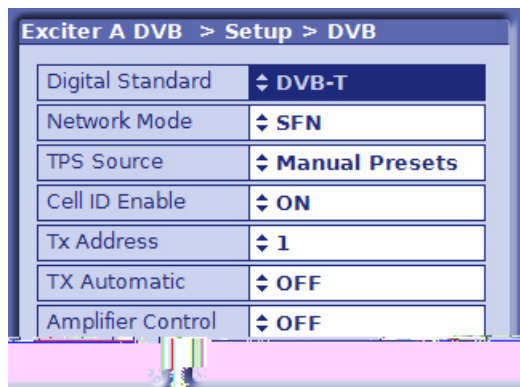
Setting item	Description
Digital Standard	Selection of the digital TV standard: DVB-T, DVB-H or ATSC *Switching over from DVB-T or DVB-H after ATSC is followed by a restart. At the same time signal processing is switched over and the associated user interface is loaded.*
Network Mode	Selection of the network operating mode: SFN or MFN
TPS Source	Setting the source for the TPS parameters: MIP or manual presets (see section "DVB Parameters > TPS") *The TPS source can also be set in the DVB Parameters > TPS menu window.*
Cell ID Enable	Switching cell ID signaling on or off in the TPS The cell ID itself is set in the DVB Parameters > TPS menu window. It can also be retrieved from the MIP.
Tx Address	Setting the transmitter address; address range: 0 to 65535 Setting the transmitter address is a precondition to reading Tx information (transmitter-specific settings) from the MIP. However, the information is only used if Tx Automatic is enabled.
Tx Automatic	Activates and deactivates Tx Automatic When the automatics are enabled (and the transmitter address is set) the following Tx parameters are retrieved from the MIP: Time Offset, Frequency Offset and Cell ID

Setting item	Description
Amplifier Control	Activates and deactivates the amplifier control unit *In R&S low-power transmitters without NETCCU the exciter can have control of the amplifier. This function is implemented with effect from software release V1.2.0.*

3.5 Input Menu
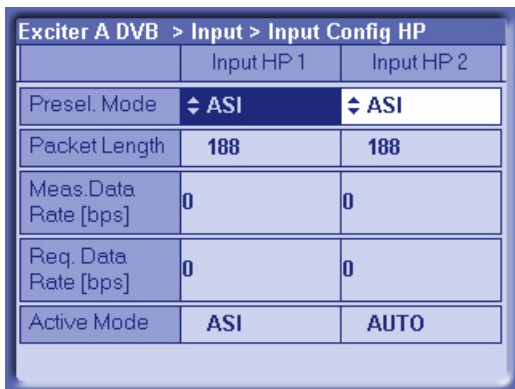
The menu windows in the **INPUT** menu can be used to configure up to four input channels.

The menu windows

The **Input** menu leads to the following menu windows:

– **Input Config HP**: For configuring input data streams (in the case of hierarchical coding: high priority) and displaying the data format, packet length and data rate
– **Input Config LP**: For configuring low priority data streams (in the case of hierarchical coding only) and displaying the data format, packet length and data rate
– **Input Automatic**: For preselecting operating inputs, configuring automatic input switchover, and setting behavior in the event of input signal failure

3.5.1 Input > Input Config HP

Setting item	Description
Presel. Mode [Input HP1/Input HP2]	Setting the data format for the data streams HP 1 or HP 2 (operating and standby signals) on inputs TS 1 IN or TS 3 IN. The options are as follows: – AUTO: The data format is recognized automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for a SMPTE transport stream *In the case of hierarchical coding the operating or standby signal for the high priority (HP) stream is fed via the two inputs HP 1 and/or HP 2.*

Display	Description
Packet Length [Input HP1/Input HP2]	Display showing the packet length detected at the respective input
Meas.Data Rate [bps] [Input HP1/Input HP2]	Display showing the *measured data rate* at the respective input. In MFN mode the net data rate is displayed (without null packets).
Req. Data Rate [bps] [Input HP1/Input HP2]	Display for checking the measured data rate. Depending on the chosen network mode, the following information is displayed: – MFN: *Maximum data processing rate* – SFN: *Required data rate*
Active Mode	Display showing the data format detected or set at the respective input: – ASI: As described – SMTPE: As described – Auto: Auto is selected and there is no data stream

3.5.1.1   Checking the Measured Data Rate

By comparing the **Meas. Data Rate [bps]** and **Req. Data Rate [bps]** displays, it is possible to check that the input buffers (FIFO) are neither underflowing nor overflowing, since this would lead to breaks in transmission.

Maximum data processing rate in MFN mode

In MFN mode all null packets are first of all removed from the transport stream. The associated useful data rate is then measured and displayed at **Meas. Data Rate [bps]**. Provided this measured value stays below the **Req. Data Rate [bps]** value, trouble-free operation is possible.

Note   *When the useful data rate has been measured, stuffing takes place up to the data rate required, that is, the difference between* **Req. Data Rate [bps]** *and* **Meas. Data Rate [bps]** *is made up by inserting null packets.*

Required data rate in SFN mode

In SFN mode the incoming transport stream is passed to processing unchanged. The associated data rate is then measured and displayed at **Meas. Data Rate [bps]**. Provided this measured value matches the **Req. Data Rate [bps]** to within ± 1 bps, trouble-free operation is possible.

3.5.2   Input > Input Config LP

Setting item	Description
Presel. Mode [Input LP1/Input LP2]	In the case of hierarchical coding: Setting the data format for the low priority data streams LP 1 or LP 2 (operating and standby signals) on inputs TS 2 IN or TS 4 IN. The options are as follows: – AUTO: The data format is recognized automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for a SMPTE transport stream

Display	Description
Packet Length [Input LP1/Input LP2]	Display showing the packet length detected at the respective input
Meas.Data Rate [bps] [Input LP1/Input LP2]	Display showing the *measured data rate* at the respective input. In MFN mode the net data rate is displayed (without null packets).
Req. Data Rate [bps] [Input LP1/Input LP2]	Display for checking the measured data rate. Depending on the chosen network mode, the following information is displayed: – MFN: *Maximum data processing rate* – SFN: *Required data rate*
Active Mode	Display showing the data format detected or set at the respective input: – ASI: As described – SMTPE: As described – Auto: Auto is selected and there is no data stream

3.5.2.1   Checking the Measured Data Rate

The procedures are the same as for the high priority stream.

3.5.3   Input > Input Automatic

Setting item	Description
Preselect Input	For preselecting the inputs – INPUT 1: The operating input is TS 1 IN. In the case of hierarchical coding, TS 2 IN is used as a second operating input for the low priority stream. – INPUT 2: The operating input is TS 3 IN. In the case of hierarchical coding, TS 4 IN is used as a second operating input for the low priority stream.
Autoswitch	Switches the *automatic input switchover* on or off. In the event of a failure on the active operating input, automatic switchover to the standby input takes place. The automatic switchover mode is defined by the following parameter settings.
Seaml. Switching	Switches seamless input switchover on or off. – ON: In the event of a failure, input switchover takes place without a break in transmission, provided the data streams are synchronized at the operating and standby inputs. – OFF: For the purpose of testing the automatic input switchover, the Seaml. Switching function can be deactivated. *The function has no effect when automatic input switchover is deactivated.*
Priority	Selection of the *priority mode*. – EQUAL: The preselected operating input and standby input have the same priority. Once a switchover has taken place there is normally no return switchover to the operating input which previously failed. – PRIOR: The preselected operating input is the priority input. Once a switchover has taken place the system switches back to the preselected operating input as soon as the signal reappears.

Setting item	Description
Check Time Forward	For setting a delay time (0 to 60 s) which must elapse before the switchover to the standby input takes place in the event of a failure on the operating input.
Check Time Back	For setting a delay time (0 to 60 s) which must elapse before switching back to the operating input after switching over from the standby input (which is no longer active). *The function has no effect if the priority mode is set to EQUAL.*
On Input Fail	For setting the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed – Mute: The output signal is suppressed if the data rate is incorrect or the MIP is faulty (recommended for SFN)

Display	Description
Seamless Switching	Status display for indicating whether the input streams are synchronized on the operating and standby inputs (precondition for seamless input switchover).

3.5.3.1   Automatic Input Switchover

The exciter comprises a circuit for automatic switchover from one input to the other, provided that a valid signal is present at the second input. Before a failure occurs, the preselected input is active.

The mode of this automatic switchover circuit is defined by the following factors:

– Automatic: ON or OFF (**Autoswitch**)
– Delay times until switchover (**Check Time Forward** or **Check Time Back**)
– Priority mode: Inputs have equal priority or the preselected input has priority (**Priority**)
– Operating and standby inputs synchronized or not synchronized (in conjunction with **Seamless Switching**)

Automatic input switchover ON/OFF

If automatic switchover is OFF, the preselected input remains active even if the input signal fails.

If automatic switchover is ON and there is a failure at the preselected input, switchover to the associated standby input takes place.

Priority mode PRIOR (input priority)

Following a switchover of the preselected input, the automatic system switches back to this priority input as soon as a signal reappears. Switchover is delayed for the set delay times.

If the signal fails at both the operating input and the standby input, the priority input remains active.

Priority mode EQUAL (equal input priority)

Following a switchover of the preselected input, the standby input with the same priority remains active until the input signal fails on this input also. The automatic system switches back to the preselected input, but only if a signal is present on it once again. Switchover is delayed for the set delay times.

Note   *Selecting this operating mode keeps to a minimum the number of switchover operations and in certain cases the number of breaks in transmission (in the case of unsynchronized input streams).*

3.5.3.2   Behavior in the Event of a Defective Input Signal

SFN mode

In the event of a defective input signal (due for example to an incorrect data rate, defective or missing MIP, missing or unsynchronized signal) the output signal is in effect suppressed. In this case the switch setting **On Input Fail** is meaningless.

MFN mode

The behavior in the event of a defective input signal can be influenced by the **On Input Fail** switch as follows:

– **Mute**: The output signal from the exciter is suppressed as soon as it can no longer be synchronized with the input signal (from the operating *and* standby inputs).
– **No Mute**: The output signal from the exciter is not suppressed, despite a defective input signal. However, when this happens only null packets are transmitted.

3.6   DVB Parameters Menu

The menu windows in the **DVB Parameters** menu can be used not only to set (and/or preset) the DVB transmission parameters needed for encoding and modulation, but also to check the settings used as well as the TPS settings signaled during transmission (TPS = Transmission Parameter Signaling).

Note   *Providing there is a MIP (Megaframe Initialization Packet) in the transport stream, TPS information can also be read out and used for configuring the DVB transmission parameters. In this case the signaled parameters may not be the same as the manually preset parameters.*

The menu windows

The **DVB Parameters** menu leads to the following menu windows:

– **TPS**: Selection of the TPS source, manual (pre)setting and displaying the active TPS parameters

– **SFN Delay**: Displaying and setting signal delay times in the SFN

– **Test Signals**: Configuring DVB transmission parameters for test mode

3.6.1   DVB Parameters > TPS

Note   *The TPS menu window provides comprehensive options for entering settings and obtaining information. You need to scroll in order to see all the parameter settings.*

Exciter A DVB .. DVB Parameters > TPS ⬍		
TPS Source	⬍ Manual ..	
	Active	Manual
Bandwidth	unknown	⬍ 8 MHz
FFT Length	4 K	⬍ 4 K
Guard Interval	1/16	⬍ 1/16
Constellation	16QAM	⬍ 16QAM
Alpha	No H	⬍ No Hier
Cell ID	0	⬍ 0
Interleaver	OFF	⬍ nat

HP	Active	Manual
Code Rate	1/2	⬍ 1/2
Time Slicing	OFF	⬍ OFF
MPE FEC	OFF	⬍ OFF
Req. Data Rate [bps]	0	
LP	Active	Manual
Code Rate	1/2	⬍ 1/2
Time Slicing	OFF	⬍ OFF

MPE FEC	OFF	⬍ OFF
Req. Data Rate [bps]	0	

Selection of the TPS source

The **TPS Source** switch is used to select the source for the TPS parameters:

– **MIP**: The TPS information is to be retrieved from the MIP

– **Manual Presets**: The TPS parameters are to be manually configured

Manual configuration of the TPS parameters

The parameters for DVB-T, DVB-H and hierarchical coding can be configured in the column on the right, headed **Manual**. These manual settings are active in the following cases:

– When there is no MIP in the transport stream.

– When there is a MIP in the transport stream, but this is not used because the TPS source is set to **Manual Presets**.

Displaying the active TPS parameters

The active (and signaled) TPS parameters are displayed in the column on the left, headed **Active**. There are also two displays for the required data rates on one or two active inputs (see section "Checking the Measured Data Rate").

If the TPS information from the MIP is used, the values displayed in the **Active** column may not be the same as the manual settings (**Manual** column).

The available parameters

Setting item	Description
TPS Source	Setting the source for the TPS parameters: MIP or manual presets

Display/ Setting item	Description of the active or manually set TPS parameters
Bandwidth	*Signal bandwidth* Display/setting: 5, 6, 7 or 8 MHz
FFT Length	IFFT length Display/setting: 2k or 8k; also 4k in the case of DVB-H
Guard Interval	Guard interval Display/setting: 1/4, 1/8, 1/16 or 1/32
Constellation	Modulation mode Display/setting: QPSK, 16QAM or 64QAM *In the case of hierarchical coding* the value refers to the sum of the HP and LP stream constellation points; possible values are therefore: 16QAM or 64QAM
Alpha	*Hierarchy parameter* α Display/setting: – No Hier: Non-hierarchical coding – 1 H: Hierarchical coding with $\alpha = 1$ – 2 H: Hierarchical coding with $\alpha = 2$ – 3 H: Hierarchical coding with $\alpha = 3$ 1 H, 2 H or 3 H activates the hierarchical coding mode. However, this is only possible if Constellation is set to 16QAM or 64QAM.

Display/ Setting item	Description of the active or manually set TPS parameters
Cell ID	Cell ID Display/setting: 0x0000 to 0xFFFF The Cell ID can only be retrieved from the MIP if the Tx Automatic is activated and the Tx address is correctly set (see section "Setup > DVB"). For the purpose of signaling in the output signal (TPS), Parameter Cell ID Enable must also be activated (see section "Setup > DVB").
Interleaver	Interleaver Display/setting: – nat: Default setting ("native") with normal function for DVB-T – in depth: 8k interleaving for DVB-H at IFFT lengths of 2k and 4k for improved transmission reliability (*DVB-H parameter*)
Code Rate [HP/LP]	Internal code rate (separate for HP and LP stream) Display/setting: 1/2, 2/3, 3/4, 5/6 or 6/7
Time Slicing [HP/LP]	Time Slicing Flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: A flag is set in the broadcast DVB signal. This flag informs the receiver that at least one service in the DVB-H data stream uses time slicing.
MPE FEC [HP/LP]	MPE FEC Flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: This flag informs the receiver that at least one service in the DVB-H data stream uses forward error correction for MPE (multiprotocol encapsulation).
Req. Data Rate [HP/LP]	Display showing the required data rate; cf. section "Input > Input Config HP"

3.6.1.1   Settings for DVB-T

The following quantities form the standard parameters for DVB-T:

– *DVB signal bandwidth*: Spectrum bandwidth in the transmit channel

– *IFFT length*: The signal bandwidth is divided into 2k (2048) or 8k (8192) frequency subcarriers. The 4k (4096) option is available for DVB-H only.

– *Guard interval*: A protection interval of 1/4, 1/8, 1/16 or 1/32 symbol length. The longer the guard interval, the better the intersymbol echo suppression.

– *Code rate*: Error correction bits (1/2, 2/3, 3/4, 5/6 or 7/8) added to the information data in the FEC (forward error correction) block. For instance, a code rate of 5/6 corresponds to a ratio of 5:1 between information data and FEC.

– *Modulation mode*: Depending on the modulation mode, a frequency subcarrier may contain 2-bit (QPSK), 4-bit (16QAM) or 6-bit (64QAM) information.

3.6.1.2 Settings for DVB-H

Activating DVB-H

☞ Go to the **Setup** > **DVB** menu window and use the **Digital Standard** switch to select **DVB-H** mode.

The setting options for the additional DVB-H functions are enabled.

Additional DVB-H functions

The standard DVB-H (transmission of DVB signals to handheld devices) has all the properties of DVB-T together with the following additional functions:

– a third IFFT length: 4k
– built-in enhanced error protection: MPE FEC, in-depth interleaving
– time slicing

3.6.1.3 Settings for Hierarchical Coding

Activating hierarchical coding

☞ Go to the **DVB Parameters** > **TPS** menu window for **Alpha** and select one of the settings **1 H**, **2 H** or **3 H**.

Note   *The setting **Alpha** = **No Hier** disables all LP Stream entries.*

Conditions for DVB transmission parameters

With hierarchical coding, the DVB transmission parameters for the LP stream and for the HP stream must be selected so that they match, in order to satisfy certain conditions. The user interface is the means of ensuring compliance with these conditions.

The available settings and the conditions they fulfill (⇨ via software) are shown in the following table:

	HP stream	LP stream
DVB bandwidth	Manual: 5, 6, 7 or 8 MHz	⇨ via software: LP = HP
IFFT length	Manual: 2 k or 8 k (also 4k in the case of DVB-H)	⇨ via software: LP = HP
Guard interval	Manual: 1/4, 1/8, 1/16 or 1/32	⇨ via software: LP = HP
Code rate	Manual: 1/2, 2/3, 3/4, 5/6 or 7/8	Manual: 1/2, 2/3, 3/4, 5/6 or 7/8
Modulation mode (constellation)	manual for **HP + LP**: 16QAM or 64QAM	⇨ via software: QPSK or 16QAM
Hierarchy	Manual: α = 1, 2 or 4	⇨ LP = HP

The hierarchy parameter Alpha

With hierarchical modulation, the entire information of a frequency subcarrier is interpreted as a 2-bit modulation and an additional 2-bit or 4-bit modulation. Since the 2-bit modulation merely contains the information on the relevant quadrant in the constellation diagram, it is very "robust" and is used for the high-priority stream. The second modulation represents the position specification within the quadrant. With 2-bit or 4-bit (= 4 or 16 constellation points), it contains more precise information but is also proportionately more "sensitive" to faults. It is therefore used for the low-priority stream.

In principle: The more constellation points there are and the closer together they are, the more sensitive the modulation. This basic rule can be used to further increase the robustness of the HP modulation at the expense of the LP modulation. The hierarchy parameter α is used for this purpose. It is defined as the quotient of two different distances between adjacent constellation points. The denominator is the distance between points from different quadrants, the numerator the distance between points from one and the same quadrant. A high α value therefore always signifies a more robust modulation on the HP channel at the expense of a more sensitive modulation on the LP channel.

3.6.2   DVB Parameters > SFN Delay

All transmitters in a single-frequency network (SFN) must transmit the same information at the same time and at the same frequency (single-frequency condition). A number of delay times occur prior to transmission at the antenna, defining the individual time of transmission at the transmitter station.

The **SFN Delay** menu window can be used to check the individual delay times. This makes it possible to check whether the single-frequency condition is met.

Exciter A DVB .. DVB Parameters > SFN Delay		
Processing Delay	0.0	µs
Static delay	↕ 0.0	µs
Dynamic delay	0.0	µs
Network delay	0.0	µs
Tx Offset delay	0.0	µs
Maximum delay	1 222 333.0	µs
Total delay	0.0	µs
Max Leap in Time	↕ 10	µs

Display	Description
Maximum Delay	Period of time between the signal leaving the play-out center (MIP inserter) and its regular transmission at the transmitting antenna. This delay is set in the MIP inserter and serves as a basis for all the transmitters in the SFN.
Network Delay	Signal propagation time between the play-out center (MIP inserter) and the exciter input. This delay depends on the transmission path used.

Display	Description
Processing Delay	Minimum signal transit time through the exciter. This delay depends on the DVB transmission parameters.
Dynamic Delay	Period of time by which signal processing is artificially delayed so that the desired time of transmission is obtained.
Total Delay	Actual signal transit time through the exciter. This is derived from the sum of the processing delay and the dynamic delay.
Tx Offset Delay	The offset in time of transmission (positive or negative) sent to the MIP for the individual transmitter site, relative to the regular time of transmission specified by the maximum delay. For the purpose of display and activation, the Tx Automatic must be enabled and the Tx address of the transmitter must agree (see section "Setup > DVB"). *If Tx offset delay and static delay are both present at the same time, their effects combine.*

Setting item	Description
Static Delay	The offset in time of transmission (positive or negative) set manually for the individual transmitter site, relative to the regular time of transmission specified by the maximum delay. The static delay can be used to compensate for manufacturing differences between transmitter systems. *If static delay and Tx offset delay are both present at the same time, their effect combines.*
Max Leap in Time	In relation to the computed time of transmission, this is the maximum leap in time that can be corrected without a break in transmission. Default setting: 10 μs

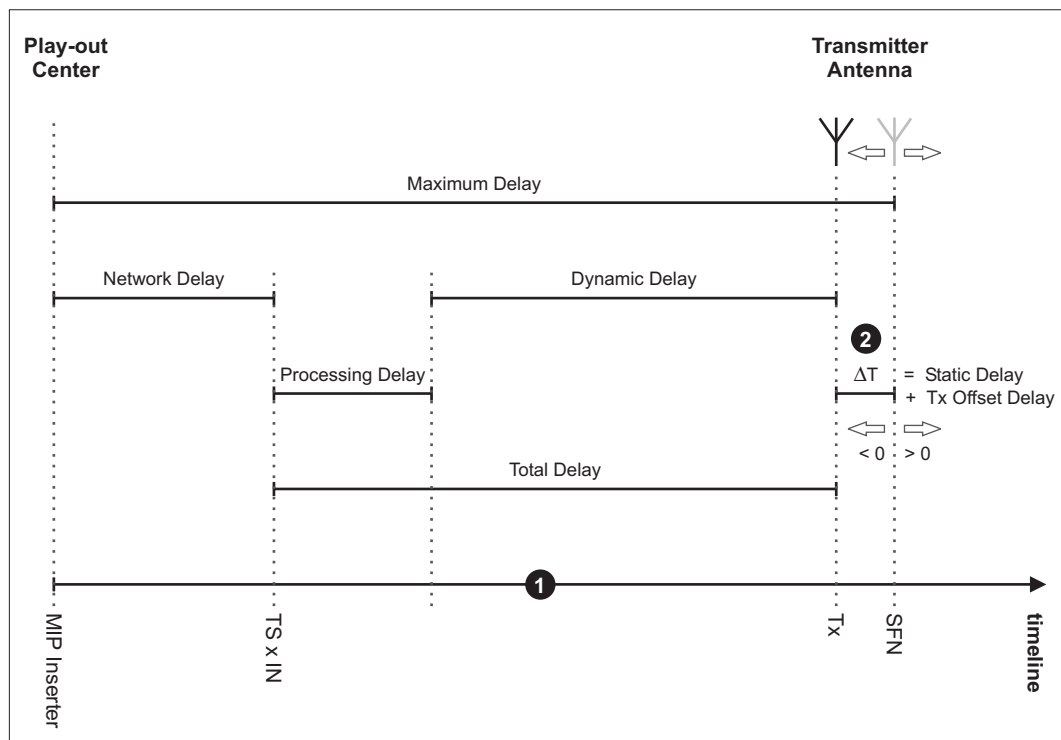### 3.6.2.1 Distribution of Delays on the Timeline

Fig. 6 *Delays in the SFN*

1) *Timeline showing the defined times for signal insertion (MIP Inserter), signal feed to the exciter (TS x IN), time of transmission at the station (Tx) and regular time of transmission (SFN)*

2) *$?T$ = the difference between the individual time of transmission at the station and the regular time of transmission in the SFN; in this example the sign is negative*

The microcontroller in the exciter calculates the dynamic delay for the planned time of transmission on the basis of the details in the MIP and the measured signal processing time.

Note   *In order to comply with the single-frequency condition, the value of the dynamic delay must be between 0 and 1 second.*

3.6.3 DVB Parameters > Test Signals

The **Test Signals** menu window is used to generate test signals.

Setting item	Description
PRBS Insertion	Insertion of a PRBS sequence instead of the transport stream present at the input Selection: – OFF: Normal operating status, test sequence not active – 2^23-1, 2^15-1 or 2^9-1: Displayed PRBS sequence selected
Test Signal Insertion	Insertion of unmodulated test carriers or suppression of modulated carrier ranges in the output frequency spectrum Selection: – OFF: Normal operating status, test signal not active – CARRIER 1: Insertion of an unmodulated test carrier at carrier position 1 – CARRIER 2: Insertion of an unmodulated test carrier at carrier position 2 – C1 and C2: Insertion of two unmodulated test carriers at carrier position 1 and carrier position 2
	– BANDPASS: Suppression of the modulated carriers from position 0 to carrier position 1 and from carrier position 2 to the end of the frequency spectrum – BANDSTOP: Suppression of the modulated carriers in the range between carrier position 1 and carrier position 2 In the BANDPASS and BANDSTOP functions, the value for carrier 1 must be smaller than the value for carrier 2.
Carrier 1	Sets the position for test carrier 1
Carrier 2	Sets the position for test carrier 2

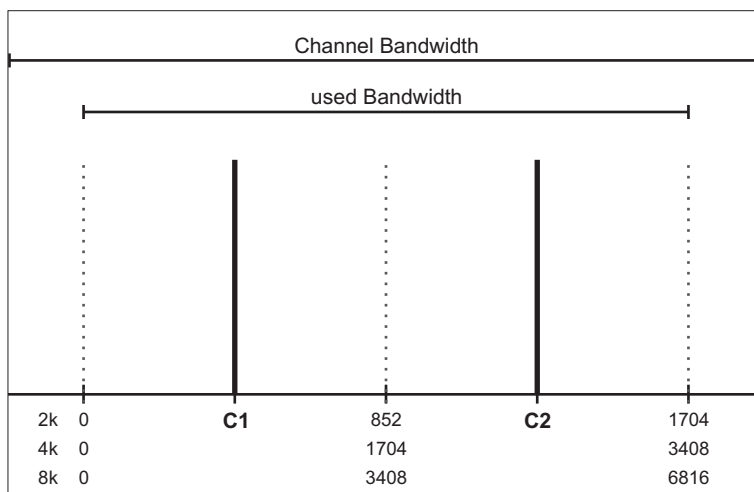### 3.6.3.1 The Arrangement of Test Signals in the Output Frequency Spectrum

Fig. 7 *Test Signal Insertion function | C1 and C2*
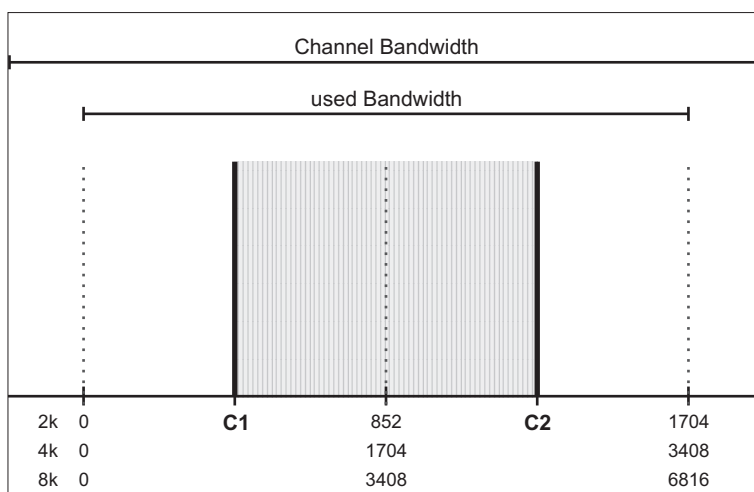

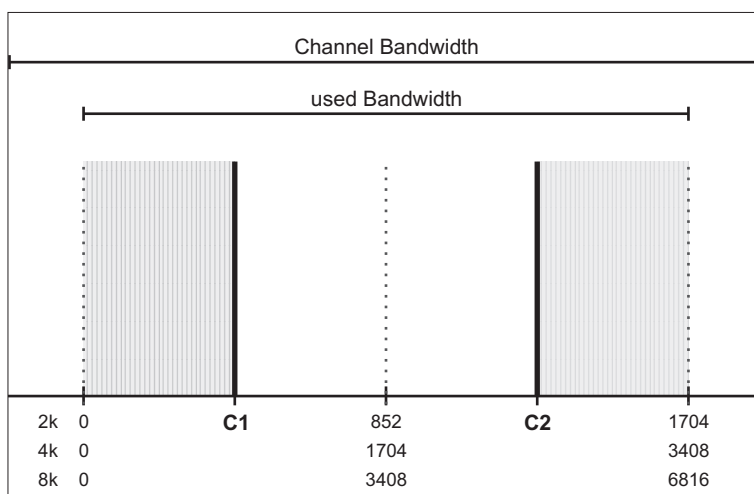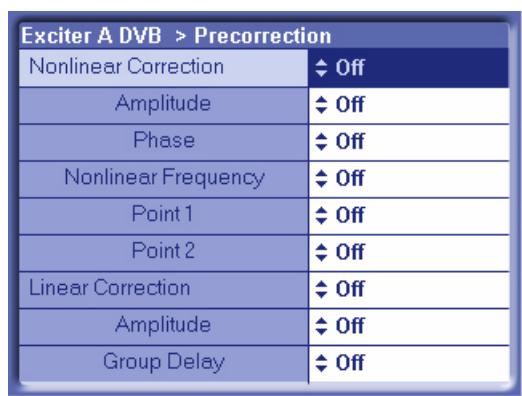***Fig. 8*** *Test Signal Insertion function | Bandpass*

Fig. 9 *Test Signal Insertion function | Bandstop*

3.7   Precorrection Menu

In the **Precorrection** menu window, you can activate or deactivate individual precorrector branches without having to access the precorrector GUI (see the section "Introduction to Operation of the Precorrector"). The different switch settings (On/Off) correspond to the related settings in the precorrector GUI.

Exciter A DVB > Precorrection	
Nonlinear Correction	⬍ Off
Amplitude	⬍ Off
Phase	⬍ Off
Nonlinear Frequency	⬍ Off
Point 1	⬍ Off
Point 2	⬍ Off
Linear Correction	⬍ Off
Amplitude	⬍ Off
Group Delay	⬍ Off

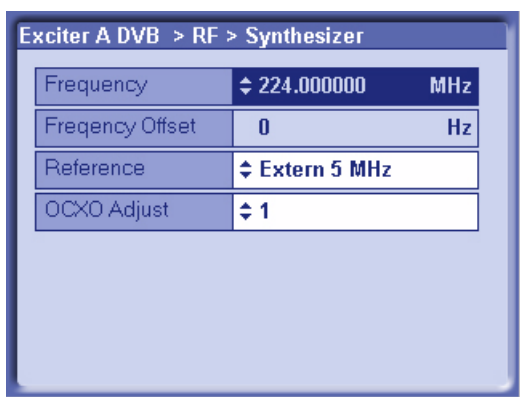| Setting item	Description
Nonlinear Correction	Switches the entire nonlinear correction on or off.
– Amplitude	Switches the amplitude correction in the nonlinear corrector on or off.
– Phase	Switches the phase correction in the nonlinear corrector on or off.
– Nonlinear Frequency	Switches the entire nonlinear frequency response correction on or off.
– Point 1	Switches the frequency response influence on branch 1 on or off (nonlinear frequency response correction).
– Point 2	Switches the frequency response influence on branch 2 on or off (nonlinear frequency response correction).
Linear Correction	Switches the entire linear correction on or off.
– Amplitude	Switches the amplitude frequency response correction in the linear corrector on or off.
– Group Delay	Switches the group delay correction in the linear corrector on or off.

3.8   RF Menu

The menu windows in the **RF** menu are used to make the settings for frequency generation, modulation and RF monitoring.

The menu windows

The **RF** menu leads to the following menu windows:

– **Synthesizer**: Set the channel center frequency and the reference frequency source
– **Output**: Enable the RF output, activate output level control or set the level manually, correct the amplitude frequency response of subsequent components
– **IQ Adjust**: Adjust the modulator

3.8.1 RF > Synthesizer

Exciter A DVB > RF > Synthesizer	
Frequency	224.000000 MHz
Freqency Offset	0 Hz
Reference	Extern 5 MHz
OCXO Adjust	1

Setting item	Description
Frequency	Setting the channel center frequency
Reference	Selecting the reference source for stabilization of the frequency processing (*reference frequency source)*. The following settings are possible: – Internal: Operation without an external reference frequency source. – External 5 MHz: Operation with an external 5 MHz reference. – External 10 MHz: Operation with an external 10 MHz reference. – External 1pps: Operation with an external time reference (1 pps) *The same setting options can be found in the RF > Reference menu window.*
OCXO adjust	Setting for adjusting the internal OCXO frequency (for "Internal" mode). *The same setting options can be found in the RF > Reference menu window.*

Display	Description
Frequency offset	Any frequency offset is added straight to the channel center frequency. The frequency offset transferred in the MIP is addressed to a particular transmitter in the network and is evaluated only if the Tx address set in the Setup > DVB menu window is the correct recipient. For the purpose of display and activation the Tx Automatic also needs to be enabled (see section "Setup > DVB").

3.8.1.1 Reference Frequency Source

The basis for frequency generation in the exciter is a 10 MHz oven controlled crystal oscillator (OCXO). This OCXO can be operated in two different modes:

"Internal" mode

The OCXO runs in uncontrolled mode.

It obtains its control voltage via a D/A converter which can be set using the **OCXO adjust** item. The frequency of the OCXO present at the **10 MHz MONITORING** test output (on the front panel of the exciter) can be adjusted to 10 MHz if necessary.

"External" mode

The OCXO runs in controlled mode.

Due to the control, the control voltage generated by the D/A converter is adapted on an ongoing basis so that the 10 MHz frequency of the OCXO is synchronized to the externally supplied 5 MHz or 10 MHz reference frequency, or to the external 1-pps signal.

3.8.1.2 Holdover Mode (In Case of Failure of the Reference Frequency)

As soon as a failure of the external reference frequency is detected, the control voltage for the OCXO is no longer modified. The result of this is that the RF generation is now based on the stability of the OCXO.

As soon as the external reference frequency is restored, the control voltage on the OCXO will be controlled again with the externally supplied reference frequency.

3.8.2   RF > Output

Setting item	Description
RF Output	Enables (On) or disables (Off) the RF output.
Regulation	Activates (On) or activates (Off) the *output level control*. During transmission operation, control must be enabled. *The current status of the related level adjuster is displayed as a percentage under RF > RF Monitor > AGC Exciter.*
Manual RF Level	Manual setting of the *output level*; the setting has an effect only if output level control is deactivated. *The current status of the related level adjuster is displayed as a percentage under RF > RF Monitor > AGC Exciter.*
Output Attenuation	For level adaptation purposes, an integrated attenuator with a value of 3 dB, 6 dB or 9 dB can be connected. *This has no influence on the level control.*
RF Slope	Correction of a slope of the amplitude frequency response in the spectrum for equalizing subsequent components (output stage, filter).
Modulation Slope	Correction of a curvature of the amplitude frequency response in the spectrum for equalizing subsequent components (output stage, filter).

Display	Description
AGC Regulation	Displays the level of the output level control

3.8.2.1   Output Level Control

The output power delivered by the exciter is determined by a nominal output level controller.

For test purposes this controller can be deactivated. The output level is then set via the **Manual RF Level** control element.

Note   *If **Manual RF Level** is set too low, the RF FAIL error will be generated.*

3.8.3   RF > IQ Adjust

When it is delivered from the factory, the I/Q modulator is preadjusted so that no customer intervention is normally required.

If you need a new I/Q adjustment at a later point in time, this will involve the use of the actuators in the **RF** > **IQ Adjust** menu window.

The I/Q adjustment is dependent on the automatically selected intermediate frequency LO1. Accordingly, it applies only for the intermediate frequency displayed under **LO1 Frequency**.

Note   *The following table shows the relationship between the set vision carrier frequency and intermediate frequency LO1:*

Vision carrier frequency		Intermediate frequency
$47\ MHz \leq fV < 510\ MHz$	$\Rightarrow$	LO1 = 2160 MHz
$510\ MHz \leq fV < 580\ MHz$	$\Rightarrow$	LO1 = 1920 MHz
$580\ MHz \leq fV < 680\ MHz$	$\Rightarrow$	LO1 = 2160 MHz
$680\ MHz \leq fV < 860\ MHz$	$\Rightarrow$	LO1 = 1920 MHz

Note   *For information on how to carry out a manual I/Q adjustment, see the section "Manual Adjustment of the I/Q Modulator".*
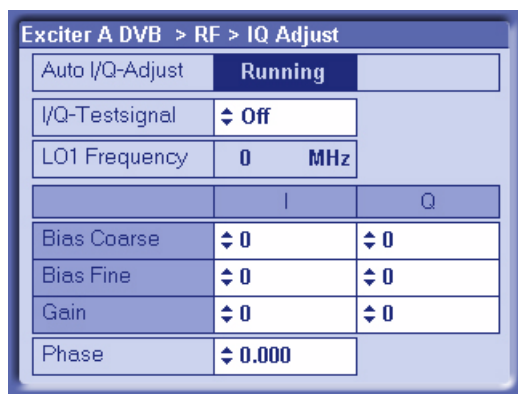
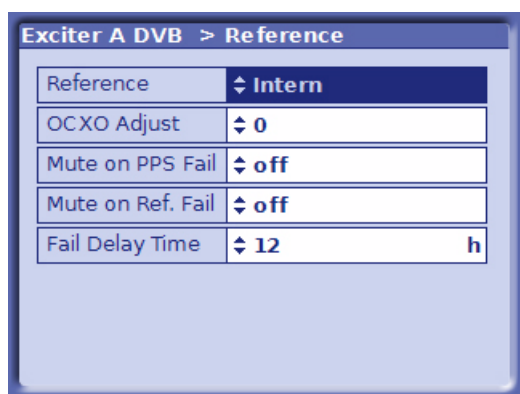| Setting item	Description
Auto I/Q Adjust	*An option for automatic I/Q adjustment will be implemented in a later software release.*
I/Q Test Signal	Switches a test signal on or off for use in performing manual I/Q adjustment.

Setting item	Description
Bias Coarse [I/Q]	Course setting of an actuator for suppressing the undesired center carrier; setting range: -1023 to +1023
Bias Fine [I/Q]	Fine setting of an actuator for suppressing the undesired center carrier; setting range: -32767 to +32767
Gain (I/Q)	Setting of an actuator for suppressing the undesired carrier in the sideband; setting range: 0 to 255
Phase	Setting of an actuator for suppressing the undesired carrier in the sideband; setting range: -14 to +14

Display	Description
LO1 Frequency	Display of the intermediate frequency LO1 which is automatically set in the modulator (1.92 GHz or 2.16 GHz)
	The adjustment values for the actuators described above apply only for the displayed intermediate frequency.

3.9   Reference Menu

A reference source for stabilization of the frequency processing (reference frequency source) can be selected via the **Reference** menu window.

It is also possible to set the behavior of the exciter in the event of failure of the reference sources for frequency processing and for synchronization in the SFN (external 1-pps signal).

Setting item	Description
Reference	Selection of the reference frequency source. The following settings are possible: – Internal: Operation without an external reference frequency source – External 5 MHz: Operation with an external 5 MHz reference – External 10 MHz: Operation with an external 10 MHz reference – External 1pps: Operation with an external time reference (1 pps) *The same setting option can be found in the RF > Synthesizer menu window.*
OCXO Adjust	Setting for adjusting the internal OCXO frequency (for "Internal" mode) *The same setting option can be found in the RF > Synthesizer menu window.*
Mute on PPS Fail	For setting the behavior in SFN mode in the event of failure of the external time reference. The following settings are possible: – off: The output signal is not suppressed. – only at startup: The output signal is suppressed at startup until a valid 1-pps signal is detected; if the 1-pps signal fails after synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the 1-pps signal fails for longer than the period specified at Fail Delay Time This is the recommended setting for operation in SFN mode.
Mute on Ref. Fail	For setting the behavior in SFN and MFN mode in the event of failure of the external reference frequency source. The following settings are possible: – off: The output signal is not suppressed. – only at startup: The output signal is suppressed at startup until a valid reference source is detected; if the reference source fails after synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the reference source fails for longer than the period specified at Fail Delay Time This is the recommended setting for operation in SFN mode.
Fail Delay Time	Delay time until the output signal is suppressed after failure of a reference source. The setting takes effect if the 'after fail delay time' behavior is set at Mute on PPS Fail or Mute on Ref. Fail. Selection: 0 to 24 hours

3.9.1   Behavior in the Event of Failure of a Reference Source

The behavior in the event of failure of the reference frequency source or time reference is defined by the settings in the **Reference** menu window.

The failure of a required or set reference source is indicated as follows:

	LED (front panel)	LED (Status menu)	Logbook entry
In SFN mode in the event of failure of			
Reference frequency source: 5 MHz, 10 MHz or 1 pps	REF FAIL: Yellow	– Reference: - OFF - – Sum Warning: Yellow	no reference
Time reference: 1 pps	REF FAIL: Yellow	– 1 PPS: - OFF - – Sum Warning: Yellow	Ext PPS Fail
In MFN mode in the event of failure of			
Reference frequency source: 5 MHz or 10 MHz	REF FAIL: Yellow	– Reference: - OFF - – Sum Warning: Yellow	no reference
Reference frequency source: 1 pps	REF FAIL: Yellow	– 1 PPS: - OFF - – Sum Warning: Yellow	Ext PPS Fail

3.10 Device Info Menu

The menu windows under Device Info contain the electronic type plates for the exciter as a whole as well as for the individual modules or elements in the exciter:

– Exciter (complete device)
– Boards (modules)
   – Mainboard
   – Input interface
   – RF board
   – Synth 1
   – Synth 2

The structure of the different type plates is more or less identical. The information which is displayed is explained below using the exciter type plate as an example:

Device Info > Exciter

Exciter A DVB > Device Info > Exciter	
Part Number	0000.0000
Variant	00
Product index	00.00
Serial Number	000000
Product Date	2004-12-24
Software Number	0000.0000
Software Version	0.0.0
Operating hours	0
Power up cycles	0

Display	Description
Part Number	Part number
Variant	Device or module variant (model)
Product Index	Product modification index
Serial Number	Serial number
Product Date	Date of production
Software Number	Part number for the software
Software Version	Version number for the software
Operating hours	Number of operating hours
Power up cycles	Number of times device has been switched on/off

The information saved here is used for troubleshooting purposes. In case servicing is required, this information allows you to precisely identify the defective component and order a replacement.

4   Manual Adjustment of the I/Q Modulator

Note   *Before performing the adjustment, make sure that the exciter has been in operation for at least 15 minutes.*

Objective

If quadrature modulation were optimal (theoretically possible), the residual carrier would be completely suppressed. In actual practice however, residual carriers arise (e.g. due to crosstalk). They must be suppressed using suitable correction carriers.

The objective of I/Q adjustment is to suppress the undesired center carrier and undesired carrier in the sideband with respect to a test carrier by better than 70 dB.

Preparation and test carrier measurement

1. Call up the exciter menu with **RF** > **IQ Adjust**.
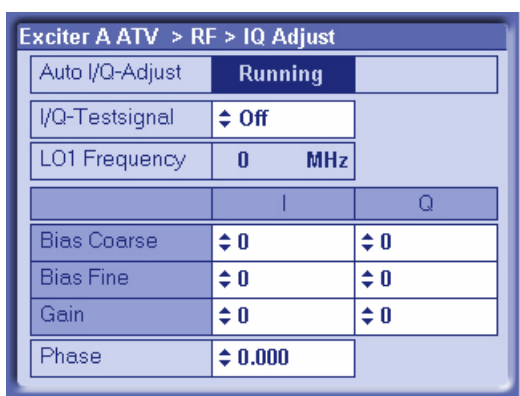
2. Use the **I/Q Test Signal** switch to turn on the test signal.

3. Connect a spectrum analyzer to the **RF MONITORING** output on the front panel of the exciter and make the following settings:

Center Frequency	Frequency of the vision carrier
Span	6 MHz
Resolution BW	30 kHz
Video BW	300 Hz
Sweep	Coupled

```
                                                    * RBW  30 kHz
                                                    * VBW  300 Hz
        Ref   20 dBm              Att  45 dB         SWT 1.9 s
```
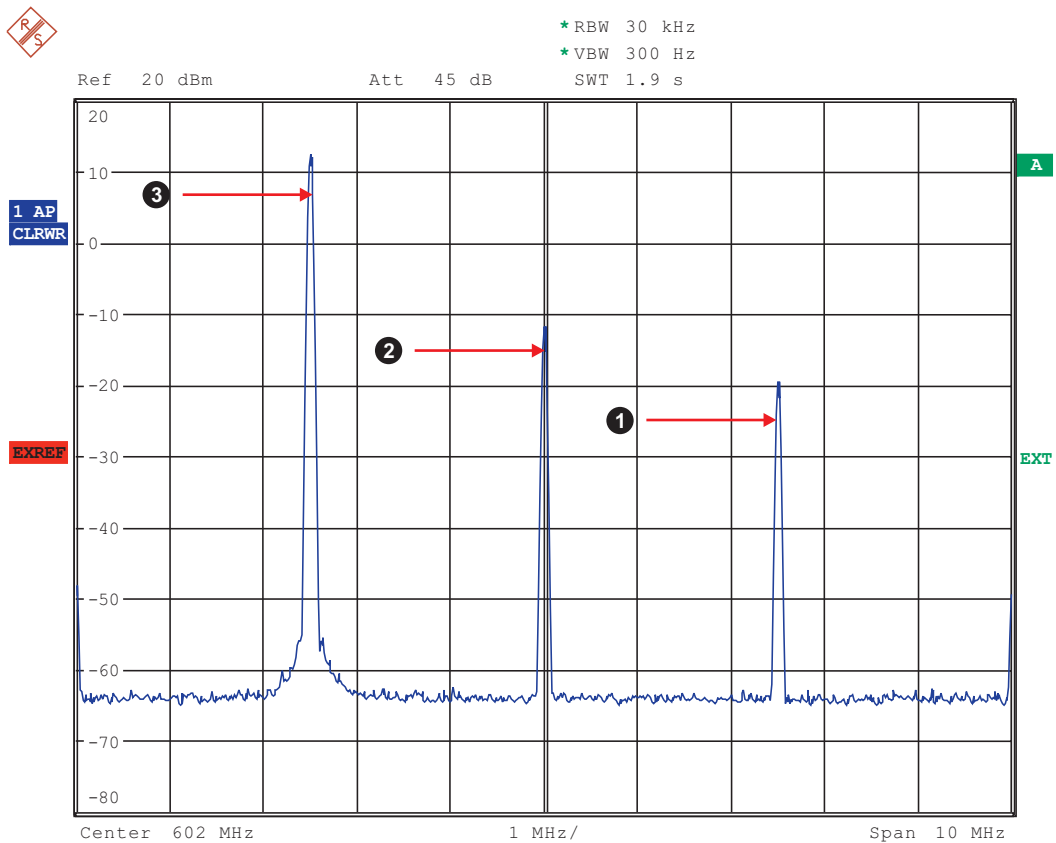

Fig. 10 *Spectrum analyzer display prior to adjustment*

1) *Undesired carrier in the sideband at the vision carrier frequency + 2.5 MHz*
2) *Undesired center carrier at the vision carrier frequency*
3) *Desired test carrier at the vision carrier frequency - 2.5 MHz*

Implementation

1. Set the **Bias Fine [I/Q]** actuators to zero.

2. *Course adjustment, center carrier*: Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.

3. *Sideband adjustment*: Use the **Gain [I/Q]** and **Phase** actuators to suppress the undesired carrier in the sideband by more than 70 dB with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.

4. *Course adjustment, center carrier optimization*: Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.

5. *Fine adjustment, center carrier*: If the center carrier is suppressed by less than 70 dB, carry out a fine adjustment using the **Bias Fine [I/Q]** actuators.
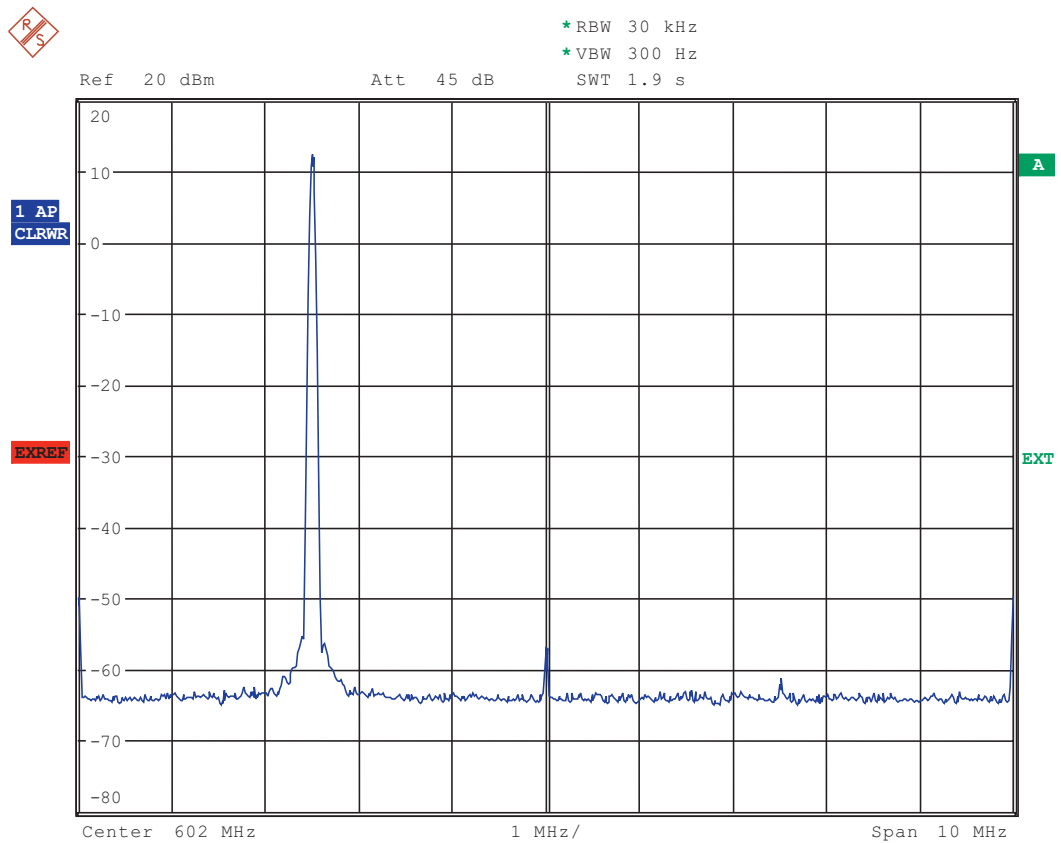
```
                                                         * RBW  30 kHz
                                                         * VBW  300 Hz
           Ref   20 dBm              Att   45 dB          SWT 1.9 s
            20
                                                                              A
            10

   1 AP
   CLRWR    0

           -10

           -20

   EXREF   -30                                                               EXT

           -40

           -50

           -60

           -70

           -80
           Center  602 MHz                   1 MHz/              Span  10 MHz
```

**Fig. 11** *Spectrum analyzer display after the adjustment*

6. Use the **I/Q Test Signal** switch to turn the test signal back off.

5 Outputstage A/B Menus

You can use the Outputstage A/B menus to operate and configure the transmitter rack and the amplifier and to call up information.

Note   *The Outputstage B menus and menu windows are identical to the Outputstage A menus and menu windows.*

5.1 Overview of Menus
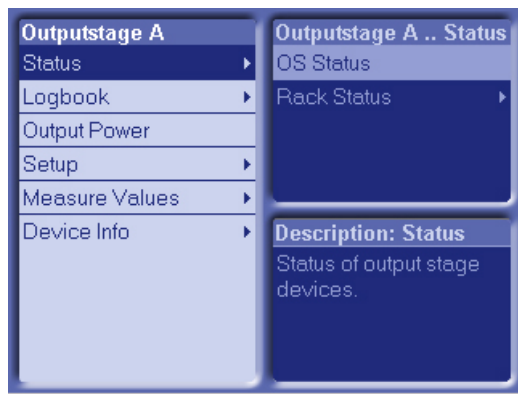
Outputstage A menu structure			
Level 1	**Level 2**	**Level 3**	**Level 4**
Status			
	OS Status		
	Rack Status		
		Rack 1	
			Rack controller
Logbook			
	Summary		
	Status		
	Warning		
	Fault		

| Outputstage A menu structure			
Output Power			
Setup			
	OS Setup		
Measure Values			
	Rack Measure Values		
		Rack 1	
Device Info			
	Rack 1		

5.2 Status Menu

The **Status** menu provides an overview of faults, warnings and status messages relating to the individual output stage components.

5.2.1 OS Status Menu Window

Outputstage A > **Status** > **OS Status**

The **OS Status** menu window provides an overview of faults, warnings and status messages relating to the output stage components.
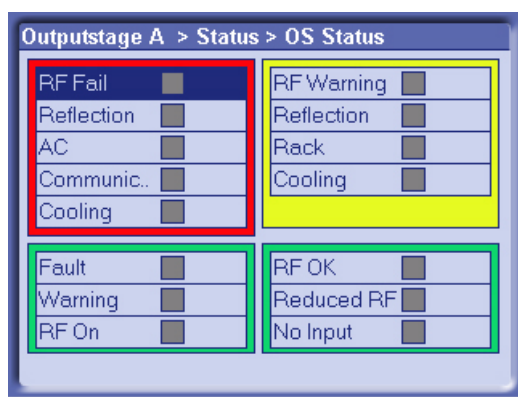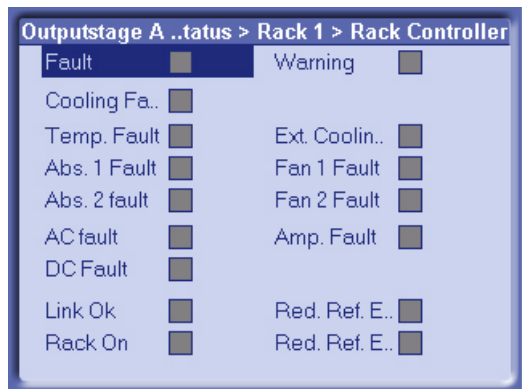

The following table explains the meaning of the individual display fields:

Display	Description
RF Fail	Red: Antenna output power below the fault threshold that has been set
Reflection	Red: Antenna reflected power above the fault threshold that has been set
AC	Red: Interference AC supply voltage (e.g. phase absent)
Communic..	Red: Communication to output stage interrupted
Cooling	Red: Disruption to cooling system, both fans failed
Fault	Red: Output stage sum fault
Warning	Yellow: Output stage sum warning
RF On	Green: Antenna output power above the fault threshold that has been set
RF Warning	Yellow: Antenna output power below the warning threshold that has been set
Reflection	Yellow: Antenna reflected power above the warning threshold that has been set
Rack	Yellow: Fault on at least one transmitter rack
Cooling	Yellow: Fault on cooling system
RF OK	Green: Antenna output power above the warning limit that has been set
Reduced RF	Yellow: Amplifiers operating on reduced power (VF absent)
No Input	Yellow: No input signal to amplifiers

5.2.2   Status/Rack Controller Menu Window

Outputstage A > **Status** > **Rack Status** > **Rack x** > **Rack Controller**

The **Status/Rack Controller** menu window provides you with status information about the rack controller.

The following table explains the meaning of the individual display fields:

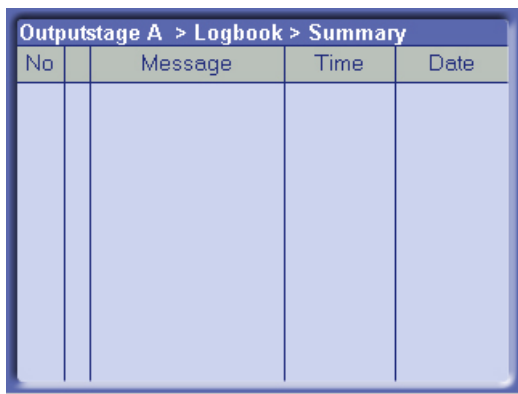| Display	Description
Fault	Red: Transmitter rack sum fault
Cooling Fa..	Red: Cooling system sum fault
Temp. Fault	Red: Outlet temperature above the fault threshold that has been set
Abs. 1 Fault	Red: Fault on absorber 1
Abs. 2 Fault	Red: Fault on absorber 2
AC Fault	Red: Network interference (e.g. phase absent)
DC Fault	Red: Fault on auxiliary power supply
Link OK	Green: Communication to transmitter rack present
Rack On	Green: On command present
Warning	Yellow: Transmitter rack sum warning
Ext. Coolin..	Yellow: Disruption to ext. cooling
Fan 1 Fault	Yellow: Fault on fan 1
Fan 2 Fault	Yellow: Fault on fan 2
Amp. Fault	Yellow: Amplifier sum fault (at least one amplifier showing interference)
Red. Ref. E.	Yellow: Exciter A initiates reduction in transmitter output power (VF absent)
Red. Ref. E.	Yellow: Exciter B initiates reduction in transmitter output power (VF absent)

5.3   Logbook Menu

You can use the **Logbook** menu to query status and error messages about the output stage.

5.3.1   Logbook Menu Window

Outputstage A > **Logbook**

You can use the **Logbook** menu to query status and error messages about the output stage. The Logbook menu windows provide an overview of status messages, warning messages and fault messages about the output stage.

Note   *You can call up Logbook entries via the **Summary**, **Status**, **Warning** and **Fault** windows.*

The following table explains the meaning of the columns:

Column	Description
No	Consecutive entry number
Message	Message
Time	Time the message was received
Date	Date the message was received

The arrows in the second column have the following meanings:

Arrow direction	Arrow color	Description
Up		The event has just occurred.
Down		The event is no longer current or relevant.
	Red	Fault

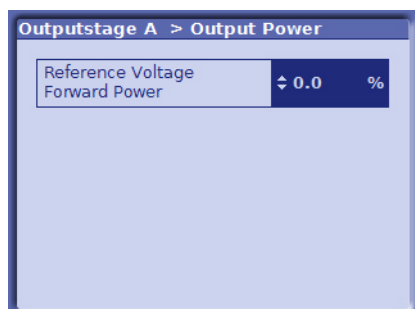| Arrow direction	Arrow color	Description
	Yellow	Warning
	Green	Status: In order

5.4 Output Power Menu

You may use the **Output Power** menu to access the **Output Power** window.

5.4.1 Output Power Menu Window

Outputstage A > **Output Power**

Use the **Output Power** menu window to set the transmitter output power.

The following table explains the meaning of the individual settings:

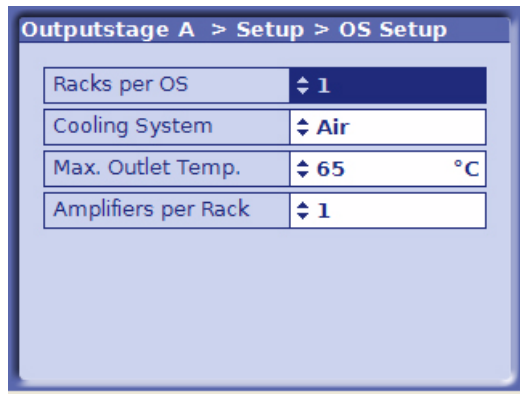| Setting	Description
Reference Voltage Forward Power	For setting the forward power. Values from 0% to 100%

5.5 Setup Menu

You may use the **Setup** menu to access the **OS Setup** window.

5.5.1 OS Setup Menu Window

Outputstage A > **Setup** > **OS Setup**

You can enter the basic settings for the output stage in the **OS Setup** menu window.

The following table explains the meaning of the individual settings:

| Setting	Description
Racks per OS	For entering the number of racks belonging to the transmitter
Cooling System	For setting the cooling system used Value: Air
Max. Outlet Temp.	For inputting the maximum permitted outlet air temperature If the entered limit is exceeded the rack controller switches off the transmitter rack. Value: 45 °C - 65 °C
Amplifiers per Rack	For entering the number of amplifiers installed in the rack Value: 1 - 4

5.6　Measure Values Menu

You can use the **Measure Values** menu to read results.

5.6.1　Measure Values/Rack Controller Menu Window

Outputstage A > **Measure Values** > **Rack Measure Values** > **Rack x** > **Rack Controller**

The **Measure Values/Rack Controller** menu window displays the inlet and outlet air temperatures and the transmitter rack control voltage.
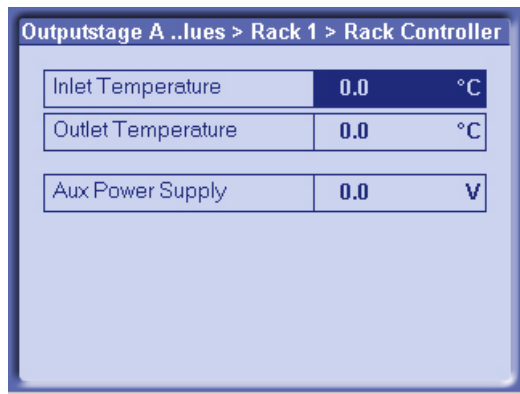
The following table explains the meaning of the fields:

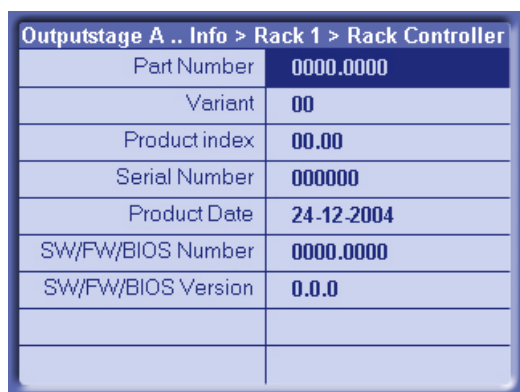| Display	Description
Inlet Temperature	Inlet temperature of the cooling medium (intake)
Outlet Temperature	Outlet temperature of the cooling medium (outgoing air)
Aux Power Supply	Control voltage of the internal auxiliary power supply for the transmitter rack The value must be between 3.7 V and 4.4 V.

5.7 Device Info Menu

You can use the **Device Info** menu to call for information on the transmitter rack.

5.7.1 Device Info/Rack Controller Menu Window

Outputstage A > **Device Info** > **Rack x** > **Rack Controller**

You can use the **Device Info/Rack Controller** menu to call for information on the transmitter rack.

The following table explains the meaning of the display fields:

Display	Description
Part Number	R&S stock number
Variant	Model (basic model = 02)
Product Index	Hardware amendment index
Serial Number	Serial number
Product Date	Date of production
SW/FW/BIOS Number	R&S stock number for software, firmware or BIOS
SW/FW/BIOS Version	Version number of software, firmware or BIOS