

R&S®SFC

Compact Modulator

Getting Started



2115.3691.02 – 05

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" document, which is available for download from the R&S SFC product page at www.rohde-schwarz.com/product/sfc.html > "Downloads" > "Firmware".

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

© 2015 Rohde & Schwarz GmbH & Co. KG

Mühldorfstr. 15, 81671 München, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

Email: info@rohde-schwarz.com

Internet: www.rohde-schwarz.com

Subject to change – Data without tolerance limits is not binding.

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.

Trade names are trademarks of the owners.

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

Contents

1	Preface	5
1.1	For Your Safety.....	5
1.2	Documentation Overview.....	5
1.3	Conventions Used in the Documentation.....	6
2	Setting Up the R&S SFC	7
2.1	Unpacking the R&S SFC.....	7
2.1.1	Inspecting for Shipping Damage.....	7
2.1.2	Unpacking the Cardboard Box.....	7
2.1.3	Checking the Accessories.....	8
2.1.4	Warranty Conditions.....	8
2.2	Putting Up the R&S SFC.....	8
2.2.1	Placing the R&S SFC on a Bench Top.....	8
2.2.2	Mounting the R&S SFC in a Rack.....	9
3	Interfaces and Connectors	10
3.1	Front Panel.....	10
3.1.1	Status Display LEDs.....	10
3.1.2	DIG I/Q.....	11
3.1.3	TS IN.....	12
3.1.4	1PPS.....	13
3.1.5	REF IN.....	13
3.1.6	RF.....	13
3.2	Rear Panel.....	14
3.2.1	AC Power Supply Connector and Switch.....	14
3.2.2	DVI-D.....	14
3.2.3	100 BASE-T.....	15
3.2.4	USB Interfaces.....	16
4	Connecting the R&S SFC	18
4.1	Preventing Electromagnetic Interference.....	18
4.2	Connecting to the AC Power Supply.....	18
4.3	Connecting External Devices.....	19

4.3.1	External Keyboard.....	20
4.3.2	Mouse.....	21
4.3.3	Memory Stick.....	21
4.3.4	External Monitor.....	21
5	Switching On or Off the R&S SFC.....	22
5.1	Switching On the R&S SFC.....	22
5.2	Switching Off the R&S SFC.....	23
5.3	Checking the Provided Options.....	23
5.4	Turn-On Tests.....	24
6	Sample Application.....	25
7	Operating the R&S SFC in a LAN.....	31
7.1	Connecting the R&S SFC to the Network.....	31
7.2	Establishing a Point-to-Point Connection.....	32
7.3	Zero Configuration Networking.....	32
7.4	Configuring the Network Card.....	33
7.5	Firewall Settings.....	34
8	Installed Software.....	35
8.1	Operating System.....	35
8.1.1	Login.....	35
8.1.2	Windows XP Start Menu.....	36
8.2	Additional Software.....	36
8.3	Windows XP Recovery and Backup Partition.....	36
8.3.1	Windows XP Embedded Recovery and Backup Partition Dialog.....	36
9	Maintenance.....	41
9.1	Cleaning the Instrument.....	41
9.2	Storing the Instrument.....	42
	Index.....	43

1 Preface

This chapter provides safety related information, an overview of the user documentation and the conventions used in the documentation.

1.1 For Your Safety

The product documentation helps you to use the R&S SFC safely and efficiently. Keep the product documentation in a safe place and pass it on to the subsequent users. Use the R&S SFC only in its designated purpose as described in the product documentation. Observe the performance limits and operating conditions stated in the specifications (data sheet).

Safety information is part of the product documentation. It warns you about the potential dangers and gives instructions how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In the "Basic Safety Instructions", safety issues are grouped according to subjects. For example one subject is electrical safety. The "Basic Safety Instructions" are delivered with the R&S SFC in different media and languages: on the CD-ROM, in the printed safety brochure and in the printed getting started manual.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

Always read the safety instructions carefully. Make sure to fully comply with them. Do not take risks and do not underestimate the potential danger of small details such as a damaged power cable.

1.2 Documentation Overview

Getting started

This manual is delivered with the instrument in printed form. It is an excerpt from the user manual (see below) and provides the information needed to set up the R&S SFC and start working with it. Also a sample application is described. For instructions on installation, refer to the release notes. The printed getting started manual also includes general information, e.g. the basic safety instructions. In PDF format, it is included in the user manual to allow quick access to the information needed.

User manual

This manual is delivered with the instrument on CD-ROM. It provides the necessary information to work with the instrument. For additional information on default settings and parameters, refer to the data sheet.

Help

The help is context-sensitive and provides a quick access to the complete description. To avoid crowding the screen, the screenshots are omitted.

For detailed information on how to use the help, refer to the chapter "Operating Concepts".

1.3 Conventions Used in the Documentation

The following conventions are used throughout this documentation.

Typographical conventions

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialogs, menus, options, buttons, and softkeys are enclosed by parentheses.
KEYS	Key names are written in capital letters.
File names, commands, program code	File names, commands, coding samples and screen output are distinguished by their font.
<i>Input</i>	Input to be entered by the user is displayed in italics.
Links	Links are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by parentheses.

Conventions for procedure descriptions

When describing how to operate the R&S SFC, several alternative methods may be available to perform the same task. If possible, the procedure using the front panel is described.

The terms "select" and "press" may refer to any of the described methods, i.e. using a key on the R&S SFC or on a keyboard, or a mouse pointer in the display.

2 Setting Up the R&S SFC

WARNING

Risk of injuries

To avoid injuries to yourself or others, always follow the instructions provided in the following chapters. Furthermore, observe the general safety instructions at the beginning of this manual.

2.1 Unpacking the R&S SFC

The R&S SFC is shipped together with its mandatory accessories in a cardboard box.

2.1.1 Inspecting for Shipping Damage

Check the following. If anything is damaged, immediately notify the carrier.

1. Check the shipping container and cushioning material for damage.
2. Unpack the cardboard box (see [Chapter 2.1, "Unpacking the R&S SFC"](#), on page 7) and check the housing and handle for visible damages or loose parts.

2.1.2 Unpacking the Cardboard Box

Proceed as follows:

1. Open the cardboard box.
2. Remove the accessories packed into the box.
3. Take the R&S SFC out of the packaging.
4. Remove the shock protectors attached to the R&S SFC.



Retain the original packing material. If the R&S SFC needs to be transported or shipped at a later date, you can use the material to prevent control elements and connectors from being damaged. Rohde & Schwarz will only accept claims of warranty if the R&S SFC is shipped with sufficient packaging.

2.1.3 Checking the Accessories

The R&S SFC comes with the following accessories:

- Power cable
- Getting started manual
- CD-ROM containing the complete user documentation and firmware

2.1.4 Warranty Conditions

For information on warranty conditions for the R&S SFC refer to the terms of the delivery documents.

2.2 Putting Up the R&S SFC

The R&S SFC is designed for interior use only. The R&S SFC can be used in stand-alone operation or can be installed in a rack.

NOTICE

Risk of material damage

Make sure that the following conditions are met at the operation site:

- The ambient temperature does not exceed the range specified in the data sheet.
- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is at least 10 cm.

Failure to meet these conditions may cause damage to the R&S SFC or other devices in the test setup.

If necessary, use proper protective equipment to protect DUTs against electrostatic discharge in the event of human contact.

2.2.1 Placing the R&S SFC on a Bench Top

The R&S SFC is designed for use under general laboratory conditions.

⚠ WARNING**Risk of injuries**

If the R&S SFC is not set up securely, you or others can be injured.

Place the R&S SFC on a stable and level surface. Do not place anything on top of the R&S SFC, if the R&S SFC is not in a level position.

Before folding out the feet at the R&S SFC bottom, read the safety instructions for instruments with fold-out feet at the beginning of this manual carefully.

2.2.2 Mounting the R&S SFC in a Rack

The R&S SFC may be installed in a 19" rack mount by using a rack adapter kit (for order no. see data sheet). Follow the installation instructions that are part of the adapter kit.

3 Interfaces and Connectors

This chapter describes the front panel and the rear panel of the R&S SFC, including all status displays and connectors. See the data sheet for information about permissible levels on the inputs and output levels on the outputs.

If you use the interfaces and connectors, take care to avoid electromagnetic interference. For details see [Chapter 4.1, "Preventing Electromagnetic Interference"](#), on page 18.

3.1 Front Panel

This chapter provides an overview of the controls and connectors on the front panel. Each control or connector is briefly described along with a reference to the chapter(s) containing detailed information about its usage.

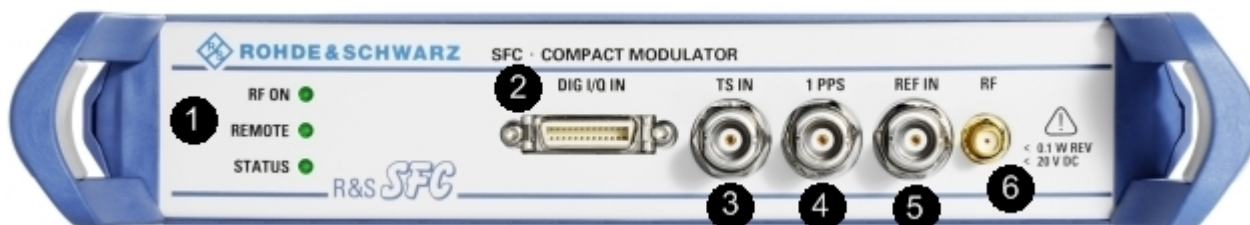


Figure 3-1: Front panel view

- 1 = Status display LEDs
- 2 = Digital I/Q input
- 3 = Transport stream input
- 4 = Pulse input
- 5 = Reference frequency input
- 6 = RF output

3.1.1 Status Display LEDs

See (1) in [Figure 3-1](#).

The basic state is indicated by LEDs.

RF ON

Displays the status of the RF output.

- LED off: RF output is switched off.
- LED green: RF output is switched on.

REMOTE

Displays the remote control status.

- LED off: R&S SFC is not used for remote control.

- LED green: R&S SFC is connected to the USB host.

STATUS

Displays the error status.

- LED green: neither warning nor error is present.
- LED yellow: a warning is present, but no error.
- LED red: an error is present.

3.1.2 DIG I/Q

Requires the extended I/Q input option (R&S SFC-K80). Used to receive digital I/Q signals from another R&S instrument with the same interface.

For further details see the user manual or the help system.



3.1.2.1 DIG I/Q IN

Digital I/Q input of the R&S SFC.

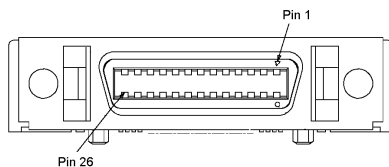


Table 3-1: Input pin assignment

Pin	Name	Signal
1	DIG_IQ_CLK2+	Data clock 2 (control signal)
2	GND	Ground (control signal)
3	DIG_IQ_IN_D0+	Data bit (LSB), OUT/IN 0 line (I/Q signal)
4	DIG_IQ_IN_D1+	Data bit, OUT/IN 1 line (I/Q signal)
5	DIG_IQ_IN_D2+	Data bit, OUT/IN 2 line (I/Q signal)
6	DIG_IQ_IN_CLK1+	Data clock 1 (I/Q signal)
7	DIG_IQ_IN_SCLK	Serial clock (control signal)
8	+U5V2	+5 V (control signal)
9	DIG_IQ_IN_D3+	Data bit, OUT/IN 3 line (I/Q signal)
10	DIG_IQ_IN_D4+	Data bit, OUT/IN 4 line (I/Q signal)

Pin	Name	Signal
11	DIG_IQ_IN_D5+	Data bit, OUT/IN 5 line (I/Q signal)
12	DIG_IQ_IN_D6+	Data bit, OUT/IN 6 line (I/Q signal)
13	DIG_IQ_IN_D7+	Data bit (MSB), OUT/IN 7 line (I/Q signal)
14	DIG_IQ_CLK2-	Data clock 2 (control signal)
15	DIG_IQ_IN_D0-	Data bit (LSB), OUT/IN 0 line (I/Q signal)
16	DIG_IQ_IN_D1-	Data bit, OUT/IN 1 line (I/Q signal)
17	DIG_IQ_IN_D2-	Data bit, OUT/IN 2 line (I/Q signal)
18	DIG_IQ_IN_CLK1-	Data clock 1 (I/Q signal)
19	GND	Ground (control signal)
20	DIG_IQ_IN_SDAT	Serial data (control signal)
21	DIG_IQ_IN_D3-	Data bit, OUT/IN 3 line (I/Q signal)
22	DIG_IQ_IN_D4-	Data bit, OUT/IN 4 line (I/Q signal)
23	DIG_IQ_IN_D5-	Data bit, OUT/IN 5 line (I/Q signal)
24	DIG_IQ_IN_D6-	Data bit, OUT/IN 6 line (I/Q signal)
25	DIG_IQ_IN_D7-	Data bit (MSB), OUT/IN 7 line (I/Q signal)
26	GND	Ground (control signal)

Line pairs have a name that only differs in the last character. For example, the pins 1 and 14 are a pair.

3.1.3 TS IN

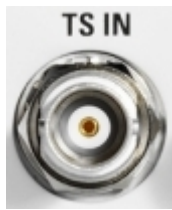
BNC connector. Used to feed in a serial MPEG2 transport stream.

These inputs handle a serial signal with one of three formats:

- ASI (asynchronous serial interface)
- SMPTE 310 (Society of Motion Picture and Television Engineers)
- ETI (TS2 IN only)

To select the input, select "DIGITAL TV" menu, "INPUT SIGNAL", "INPUT". For further details see the user manual or the help system.

For the T-DMB / DAB transmission standard, TS IN is used as an external ETI input (ensemble transport interface). TS IN is conform to the ETS 300 799 specification. ETI NI (network independent) and ETI NA 5592 or ETI NA 5376 (network adaptation) signals are accepted.



3.1.4 1PPS

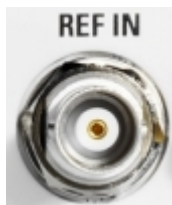
BNC connector. Input for the 1 pulse per second signal used in SFN modes.



3.1.5 REF IN

BNC connector. Used to input the reference frequency.

For further details see user manual or the help system.



3.1.6 RF

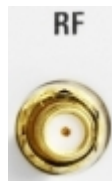
See (6) in [Figure 3-1](#).

SMA connector. Used to output the RF signal.

NOTICE

Do not overload the RF output

See the data sheet for the limits for the DC voltage and reverse RF power. Do not exceed these limits. Exceeding these limits can cause instrument damage.



3.2 Rear Panel

This chapter provides an overview of the controls and connectors on the rear panel. Each control or connector is briefly described along with a reference to the chapter(s) containing detailed information about its usage.



3.2.1 AC Power Supply Connector and Switch

The IEC 320 / EN 60320 AC power supply connector and the AC power switch are combined (type C14).

The AC power switch is located on the right of the AC power connector.



Switch positions:

- I: The R&S SFC is in operation.
- O: The entire instrument is disconnected from the AC power supply.

For further information:

- See [Chapter 4.2, "Connecting to the AC Power Supply"](#), on page 18
- See [Chapter 5, "Switching On or Off the R&S SFC"](#), on page 22

3.2.2 DVI-D

The DVI-D socket provides the monitor output signal of the built-in computer. The connected computer monitor should provide a resolution of 1024x768 pixels or higher.



You can use a DVI-I cable for connecting R&S SFC and display, but the analog video interface (pins C1 to C4) is not provided by the R&S SFC.

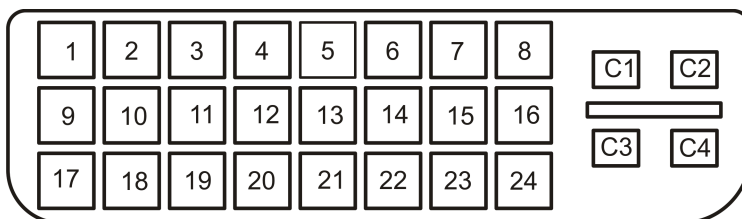


Table 3-2: Pin assignment

Pin	Signal	Pin	Signal
1	TMDS Data 2-	15	Ground (for +5V)
2	TMDS Data 2+	16	Hot Plug Detect (HPD)
3	TMDS Data 2 Shield	17	TMDS Data 0-
4	Not used	18	TMDS Data 0+
5	Not used	19	TMDS Data 0 Shield
6	DDC Clock	20	Not used
7	DDC Data	21	Not used
8	Analog Vertical Sync	22	TMDS Clock Shield
9	TMDS Data 1-	23	TMDS Clock+
10	TMDS Data 1+	24	TMDS Clock-
11	TMDS Data 1 Shield	C1	Not used
12	Not used	C2	Not used
13	Not used	C3	Not used
14	+5V Power	C4	Not used

3.2.3 100 BASE-T

1 Gigabit LAN interface (100 Base-T).

Used to connect the R&S SFC to a local network for remote control, remote operation, printouts and data transfer. The assignment of the RJ.45 CAT5 connector supports twisted pair category 7 UTP/STP cables in a star configuration (UTP stands for "unshielded twisted pair", and STP for "shielded twisted pair").



Do not connect or disconnect the network cable until the instrument is switched off. Otherwise, the network connection cannot be reliably detected.

Electromagnetic interference (EMI) can affect the measurement results. To avoid any impact, use category 7 cables.

For further information:

- See [Chapter 7, "Operating the R&S SFC in a LAN"](#), on page 31
- See user manual or the help system for remote control using the Ethernet

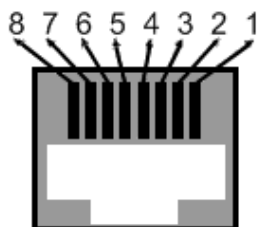


Table 3-3: Pin assignment

Pin	Abbreviation	Signal
1	TXD+	Transmit data, positive
2	TXD-	Transmit data, negative
3	RXD+	Receive data, positive
4, 5	R0	Termination, 75R
6	RXD-	Receive data, negative
7, 8	R1	Termination, 75R

3.2.4 USB Interfaces

Two USB (universal serial bus) interfaces of the type A (host USB) are provided. Use the interfaces to connect external devices like a keyboard, mouse, printer, memory stick ([Chapter 4.3, "Connecting External Devices"](#), on page 19), or to perform a firm-ware update.



Electromagnetic interference (EMI) can affect the measurement results. To avoid any impact, make sure that the following conditions are met:

- Use suitable double-shielded cables.
- Do not use USB connecting cables exceeding 1 m in length.
- Use only USB devices that remain within the permissible EMI limits.

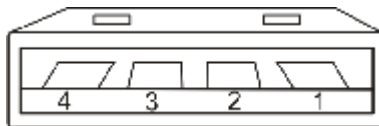


Table 3-4: Pin assignment

Pin	Abbreviation	Signal
1	PWR	+ 5 V / + 0.5 A max!
2	D-	Data -
3	D+	Data +
4	GND SHIELD	Ground

4 Connecting the R&S SFC

This chapter describes how to connect the R&S SFC to the power supply and external devices.

4.1 Preventing Electromagnetic Interference

To prevent electromagnetic interference, the R&S SFC must be operated with all shielding covers fitted. Only suitable and shielded signal and control cables may be used.

RF/ASI inputs and outputs

In particular cables that are connected to these inputs/outputs can cause EMC problems. Therefore these cables should have at least 80 dB to 1 GHz shielding. This is usually achieved by means of double-shielded cables.

USB interfaces

To connect the USB interfaces, only use peripheral equipment that does not cause limit violations. For details see [Chapter 3.2.4, "USB Interfaces"](#), on page 16.

Digital I/Q input

To connect to DIG I/Q IN, use a double-shielded cable.

LAN interface (100 BASE-T)

To connect the LAN interface (100 BASE-T), use a suitable cable. For details see [Chapter 3.2.3, "100 BASE-T"](#), on page 15.

DVI-D

To connect the DVI-D interface, use a cable shielded with ferrite cores.

All other cables can be single shielded. The AC cable is unshielded.

4.2 Connecting to the AC Power Supply

The R&S SFC can be used with different AC power voltages and adapts itself automatically to it. Adjusting the R&S SFC to a particular AC supply voltage is therefore not required. Refer to the data sheet for the requirements of voltage and frequency.

⚠ WARNING**Shock hazard**

Observe the basic safety instructions at the beginning of this manual, especially the instructions on electrical safety.

Take care that the AC voltage lies within the limits printed on the AC power connector of the R&S SFC and listed in the data sheet.

- ▶ Connect the R&S SFC to the AC power supply, using the power cable that is supplied. The AC power connector is located on the rear panel of the R&S SFC. The R&S SFC complies with safety class EN61010-1. The R&S SFC's power supply must be connected to a socket with protective earth contact.

For further information see [Chapter 3.2.1, "AC Power Supply Connector and Switch"](#), on page 14.

4.3 Connecting External Devices

Using the USB interfaces, you can directly connect USB devices to the R&S SFC. This number can be increased as necessary by using USB hubs.

Due to the large number of available USB devices, there is almost no limit to the possible expansions. In the following, USB devices that can be useful are listed.

- Keyboard for entering comments, file names, etc. or for easy access to Windows XP settings. See [Chapter 4.3.1, "External Keyboard"](#), on page 20.
- Mouse for easy operation of Windows dialogs. See [Chapter 4.3.2, "Mouse"](#), on page 21.
- Memory stick for easy transfer of data to/from a computer (e.g. firmware updates). See [Chapter 4.3.3, "Memory Stick"](#), on page 21.
- CD-ROM drives for easy installation of firmware applications.
- Printer for printing out measurement results.

To install a USB device

1. Connect the USB device to the R&S SFC. You can do this during operation because all USB devices are Plug and Play.
Windows XP automatically searches for a suitable device driver.
2. If Windows XP does not find a suitable driver, it will prompt you to specify a directory that contains the driver software. If the driver software is on a CD-ROM, connect a USB CD-ROM drive to the R&S SFC before proceeding.

To uninstall a USB device

- ▶ Disconnect the USB device from the R&S SFC. You can do this during operation.

Windows XP immediately detects the change in the hardware configuration and deactivates the corresponding driver.

4.3.1 External Keyboard

Connect the keyboard to one of the USB interfaces (type A). The default language setting is for a UK keyboard. You can change the language and modify other settings such as the repetition rate in Windows XP.

Changing Regional and Language Settings

1. Open the "Start" menu by pressing the WINDOWS key on an external keyboard.
2. Select "Control Panel" and then "Keyboard" or "Regional and Language Options".

During remote operation, you can use the following virtual keys provided in the "HARD-KEY" menu. These keys are not available on the front panel.

Table 4-1: Corresponding keys: virtual keys - external keyboard

Virtual key	Corresponding key on keyboard	Function description
HELP	F1	Opens and closes the context-sensitive help function. For details see user manual or the help system
ASSIGN	F2	Starts management of favorites. For details see user manual or the help system
LOCAL	F3	Switches from remote control or remote operation to manual operation. For details see user manual or the help system
PRESET	F4	Sets the instrument to a defined state. For details see user manual or the help system
FILE	F5	Opens the menu for saving instrument settings. For details see user manual or the help system
SETUP	F6	Opens the setup menu for general instrument settings. For details see user manual or the help system

Virtual key	Corresponding key on keyboard	Function description
HOME	F8	Resets tree navigation. For details see user manual or the help system
APPL	F9	Selects another application. For details see user manual or the help system

4.3.2 Mouse

You can change settings such as the speed of the mouse cursor in Windows XP.

Changing Mouse Settings

1. Open the "Start" menu by pressing the WINDOWS key on an external keyboard.
2. Select "Control Panel" and then "Mouse".

4.3.3 Memory Stick

The R&S SFC has a disk drive. You can exchange data by using a memory stick which you plug into one of the USB interfaces. The memory stick is automatically assigned a free drive letter and you can use Windows Explorer to transfer data.

4.3.4 External Monitor

To connect the monitor, see [Chapter 3.2.2, "DVI-D"](#), on page 14.



If you have used the R&S SFC without monitor before, activate the DVI-D interface by pressing the CTRL+ALT+F4 key combination, several times if necessary.

For details on remote operation see the user manual or the help system.

5 Switching On or Off the R&S SFC

⚠ WARNING

Shock hazard

Observe the basic safety instructions at the beginning of this manual, especially the instructions on electrical safety.

5.1 Switching On the R&S SFC

NOTICE

Risk of instrument damage

Before switching on the R&S SFC, make sure that the following conditions are met:

- The R&S SFC is set up as described in [Chapter 2, "Setting Up the R&S SFC"](#), on page 7.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded. In particular, do not exceed the maximum permissible reverse power allowed at the RF output.

The values are specified in the data sheet. Failure to meet these conditions may cause damage to the R&S SFC or other devices in the test setup.

To switch on the R&S SFC

1. Make sure that the R&S SFC is connected to a power supply (for details see [Chapter 4.2, "Connecting to the AC Power Supply"](#), on page 18).
2. Press the AC power switch on the rear panel into I position (for details see [Chapter 3.2.1, "AC Power Supply Connector and Switch"](#), on page 14).

The R&S SFC starts booting:

- The installed BIOS version and some of the computer features are displayed on the screen for a few seconds.
- The Windows XP Embedded operating system is booted, followed by the R&S SFC firmware.
- A self-test is performed.

After booting is completed, the main screen of the R&S SFC is displayed, and the R&S SFC is ready for operation.

If the external monitor remains dark, proceed as described in [Chapter 4.3.4, "External Monitor"](#), on page 21.

The configuration settings that were active before the R&S SFC was last switched off are automatically restored.

Use the "FILE" menu to load another instrument setting. For details see the user manual or the help system.

5.2 Switching Off the R&S SFC

NOTICE

Risk of losing data

If you set the power switch to the O position before the R&S SFC settings have been saved, the current settings will be lost.

To switch off the R&S SFC

1. Check the status displays on the front panel of the R&S SFC. If the REMOTE status display on the front panel is on, do not switch off the R&S SFC. Someone else is using the R&S SFC by means of remote control (see also [Chapter 3.1.1, "Status Display LEDs"](#), on page 10).
2. Set the AC switch on the rear panel of the R&S SFC to the O position.
None of the LEDs on the front panel should be lit.

5.3 Checking the Provided Options

The R&S SFC may be equipped with options. In order to check whether the installed options correspond to the options indicated on the delivery note, proceed as follows.

Connect an external monitor ([Chapter 4.3.4, "External Monitor"](#), on page 21) or use remote operation (for details see user manual).

1. In the "HARDKEY" menu, select "SETUP".
2. In the tree, select "INFO HARDWARE" to display a list showing the currently installed hardware.
3. Check the availability of the hardware options as indicated in the delivery note.
4. In the tree, select "SOFTWARE OPTIONS" and then "ACTIVE OPTIONS" to display a short tabular overview of the enabled software options.
5. Check the availability of the software options as indicated in the delivery note.

For further details see the user manual or the help system.

For an overview of the all options available for the R&S SFC refer to the Rohde & Schwarz Homepage.

5.4 Turn-On Tests

If an error is detected, an error indication is displayed in the error/warnings line along with a brief description of the error.

- ▶ To obtain more information about the error, press the "ERROR/WARNING DETAILS" softkey.

A description of the error(s) or warning(s) is displayed.

For further details see the user manual or the help system.

Besides automatic monitoring of instrument functions, the R&S SFC also offers the following way of ensuring proper operation.

System adjustment

Use the SETUP menu to carry out an internal adjustment. This is a way of obtaining the best possible IQ modulator performance and level accuracy, for example.

1. In the "HARDKEY" menu, select "SETUP".
2. In the tree, select "ADJUSTMENT".

For further details see the user manual or the help system.

6 Sample Application

The following example involves the following main steps:

- Feed an MPEG2 transport stream to the R&S SFC using the serial interface (TS IN, see [Chapter 3.1.3, "TS IN"](#), on page 12) on the front panel.
- This MPEG2 transport stream undergoes channel encoding and modulation for transmission in compliance with the DVB-C specification. To achieve this, perform the following step-by-step instructions. The involved settings are summed up in [Table 6-1](#).
- The result is output as an RF signal on the RF output.

Table 6-1: Involved settings

Parameter	Value
Center frequency	330 MHz
Level	-20.0 dBm
Transmission standard	DVB-C
Constellation	64 QAM
Symbol rate	6.9 MS/s
Roll off	0.15

If you connect an external monitor, keyboard and mouse (see [Chapter 4.3, "Connecting External Devices"](#), on page 19) or operate the R&S SFC using an external computer, you can use the graphical user interface. The following step-by-step instructions describe how to perform the sample application.



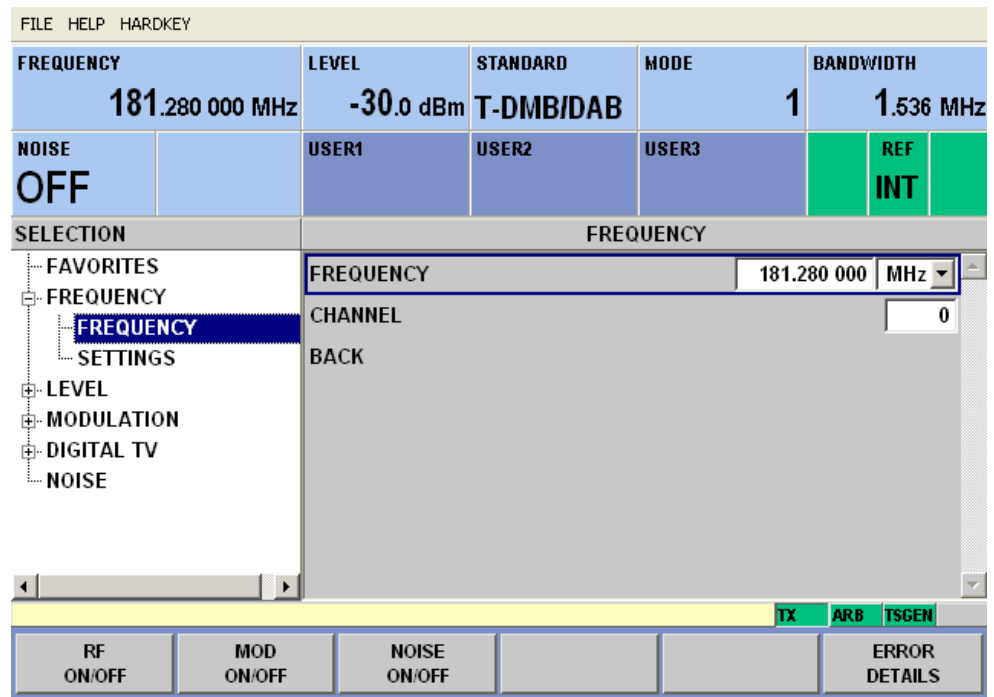
An explanation of the graphical user interface and information on how to select items, open lists and enter parameters are provided in the user manual or the help system.

Selecting the transmitter application (TX)

1. In the "HARDKEY" menu, select "APPL".
2. Select the TX application (DVB-C transmission is a transmitter application).
3. Press the ENTER key.
The TX application is displayed.

Setting the output frequency

1. In the tree, select the "FREQUENCY" menu.
2. Press the ENTER key.
The tree is expanded and the "FREQUENCY" submenu is displayed.



3. In the tree, select the "FREQUENCY" submenu.

4. Press the ENTER key.

The focus is set on the work view.

5. Set a frequency of 330 MHz.

a) Select the "FREQUENCY" field.

b) Enter 330.

c) Press the ENTER key.

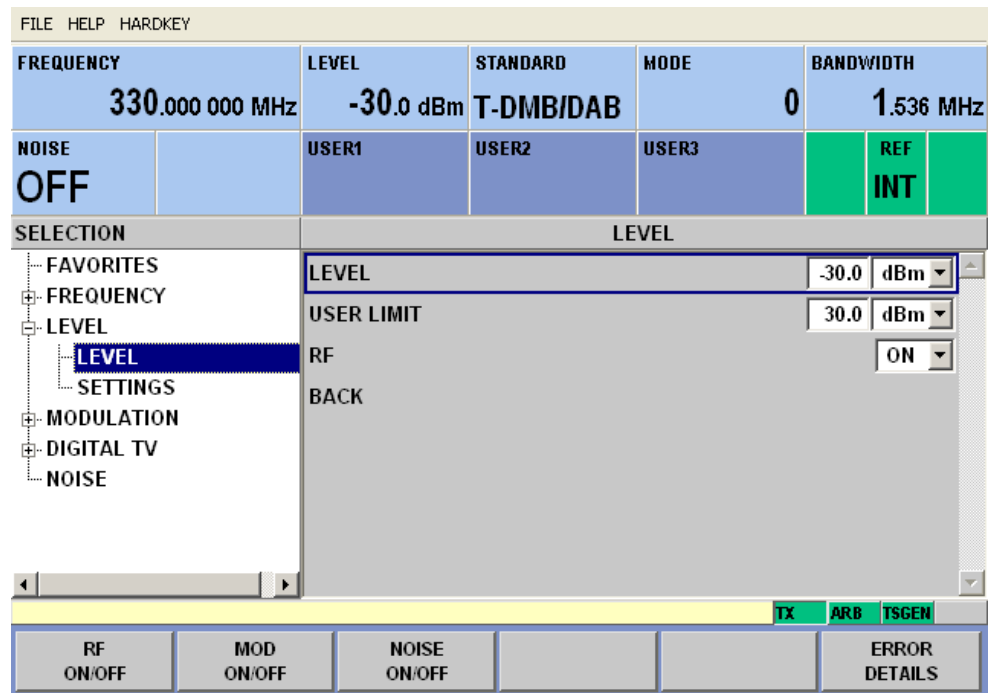
The entered frequency is displayed in the info area.

Setting the output level

1. In the tree, select the "LEVEL" menu.

2. Press the ENTER key.

The tree is expanded and the "LEVEL" submenu is displayed.

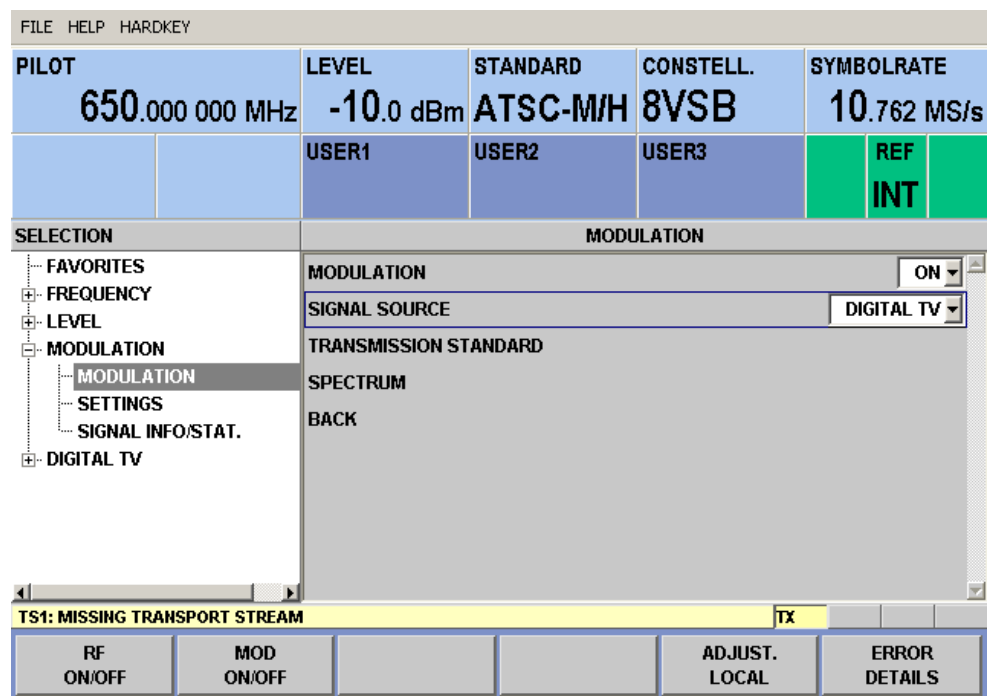


3. In the tree, select the "LEVEL" submenu.
4. Press the ENTER key.
The focus is set on the work view.
5. Set a level of -20 dBm.
 - a) Select the "LEVEL" field.
 - b) Enter -20.
 - c) Press the ENTER key.
 - d) If you want to enter the level in a different unit, change the unit in the "LEVEL" menu, under "SETTINGS" / "LEVEL UNIT" first (see user manual or help system).

The entered level is displayed in the info area.

Setting the modulation parameters and selecting the transmission standard

1. In the tree, select the "MODULATION" menu.
2. Press the ENTER key.
The tree is expanded and the "MODULATION" submenu is displayed.



3. In the tree, select the "MODULATION" submenu.
4. Press the ENTER key.
The focus is set on the work view.
5. Activate the modulation.
 - a) Select the "MODULATION" field.
 - b) Press the ENTER key to display the list.
 - c) Select "ON".
 - d) Press the ENTER key to confirm the selection.
6. Select the "DIGITAL TV" signal source.
 - a) Select the "SIGNAL SOURCE" field.
 - b) Press the ENTER key to display the list.
 - c) Select "DIGITAL TV".
 - d) Press the ENTER key to confirm the selection.
7. Depending on the installed options, select the "DVB-C" transmission standard.
 - a) Select the "TRANSMISSION STANDARD" field.
 - b) Press the ENTER key to display the list.
 - c) Select "DVB-C".
 - d) Press the ENTER key to confirm the selection.

The selected standard is displayed in the info area.

The I/Q modulation is switched on, the internal coder is selected as the signal source, and the DVB-C transmission standard is set.

Selecting the transport stream input and setting the DVB-C transmission parameters

1. In the tree, select the "DIGITAL TV" menu.
2. Press the ENTER key.
The tree is expanded and the "DIGITAL TV" submenu is displayed.
(See [Figure 6-1](#).)
3. In the tree, select the "INPUT SIGNAL" submenu.
4. Press the ENTER key.
The focus is set on the work view.

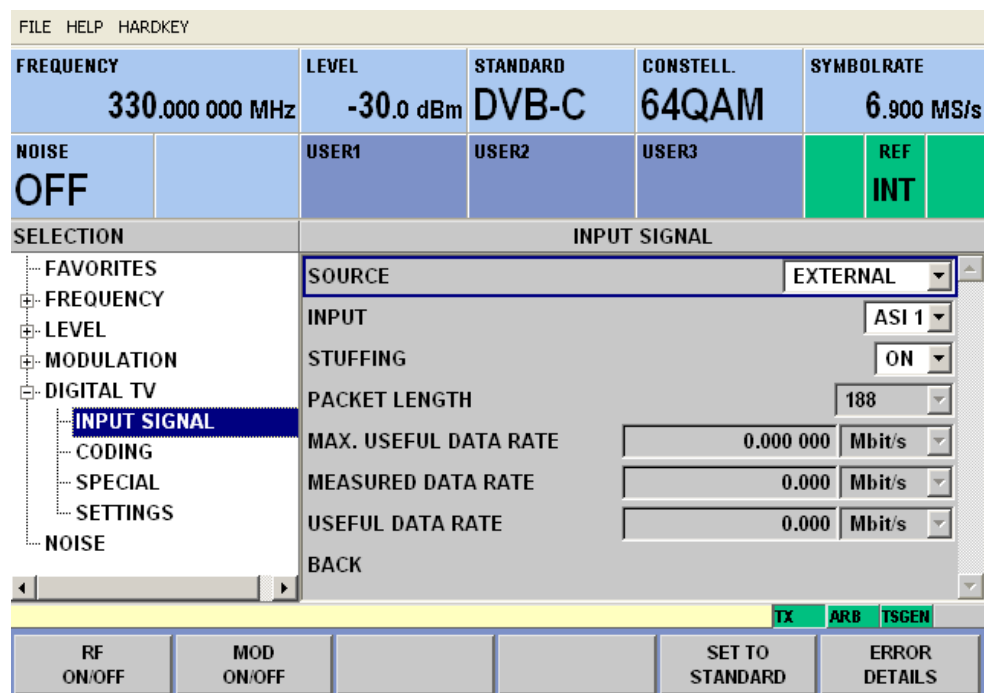


Figure 6-1: DIGITAL TV menu

5. Select the "EXTERNAL" signal source.
 - a) Select the "SOURCE" field.
 - b) Press the ENTER key to display the list.
 - c) Select "EXTERNAL".
 - d) Press the ENTER key to confirm the selection.
6. Select the "ASI 1" input.
 - a) Select the "INPUT" field.
 - b) Press the ENTER key to display the list.
 - c) Select "ASI 1".
 - d) Press the ENTER key to confirm the selection.
7. Make sure that the "STUFFING" field in the work view is set to "ON".

This ensures that the incoming transport stream will be adapted to the proper data rate of the coder. The data rate of the coder will depend on the transmission parameters. The data stream is padded with null packets to allow adaptation to the transmission parameters.

- a) Select the "STUFFING" field.
- b) Press the ENTER key to display the list.
- c) Select "ON".
- d) Press the ENTER key to confirm the selection.

8. Select "BACK" and press the ENTER key.

The focus is set to the tree.

9. In the tree, select the "CODING" submenu.

10. Press the ENTER key.

The focus is set on the work view.

11. Select a symbol rate of 6.9 .MS/s.

- a) Select the "SYMBOL RATE" field.
- b) Enter 6.9.
- c) If the units field to the right shows "MS/s", press the ENTER key.
- d) If the units field indicates another unit, select this field. Press the ENTER key, and select the "MS/s" unit. Press the ENTER key twice to confirm the unit and the symbol rate.

The selected symbol rate is displayed in the info area.

12. Select the "64 QAM" constellation.

- a) Select the "CONSTELLATION" field.
- b) Press the ENTER key to display the list.
- c) Select "64 QAM".
- d) Press the ENTER key to confirm the selection.

The selected constellation is displayed in the info area.

7 Operating the R&S SFC in a LAN

The R&S SFC is equipped with a network interface and can be connected to an Ethernet LAN (local area network). The network card operates with 100 MBit Ethernet IEEE 802.3u. The TCP/IP network protocol and the associated network services are pre-configured.

To be able to exchange data within a local area network (LAN), every computer or instrument that is connected must have a unique IP address or a unique computer name. Access between different users is managed with access authorizations.

Provided the appropriate rights have been assigned and the Windows XP firewall configuration is adapted accordingly, the interface can be used e.g. for transferring data, printing on network printers, operating the R&S SFC from a remote computer.

To use network resources, access must be granted. To share files on the R&S SFC with other network users, access to instrument resources, e.g. the hard drives, must also be granted. All these administration tasks are normally performed by a network administrator using the Windows XP Start menu (for details refer to the Windows XP help system). Contact your network administrator for access authorizations.

User name and password of the R&S SFC are factory-set. The user name is used for auto login, access authorization and remote operation.

For further information:

- See [Chapter 8.1.1, "Login"](#), on page 35
- See [Chapter 3.2.3, "100 BASE-T"](#), on page 15
- See the user manual or help system for details on remote operation.

7.1 Connecting the R&S SFC to the Network

NOTICE

Risk of network failure/virus infection

Before connecting the R&S SFC to the network or configuring the network, do the following:

- Consult your network administrator.
- If your network does not support DHCP or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information before connecting the R&S SFC to the LAN.

Errors may affect the entire network.

Efficient virus protection is a prerequisite for secure operation in the network. Never connect the R&S SFC to a network without proper protection against a virus infection, as doing so may cause damage to the instrument software.

To connect the R&S SFC to the network

1. Fulfill all prerequisites mentioned above.
2. Make sure that the R&S SFC is switched off. This is the only way to ensure that the network connection is reliably detected and any disruptions during the operation of the R&S SFC are avoided.
3. Connect the R&S SFC to the network using a CAT-5 RJ-45 cable.
4. Switch on the R&S SFC.

To disconnect the R&S SFC from the network

1. Make sure that the R&S SFC is switched off.
2. Disconnect the R&S SFC from the network.

7.2 Establishing a Point-to-Point Connection

To set up a single network (a LAN connection between an R&S SFC and a single computer without integration into a larger network), an IP address needs to be assigned to the R&S SFC and the computer. The IP addresses 192.168.xxx.yyy are available for use here. xxx and yyy can assume values of 1 to 254, and the value for the subnet mask is 255.255.255.0.

- ▶ Connect the R&S SFC and the computer with a standard RJ-45 cross-over cable.

7.3 Zero Configuration Networking



This service is available in firmware version V02.00 and later.

The R&S mDNS Service is installed with the firmware. Using this service, you can connect to a network automatically. You do not need to set up services, such as dynamic host configuration protocol (DHCP) and domain name system (DNS), or configure the network settings manually (see [Chapter 7.4, "Configuring the Network Card"](#), on page 33).

7.4 Configuring the Network Card

Under Windows XP, network card drivers do not need to be installed separately. If the R&S SFC is connected to the LAN, Windows XP automatically detects the network connection and activates the required drivers.

The configuration tasks depend on whether your network has a DHCP server or not. If necessary, ask your network administrator.



If you use the R&S mDNS Service, you do not need to configure at all. For details see [Chapter 7.3, "Zero Configuration Networking"](#), on page 32.

Networks with DHCP Server

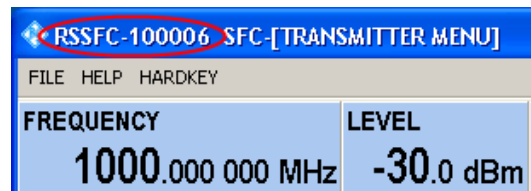
The R&S SFC is preconfigured for networks using the dynamic host configuration protocol (DHCP). In such networks, the instrument is automatically assigned a free IP address. Identification in the network is based on the use of a unique computer name.

Every instrument is assigned an individual computer name at the factory. It is displayed as part of the window title of the application.

If necessary, you can change the computer name using the firmware or the Windows XP Start menu (for details refer to the Windows XP help system).

Querying the computer name using the firmware

1. If the R&S SFC has a default computer name, the computer name is displayed as part of the window title of the application.



2. If no default computer name is displayed, do the following.
 - a) Press the SETUP key.
 - b) In the tree, select "COMMUNICATION".
 - c) Read out the computer name from the "FULL COMPUTER NAME" field.

Networks without DHCP Server

In networks that assign fixed IP addresses, the network administrator usually configures the network card. Contact your network administrator. The IP address is set using the firmware or the Windows XP Start menu (for details refer to the Windows XP help system).

Entering the IP address using the firmware

1. Press the SETUP key.

2. In the tree, select "COMMUNICATION".
3. Enter the IP address in the "TCP/IP ADDRESS" field.

7.5 Firewall Settings

By default, the Windows Firewall is activated to protect the R&S SFC from an attack of hostile users and programs. The Windows Firewall suppresses all network communication which is not initialized by the R&S SFC itself or which is not defined as an exception.

To enable data transfer or to allow access to the R&S SFC, define exceptions using the Windows XP Start menu. For details refer to the Windows XP help system or contact your network administrator for support.

8 Installed Software

The firmware and the operating system are already installed on the R&S SFC.

For further information:

- Performing a firmware update: see the release notes.
- Installing software options: see the user manual or the help system.

8.1 Operating System

The R&S SFC is equipped with the Windows XP Embedded operating system. When the R&S SFC is delivered, the operating system is configured for optimum operation. Changes to the system settings are required only if you install peripherals such as a keyboard and printer or if you configure the network and the settings do not conform to the default settings.

NOTICE

Risk of causing instrument unusability

To prevent malfunctions and to avoid instrument repair, only install service packs approved by Rohde & Schwarz.

In particular, do not use service packs for Windows XP Home Edition or Professional Edition.

8.1.1 Login

Windows XP requires that you identify yourself by entering a user name and password in a login window. The R&S SFC provides a factory-installed auto login function, i.e. login is carried out automatically in the background. The ID used for auto login has administrator rights.



As user name and password, *instrument* are factory-set.

If the R&S SFC is connected to a network and if the user name and the password are identical under Windows XP and on the network, you log on to operating system and the network at the same time.

8.1.2 Windows XP Start Menu

The Windows XP Start menu provides access to the Windows XP functionality and installed programs. Under "Control Panel", the system settings are grouped. For details refer to the Windows XP help system.

8.2 Additional Software

NOTICE

Risk of causing instrument unusability

The instrument is equipped with the Windows XP operating system. Additional software can therefore be installed on the instrument. The use and installation of additional software may impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.

The drivers and programs used on the instrument under Windows XP have been adapted to the instrument. Existing instrument software must always be modified using only update software released by Rohde & Schwarz.

8.3 Windows XP Recovery and Backup Partition

The R&S SFC provides a backup and recovery partition. A backup of the factory system partition (C:\) is stored per default and can be recovered in case of a system crash.

In addition, backups of up to 5 firmware versions can be stored on this partition. For example, it is possible to backup the current system partition prior to a firmware update or to provide different system configurations for different environments. When recovered, the system partition (C:/) is deleted, formatted and written newly. The data partition (D:\) is not affected.

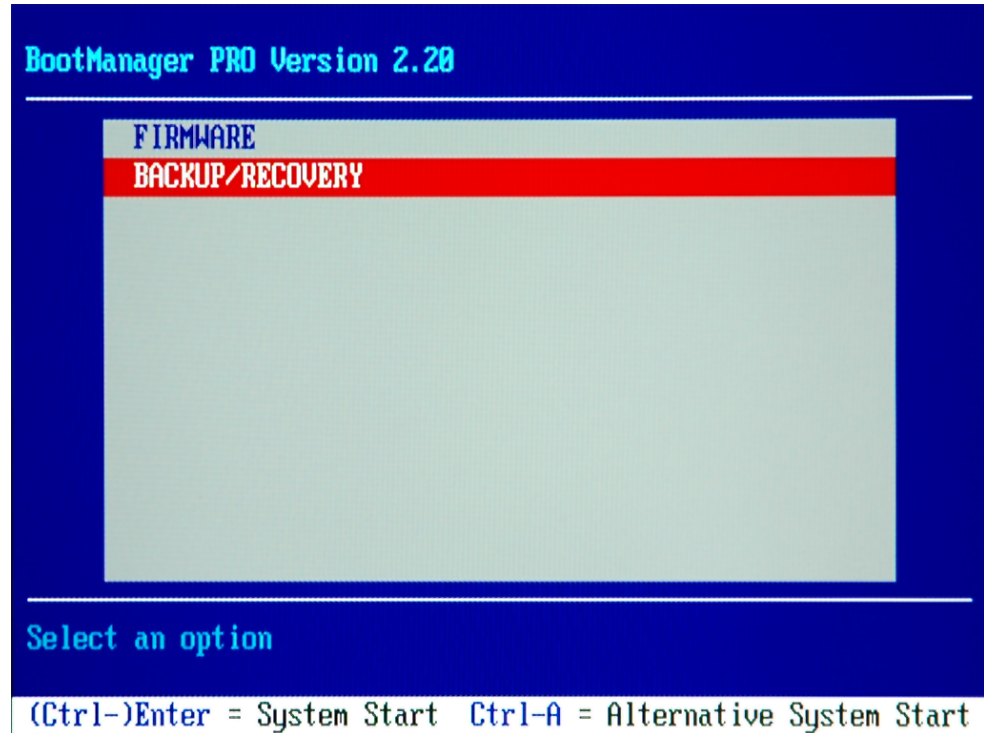
8.3.1 Windows XP Embedded Recovery and Backup Partition Dialog

To display the Windows XP Embedded Recovery and Backup Partition dialog

1. Connect an external monitor, a keyboard and a mouse ([Chapter 4.3, "Connecting External Devices"](#), on page 19).
2. Switch the R&S SFC off and on again.

The boot screen is displayed with the default selection "Firmware". If you do not perform [step 3](#) within 4 seconds, the dialog vanishes and the booting process continues.

3. Select "Backup/Recovery" and press ENTER.



The "Windows XP Recovery and Backup Embedded Partition" dialog is displayed. It shows the available selections for the recovery and backup partition.

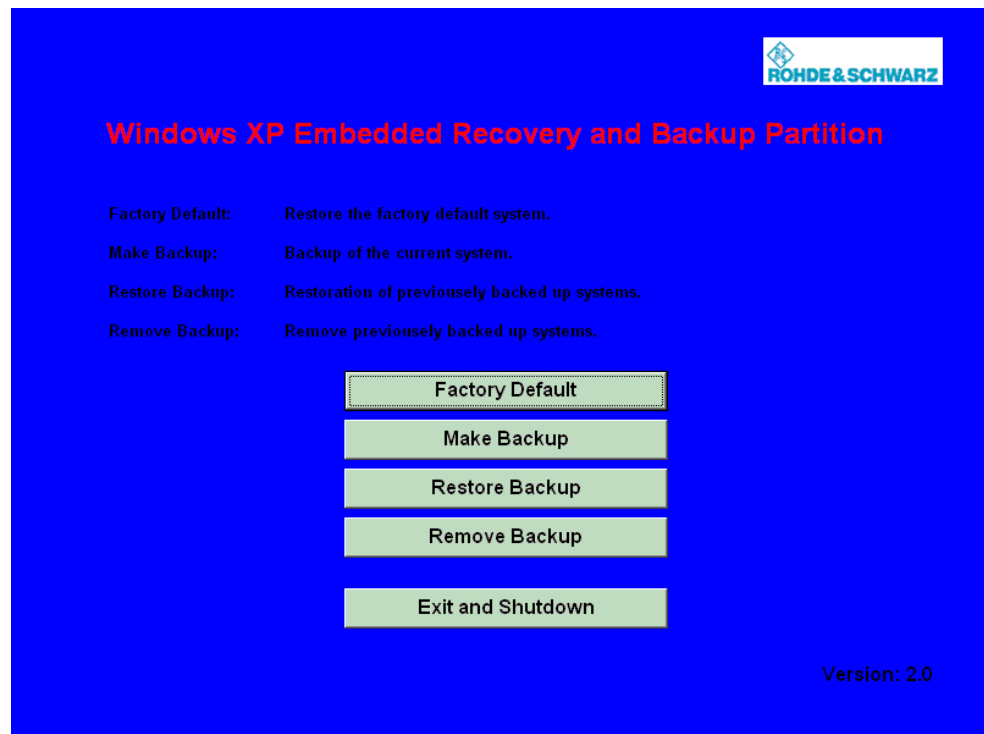


Figure 8-1: Windows XP Recovery and Backup Embedded Partition dialog

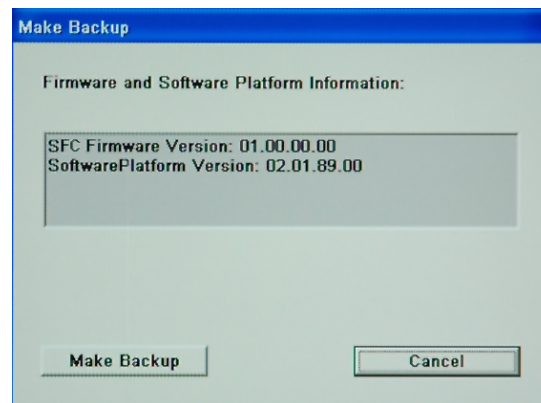
To continue see one of the following chapters:

- The [Chapter 8.3.1.1, "Backing Up Current System Partition"](#), on page 38
- The [Chapter 8.3.1.2, "Recovering the Selected Version of System Partition"](#), on page 38
- The [Chapter 8.3.1.3, "Recovering the Factory Default"](#), on page 39
- The [Chapter 8.3.1.4, "Deleting Backups"](#), on page 40

8.3.1.1 Backing Up Current System Partition

1. In the "Windows XP Embedded Recovery and Backup Partition" dialog (see ["To display the Windows XP Embedded Recovery and Backup Partition dialog"](#) on page 36), click "Make Backup".

The "Make Backup" dialog is displayed. It shows the current versions of the firmware and the software platform.

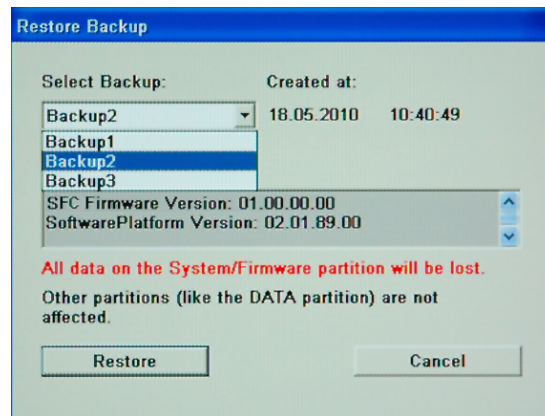


2. Click "Make Backup".
After the backup, the "Windows XP Embedded Recovery and Backup Partition" dialog is displayed again.
3. Click "Exit and Shutdown".
4. Turn off/on the R&S SFC manually.

8.3.1.2 Recovering the Selected Version of System Partition

1. In the "Windows XP Embedded Recovery and Backup Partition" dialog (see ["To display the Windows XP Embedded Recovery and Backup Partition dialog"](#) on page 36), click "Restore Backup" to recover a selected version of the system partition.

The "Restore Backup" dialog is displayed. It shows the versions of the firmware and the software platform of the backup displayed under "Select Backup".

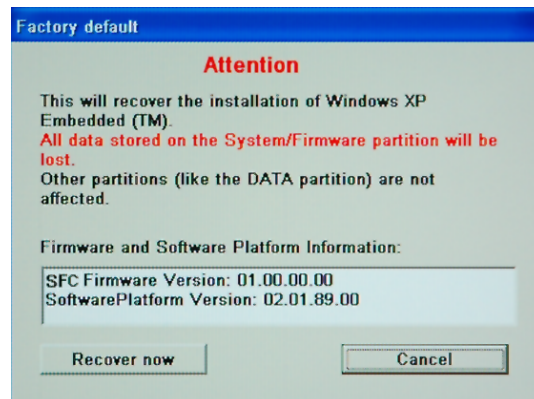


2. Under "Select Backup", select the backup to be restored.
3. Click "Restore" and follow the instructions.
4. After the recovery, turn off/on the R&S SFC manually.

8.3.1.3 Recovering the Factory Default

1. In the "Windows XP Embedded Recovery and Backup Partition" dialog (see ["To display the Windows XP Embedded Recovery and Backup Partition dialog"](#) on page 36), click "Factory Default" to recover the factory version of the system partition.

The "Factory Default" dialog is displayed. It shows the versions of the firmware and the software platform on delivery.



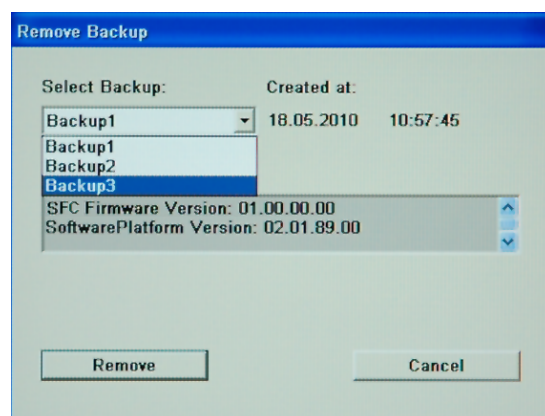
2. Click "Recover now" and follow the instructions.
3. After the recovery, turn off/on the R&S SFC manually.

8.3.1.4 Deleting Backups

On the recovery partition, you can store up to five backups in addition to the factory default. To provide space for new backups, you may need to remove older backups. The factory default cannot be deleted.

1. In the "Windows XP Embedded Recovery and Backup Partition" dialog (see ["To display the Windows XP Embedded Recovery and Backup Partition dialog"](#) on page 36), click "Remove Backup" to delete a selected backup.

The "Remove Backup" dialog is displayed. It shows the versions of the firmware and the software platform of the selected backup.



2. Under "Select Backup", select the backup to be deleted.
3. Click "Remove".

After the deletion, the R&S SFC returns to the "Remove Backup" dialog as long as backups are still available. If the last backup is deleted, the "Windows XP Embedded Recovery and Backup Partition" dialog is displayed again.
4. Click "Cancel" to return the "Windows XP Embedded Recovery and Backup Partition" dialog.
5. Click "Exit and Shutdown".
6. After the recovery, turn off/on the R&S SFC manually.

9 Maintenance

The R&S SFC does not need a periodic maintenance unless it is operated in dusty areas.

NOTICE

Risk of instrument damage

If the R&S SFC is operated in dusty areas, the fans may become obstructed by dust or other particles in the process of time. Make sure to check and, if necessary, clean the fans regularly to ensure they operate properly at all times. If the R&S SFC is run with obstructed fans for a longer period, it may become overheated which may cause damage.

Clean the outside of the instrument when necessary and check the rated data from time to time.

If any problem arises, contact one of our customer support centers. The addresses of our customer support centers are provided at the beginning of this manual.

9.1 Cleaning the Instrument

⚠ WARNING

Shock hazard

Before cleaning the R&S SFC, make sure that the R&S SFC is switched off and disconnected from all power supplies.

-
1. Clean the outside of the R&S SFC using a soft, lint-free dust cloth.
 2. Make sure that vents are not obstructed.

NOTICE

Instrument damage caused by cleaning agents

Cleaning agents contain substances that may damage the R&S SFC, e.g. cleaning agents that contain a solvent may damage the front panel labeling or plastic parts.

Never use cleaning agents such as solvents (thinners, acetone, etc), acids, bases, or other substances.

9.2 Storing the Instrument

The storage temperature range of the R&S SFC is given in the data sheet. If the R&S SFC is to be stored for a longer period of time, it must be protected against dust.

Repack the R&S SFC as it was originally packed when transporting or shipping. The two protective foam plastic parts prevent the control elements and connectors from being damaged. The antistatic packing foil avoids any undesired electrostatic charging to occur.

If you do not use the original packaging, provide for sufficient padding to prevent the R&S SFC from slipping inside the package. Wrap antistatic packing foil around the R&S SFC to protect it from electrostatic charging.

Index

Symbols

1PPS connector	13
100 BASE-T connector	15

A

AC power supply	
connecting to	18
AC power supply connector	14
AC power switch	14
Administrator ID	35

B

Backing up system partition	36, 38
Bench operation	8

C

Checking	
accessories	8
provided options	23
Cleaning the instrument	41
Connecting	
external devices	19
power supply	18
Connector	15
1PPS	13
100 BASE-T	15
AC power supply	14
DIG I/Q IN	11
DVI-D	14
REF IN	13
RF	13
TS IN	12
USB	16
Conventions	6

D

Deleting system partition backups	40
DIG I/Q IN connector	11
Documentation overview	5
DVI-D connector	14

E

Electromagnetic interference	18
preventing	18
EMC precautions	18
External devices	19
External keyboard	20
External monitor	21

F

Firewall settings	34
Firmware	
options	23
update	35
Front panel	10

G

Getting started manual	5
------------------------------	---

H

Help	6
------------	---

I

IP address	
changing	33

L

LAN connector	15
Local area network (LAN)	15, 31
Login	
Windows XP	35

M

Maintenance	41
Manual	
getting started	5
user manual	5
Memory stick	21
Mouse	21

N

Network	
configuring card	33
connecting to	31
disconnecting from	31

O

Operating system	35
Options	
checking	23
firmware	23

P

Packing the instrument	42
Password	
Windows XP	35
Power supply	
connecting to	18
Provided options	
checking	23
Putting up the instrument	8

R

Rack mounting	9
Rear panel	14
Recovering system partition	36
factory default	39
selected version	38
Recovery/backup partition dialog	36
REF IN connector	13
REMOTE status display	10
RF connector	13

RF ON status display 10

S

Safety 5

Shipping damage inspection 7

Software

installing 36

Software options

installing 35

Start menu 36

Status display

REMOTE 10

RF ON 10

STATUS 11

STATUS status display 11

Storing the instrument 42

Switching on the instrument 22

T

TCP/IP protocol

configuring 33

TS IN connector 12

U

Unpacking the cardboard box 7

USB connector 16

external devices 19

User manual 5

User name

Windows XP 35

W

Warranty 8

Windows XP 35

administrator ID 35

backing up system partition 38

deleting system partition backups 40

login 35

password 35

recovering system partition 38, 39

recovering/backing up system partition 36

recovery/backup partition dialog 36

Start menu 36

user name 35