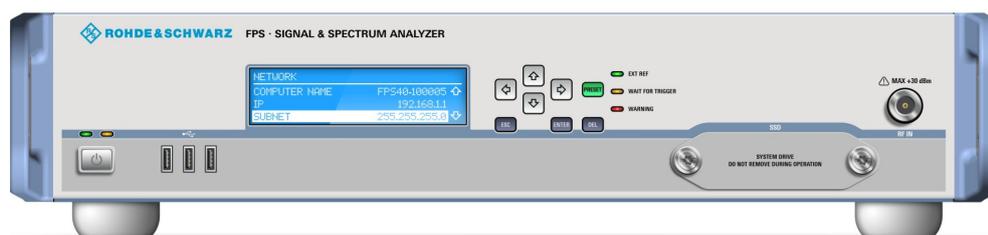# R&S®FPS
Signal and Spectrum Analyzer
Getting Started

ROHDE&SCHWARZ

This manual applies to the following R&S®FPS models with firmware version 1.30 and higher:

- R&S®FPS4 (1319.2008K04)
- R&S®FPS7 (1319.2008K07)
- R&S®FPS13 (1319.2008K13)
- R&S®FPS30 (1319.2008K30)
- R&S®FPS40 (1319.2008K40)

In addition to the base unit, the following options are described:

- R&S FPS-B4, OCXO (1321.4291.02)
- R&S FPS-B10, external generator control (1321.4256.02)
- R&S FPS-B22, preamplifier (1321.4027.02)
- R&S FPS-B25, electronic attenuator (1321.4033.02)
- R&S FPS-B40 bandwidth extension (1321.4040.02)
- R&S FPS-B160 bandwidth extension (1321.4285.xx)

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

Contents

1   Preface

1.1   Key Features

The R&S FPS Signal and Spectrum Analyzer sets standards in RF performance and usability. Outstanding key features are:

- Unmatched phase noise
- Excellent dynamic range
- High sensitivity even at low frequencies
- High measurement rates and fast sweep times with sweep rates up to 1000 sweeps per second
- Multiple measurement applications can be run and displayed in parallel
- Integrated support of R&S®NRP-Zxx power sensors

For a detailed specification refer to the data sheet.

Due to these features the R&S FPS is ideal for various measurement tasks, for instance:

- Measuring oscillators for radar and communications applications due to the low phase noise
- Identifying and analyzing spurious emissions due to the large spurious-free dynamic range and low DANL
- Measuring harmonics due to integrated highpass filters
- Measuring wide-band modulated or frequency-agile signals due to the large bandwidth
- Detecting errors caused by interaction between signals by measuring multiple standards simultaneously

1.2   Documentation Overview

The user documentation for the R&S FPS consists of the following parts:

- Printed Getting Started manual

- Online Help system on the instrument
- Documentation CD-ROM with:
    - Getting Started

    - User Manuals for base unit and firmware applications

    - Service Manual

    - Release Notes

    - Data sheet and product brochures

Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming. Online help is available using the ? icon on the toolbar of the R&S FPS.

Getting Started

This manual is delivered with the instrument in printed form and in PDF format on the CD-ROM. It provides the information needed to set up and start working with the instrument. Basic operations and handling are described. Safety information is also included.

The Getting Started manual in various languages is also available for download from the Rohde & Schwarz website, on the R&S FPS product page at http://www.rohde-schwarz.com/product/FPS.html.

User Manuals

User manuals are provided for the base unit and each additional (firmware) application.

The user manuals are available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. In the user manuals, all instrument functions are described in detail. Furthermore, they provide a complete description of the remote control commands with programming examples.

The user manual for the base unit provides basic information on operating the R&S FPS in general, and the Spectrum application in particular. Furthermore, the software functions that enhance the basic functionality for various applications are described here. An introduction to remote control is provided, as well as information on maintenance, instrument interfaces and troubleshooting.

In the individual application manuals, the specific instrument functions of the application are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S FPS is not included in the application manuals.

All user manuals are also available for download from the Rohde & Schwarz website, on the R&S FPS product page at http://www2.rohde-schwarz.com/product/FPS.html.

Service Manual

This manual is available in PDF format on the Documentation CD-ROM delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the R&S FPS by replacing modules.

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes.

The most recent release notes are also available for download from the Rohde & Schwarz website, on the R&S FPS product page at http://www2.rohde-schwarz.com/product/FPS.html > Downloads > Firmware.

1.3   About this Manual

This manual provides the information needed to set up and start working with the R&S FPS. Basic operations and handling are described.

Manual operation using an external monitor and keyboard

Although the R&S FPS does not have a built-in measurement screen, it is recommended that you connect an external monitor to the instrument initially to get familiar with the instrument and its manual operation before using it in pure remote mode. Thus, in addition to setting up a remote connection to the R&S FPS, this manual also describes in detail how to operate the instrument manually using an external monitor and mouse.

The following topics are included:

- **Preparing for Use**
  - Unpacking, setting up and checking the instrument before first use;
  - Connecting external devices such as a monitor or keyboard
  - Setting up a network connection
  - Configuring initial instrument settings
- **Instrument Tour**
  Description of the basic interface elements on the instrument hardware
- **Operating the Instrument**
  Basic handling of the instrument in manual operation
- **Obtaining Technical Support**
- **Index**

1.4 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
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.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

2 Preparing for Use

2.1 Putting into Operation

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

⚠ WARNING

Risk of injury and instrument damage

The instrument must be used in an appropriate manner to prevent electric shock, fire, personal injury, or damage.

- Do not open the instrument casing.

- Read and observe the "Basic Safety Instructions" at the beginning of this manual or on the documentation CD-ROM, in addition to the safety instructions in the following sections. Notice that the data sheet may specify additional operating conditions.

NOTICE

Risk of instrument damage

Note that the general safety instructions also contain information on operating conditions that will prevent damage to the instrument. The instrument's data sheet may contain additional operating conditions.

> **NOTICE**
>
> **Risk of electrostatic discharge (ESD)**
>
> Electrostatic discharge (ESD) can cause damage to the electronic components of the instrument and the device under test (DUT). ESD is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports. To prevent ESD, use a wrist strap and cord and connect yourself to the ground, or use a conductive floor mat and heel strap combination.
>
> For details, refer to the safety instructions delivered in electronic format on the documentation CD-ROM.

> **NOTICE**
>
> **Risk of instrument damage during operation**
>
> An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:
>
> ● All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
>
> ● The instrument is dry and shows no sign of condensation.
>
> ● The instrument is positioned as described in the following sections.
>
> ● The ambient temperature does not exceed the range specified in the data sheet.
>
> ● Signal levels at the input connectors are all within the specified ranges.
>
> ● Signal outputs are correctly connected and are not overloaded.

> **EMI impact on measurement results**
>
> Electromagnetic interference (EMI) may affect the measurement results.
>
> To suppress generated electromagnetic interference (EMI):
>
> ● Use suitable shielded cables of high quality. For example, use double-shielded RF and LAN cables.
>
> ● Always terminate open cable ends.
>
> ● Note the EMC classification in the data sheet.

2.1.1   Unpacking and Checking the Instrument

Check the equipment for completeness using the delivery note and the accessory lists for the various items. Check the instrument for any damage. If there is damage, immediately contact the carrier who delivered the instrument. Make sure not to discard the box and packing material.

Packing material

Retain the original packing material. If the instrument needs to be transported or shipped at a later date, you can use the material to protect the control elements and connectors.

NOTICE

Risk of damage during transportation and shipment

Insufficient protection against mechanical and electrostatic effects during transportation and shipment can damage the instrument.

- Always make sure that sufficient mechanical and electrostatic protection is provided.

- When shipping an instrument, the original packaging should be used. If you do not have the original packaging, use sufficient padding to prevent the instrument from moving around inside the box. Pack the instrument in antistatic wrap to protect it from electrostatic charging.

- Secure the instrument to prevent any movement and other mechanical effects during transportation.

The **carrying handles** at the front and side of the casing are designed to lift or carry the instrument. Do not apply an excessive external force to the handles.

Observe the information on transporting heavy instruments in the basic safety instructions included at the front of the printed manual and on the supplied CD ROM.

2.1.2   Accessory List

The instrument comes with the following accessories:

- Power cable
- "Getting Started" printed manual
- "R&S FPS User Documentation" CD-Rom

2.1.3   Placing or Mounting the Instrument

The R&S FPS is designed for use under laboratory conditions, either on a bench top or in a rack.

Bench Top Operation

If the R&S FPS is operated on a bench top, the surface should be flat. The instrument can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended.

⚠ **CAUTION**

Risk of injury if feet are folded out

The feet may fold in if they are not folded out completely or if the instrument is shifted. This may cause damage or injury.

● Fold the feet completely in or completely out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.

● When the feet are folded out, do not work under the instrument or place anything underneath.

● The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 500 N.

F < 500 N
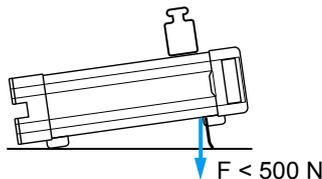
⚠ **CAUTION**

Risk of injury and instrument damage if stacking instruments

A stack of instruments may tilt over and cause injury. Furthermore, the instruments at the bottom of the stack may be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.

- The overall load imposed on the lowest instrument must not exceed 500 N.

- All instruments must have the same dimensions (width and length).

- If the instruments have foldable feet, fold them in completely.

| Correct | Too many instruments | Different dimensions | Feet folded out |
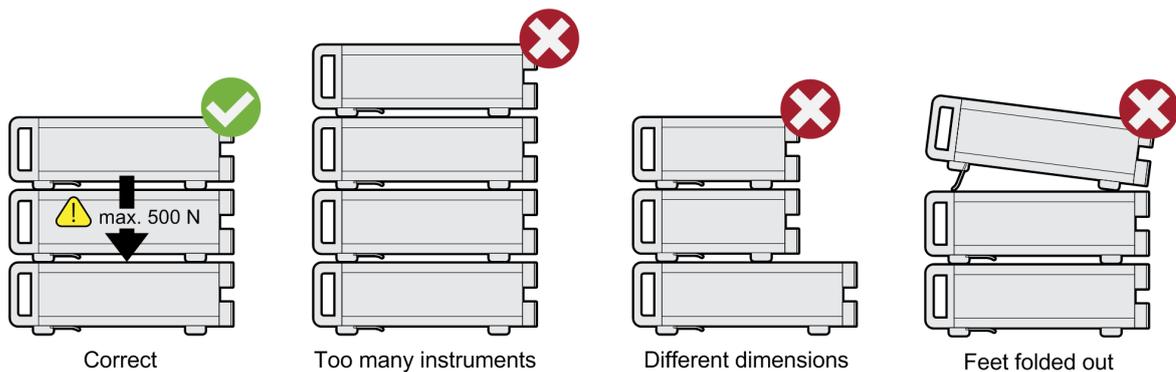
Rackmounting

The R&S FPS can be installed in a rack using a rack adapter kit (Order No. see data sheet). The installation instructions are part of the adapter kit.

NOTICE

Risk of instrument damage in a rack

An insufficient airflow can cause the instrument to overheat, which may disturb the operation and even cause damage.

Make sure that all fan openings are unobstructed, that the airflow perforations are unimpeded, and that the minimum distance from the wall is 10 cm.

2.1.4   Connecting the AC Power

In the standard version, the R&S FPS is equipped with an AC power supply connector. The R&S FPS can be used with different AC power voltages and adapts itself automatically to it. Refer to the datasheet for the requirements of voltage and frequency. The AC power connector is located on the rear panel of the instrument.

For details on the connector refer to chapter 3.2.11, "AC Power Supply Connection and Main Power Switch", on page 35.

► Connect the R&S FPS to the AC power supply using the supplied power cable.
  Since the instrument is assembled in line with the specifications for safety class EN61010, it may only be connected to an outlet that has a ground contact.

2.1.5   Switching the Instrument On and Off

Switching the instrument on

► Press the AC power switch on the rear panel to position "I".

The instrument is supplied with AC power. After booting, the instrument is ready for operation. A green LED above the POWER key indicates this.

Warm-up time for OCXO

When the instrument is switched on, the OCXO requires an extended warm-up time (see data sheet). No warm-up time is required when starting from standby mode.

Switching the instrument off

1. Press the POWER key on the front panel of the R&S FPS.

2. Change the AC power switch on the rear panel to position "O", or disconnect the instrument from the AC power supply.

    The R&S FPS changes into off mode.

NOTICE

Risk of losing data

If you switch off the running instrument using the rear panel switch or by disconnecting the power cord, the instrument loses its current settings. Furthermore, program data may be lost.

Press the Power key first to shut down the application properly.

2.2   Windows Operating System

The instrument contains the Windows 7 operating system which has been configured according to the instrument's features and needs. Changes in the system setup are only required when peripherals like keyboard or a printer are installed or if the network configuration does not comply with the default settings. After the R&S FPS is started, the operating system boots and the instrument firmware is started automatically.

To ensure that the instrument software functions properly, certain rules must be adhered to concerning the operating system.

NOTICE

Risk of causing instrument unusability

The instrument is equipped with the Windows 7 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 7 have been adapted to the instrument. Existing instrument software must always be modified using only update software released by Rohde & Schwarz.

The following program packages have been tested:

- Symantec Endpoint Security – Virus-protection software
- FileShredder - for reliable deletion of files on the hard disk

Error message display

Note that any error messages caused by the Windows 7 operating system are only visible on an external monitor or via RemoteDesktop from a controller PC. Thus, if operation of the R&S FPS seems to fail for no obvious reason, try connecting a monitor or a controller PC to check for any messages awaiting confirmation or action.

(See chapter 2.3, "Connecting USB Devices", on page 22 or chapter 5.6, "How to Set Up Remote Desktop", on page 66)

2.2.1 Virus Protection

Users must take appropriate steps to protect their instruments from infection. Beside the use of strong firewall settings and regularly scanning any removable storage device used with a Rohde & Schwarz instrument, it is also recommended that anti-virus software be installed on the instrument. While Rohde & Schwarz does NOT recommend running anti-virus software in the background ("on-access" mode) on Windows-based instruments, due to potentially degrading instrument performance, it does recommend running it during non-critical hours.

For details and recommendations, see the Rohde & Schwarz White Paper "Malware Protection" available at http://www.rohde-schwarz.com/appnote/1EF73.

2.2.2 Service Packs and Updates

Microsoft regularly creates security updates and other patches to protect Windows-based operating systems. These are released through the Microsoft Update website and associated update server. Instruments using Windows, especially those that connect to a network, should be updated regularly.

For more details and information on configuring automatic updates see the R&S White Paper "Malware Protection" (available at http://www.rohde-schwarz.com/appnote/1EF73).

2.2.3   Login

Windows 7 requires that users identify themselves by entering a user name and password in a login window. By default, the R&S FPS provides two user accounts:

- **"Instrument"**: an administrator account with unrestricted access to the computer/domain
- **"NormalUser"**: a standard user account with limited access

> **Secure User Mode**
>
> If the secure user mode option (R&S FPS-K33) is installed, an additional account is provided: the **"SecureUser"**.
>
> The "SecureUser" is a standard user account with limited functionality. In particular, administrative tasks such as LAN configuration or general instrument settings are not available. Furthermore, for a "SecureUser", data that the R&S FPS normally stores on the solid-state drive is redirected to volatile memory instead. Data that is stored in volatile memory can be accessed by the user during the current instrument session; however, when the instrument's power is removed, all data in volatile memory is erased.
>
> For details see chapter 2.6, "Protecting Data Using the Secure User Mode", on page 25.

Automatic login

For the administrator account, an automatic login function is active by default. If activated, login is carried out automatically for the administrator (with full access) in the background when the R&S FPS is started, without having to enter a password. This function is active until you explicitly deactivate it or change the password.

For information on how to deactivate or re-activate the automatic login, refer to chapter 2.2.3.1, "The Automatic Login Function", on page 19.

Passwords

For all default user accounts, the initial password is *894129*. Note that this password is very weak, and it is recommended that you change the password for both users after initial login. You can change the password in Windows 7 for any user at any time via "Start > Control Panel > User Accounts".

> **NOTICE**
>
> **Changing the password and use of auto-login function**
>
> Note that when you change the default passwords, the default auto-login function no longer works! You must reactivate it manually as described in "Reactivating the automatic login function" on page 20.
>
> Beware that since the R&S FPS has no real display, if the auto-login function is deactivated and the R&S FPS is rebooted, you require an external monitor and keyboard or a RemoteDesktop access to the R&S FPS to enter the password. Otherwise, the Windows operating system will not complete login and the R&S FPS remains inoperable.

2.2.3.1   The Automatic Login Function

When shipped, the instrument is already configured to automatically log on under Windows 7 using the default administrator account ("Instrument") and password.

> In order to change the settings for the automatic login function for the R&S FPS, a controller PC or an external monitor and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.
>
> If the auto-login function is deactivated and the R&S FPS is rebooted, you require an external monitor and keyboard or a RemoteDesktop access on the R&S FPS to enter the password. Otherwise, the Windows operating system will not complete login and the R&S FPS remains inoperable.

Deactivating the automatic login function

To deactivate the automatic login function, perform the following steps:

1.

   Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS (see also chapter 2.2.4, "Accessing the Start Menu", on page 21).

2. In the "Start" menu, select "Run".
   The "Run" dialog box is displayed.

3. Enter the command `C:\R_S\INSTR\USER\NO_AUTOLOGIN.REG`.

4. Press the ENTER key to confirm.
The automatic login function is deactivated. The next time you switch on the instrument, you are prompted to enter your user name and password (using an external monitor and keyboard or RemoteDesktop from a controller PC, not via the R&S FPS miniature display!) before the firmware is started.

Adapting the automatic login function to a new password

If you change the "Instrument" user's (administrator's) password, which is used during automatic login, this function no longer works. You must then adapt the settings for the command that activates the auto login function first.

If the SecureUser or the NormalUser are enabled, those passwords are used for autologin. In that case, if you change any of the passwords, the autologin function must be adapted each time you change the user account.

1. Open the `C:\R_S\INSTR\USER\NO_AUTOLOGIN.REG` file in any text editor (e.g. Notepad).

2. In the line `"DefaultPassword"="894129"`, replace the default password (`894129`) by the new password which is to be used for automatic login.

3. Save the changes to the file.

Reactivating the automatic login function

1.

   Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select "Run".
The "Run" dialog box is displayed.

3. Enter the command `C:\R_S\INSTR\USER\AUTOLOGIN.REG`.

4. Press the ENTER key to confirm.
The automatic login function is reactivated. It will be applied the next time the instrument is rebooted.

Switching users when using the automatic login function

Which user account is used is defined during login. However, you can also switch the user account to be used when the automatic login function is active.

1.

   Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select the arrow next to the "Shut down" button and then "Log off".

   The "Login" dialog box is displayed, in which you can enter the different user account name and password.

2.2.4   Accessing the Start Menu

The Windows "Start" menu provides access to the Windows 7 functionality and installed programs. To open the "Start" menu, select the "Windows" icon on the R&S FPS toolbar, or press the "Windows" key or the CTRL + ESC key combination on the (external) keyboard.

All necessary system settings can be defined in the "Start > Control Panel" menu (for required settings refer to the Windows 7 documentation and to the hardware description).

2.2.5   Accessing the Windows Task Bar

The Windows task bar also provides quick access to commonly used programs, for example Paint or Wordpad, but also IECWIN, the auxiliary remote control tool provided free of charge and installed by Rohde & Schwarz.

For details on the IECWIN tool, see the "Network and Remote Control" chapter of the R&S FPS User Manual.

To open the task bar, select the "Windows" icon on the R&S FPS toolbar, or press the "Windows" key or the CTRL + ESC key combination on your (external) keyboard.

2.3   Connecting USB Devices

The USB interfaces on the front and (optionally) rear panels of the R&S FPS allow you to connect USB devices directly to the instrument. 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 expansions that are possible with the R&S FPS.

The following list shows various USB devices that can be useful:

● Memory stick for easy transfer of data to/from a computer (e.g. firmware updates)
● CD-ROM drives for easy installation of firmware applications
● Keyboard or mouse to simplify the entry of data, comments, file names, etc.
● Printer for printing out measurement results

Installing USB devices is easy under Windows, because all USB devices are plug&play. After a device is connected to the USB interface, automatically searches for a suitable device driver.

If Windows 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, connect a USB CD-ROM drive to the instrument before proceeding.

When a USB device is subsequently disconnected from the R&S FPS, Windows immediately detects the change in hardware configuration and deactivates the corresponding driver.

All USB devices can be connected to or disconnected from the instrument during operation.

Connecting a memory stick or CD-ROM drive

If installation of a memory stick or CD-ROM drive is successful, Windows informs you that the device is ready to use. The device is made available as a new drive and is displayed in Windows Explorer. The name of the drive depends on the manufacturer.

Connecting a keyboard

The keyboard is detected automatically when it is connected. The default input language is English – US.

Select "Start > Control Panel > Clock, Language, and Region > Change keyboards or other input methods" to configure the keyboard properties. To access the Windows operating system, press the Windows key on the external keyboard.

Connecting a mouse

The mouse is detected automatically when it is connected.

Select "Start > Control Panel > Devices and Printers > Mouse" to configure the mouse properties. To access the Windows operating system, press the Windows key on the external keyboard.

Connecting a printer

When printing a file, the instrument checks whether a printer is connected and turned on and whether the appropriate printer driver is installed. If required, printer driver installation is initiated. A printer driver needs to be installed only once.

To install a printer, select "Start > Control Panel > Devices and Printers > Add a printer". To access the Windows operating system, press the Windows key on the external keyboard.

You can load updated and improved driver versions or new drivers from an installation disk, USB memory stick or another external storage medium. If the instrument is integrated in a network, you can also install driver data stored in a network directory.

Select "Start > Control Panel > Devices and Printers > Device Manager > Update Device drivers" to install the driver.

2.4 Performing a Self Alignment and a Self Test

During instrument start, the installed hardware is checked against the current firmware version to ensure the hardware is supported. If not, an error message is displayed ("WRONG_FW") and you are asked to update the firmware. Until the firmware version is updated, self-alignment fails.

(For details refer to the R&S FPS User Manual).

Furthermore, it may be necessary to align the data to a reference source by performing a self alignment when strong temperature changes occur.

Operating temperature

Before performing this functional test, make sure that the instrument has reached its operating temperature (for details, refer to the data sheet).

To perform a self alignment directly on the R&S FPS

► In the R&S FPS's mini display, navigate to "System commands" > "Self align". For details on working with the mini display, see chapter 4, "Miniature Display", on page 37.

To perform a self alignment via Remote Desktop

Performing a self alignment via Remote Desktop requires a controller PC to be connected, see chapter 5.6, "How to Set Up Remote Desktop", on page 66.

1. Select the SETUP key in the soft front panel on the Remote Desktop.

2. Select the "Alignment" softkey.

3. Select the "Start Self Alignment" button in the "Alignment" dialog box.

   Once the system correction values have been calculated successfully, a message is displayed.

To display the alignment results again later

● Select the SETUP key in the soft front panel on the Remote Desktop.

● Select the "Alignment" softkey.

Self tests

The self test does not need to be repeated every time the instrument is switched on. It is only necessary when instrument malfunction is suspected.

To perform a self test directly on the R&S FPS

► In the R&S FPS's mini display, navigate to "System commands" > "Selftest". For details on working with the mini display, see chapter 4, "Miniature Display", on page 37.

To perform a self test via Remote Desktop

Performing a self alignment via Remote Desktop requires a controller PC to be connected, see chapter 5.6, "How to Set Up Remote Desktop", on page 66.

1. Select the SETUP key in the soft front panel on the Remote Desktop.

2. Select the "Service" softkey.

3. Switch to the "Selftest" tab in the "Service" dialog box.

4. Select the "Start Selftest" button.

   Once the instrument modules have been checked successfully, a message is displayed.

2.5 Checking the Supplied Options

The instrument may be equipped with both hardware and firmware options. In order to check whether the installed options correspond to the options indicated on the delivery note, proceed as follows.

Checking the supplied options via Remote Desktop requires a controller pc or an external monitor, mouse and keyboard to be connected, see chapter 5.6, "How to Set Up Remote Desktop", on page 66.

1. Select the SETUP key in the soft front panel on the Remote Desktop.

2. Select the "System Config" softkey.

3. Switch to the "Versions + Options" tab in the "System Configuration" dialog box.

   A list with hardware and firmware information is displayed.

4. Check the availability of the hardware options as indicated in the delivery note.

2.6 Protecting Data Using the Secure User Mode

During normal operation, the R&S FPS uses a solid-state drive to store its operating system, instrument firmware, instrument self-alignment data, and any user

data created during operation. If necessary, the solid-state drive can be removed from the R&S FPS and locked in a secure place to protect any classified data it may contain.

Redirecting storage to volatile memory

Alternatively, to avoid storing any sensitive data on the R&S FPS permanently, the *secure user mode* was introduced (option R&S FPS-K33). In secure user mode the instrument's solid-state drive is write-protected so that no information can be written to memory permanently. Data that the R&S FPS normally stores on the solid-state drive is redirected to volatile memory instead, which remains available only until the instrument is switched off. This data includes:

- Windows 7 operating system files
- Firmware shutdown files containing information on last instrument state
- Self-alignment data
- General instrument settings such as the IP address
- Measurement settings
- User data created during operation
- Any data created by other applications installed on the R&S FPS, for example text editors (Notepad), the Clipboard, drawing tools etc.

Data that is stored in volatile memory can be accessed by the user just as in normal operation; however, when the instrument's power is switched off, all data in this memory is cleared. Thus, in secure user mode, the instrument always starts in a defined, fixed state when switched on.

In order to store data such as measurement results permanently, it must be stored to an external storage device, such as a memory stick.

> **Limited storage space**
>
> The volatile memory used to store data in secure user mode is restricted to 256 MB. Thus, a "Memory full" error may occur although the hard disk indicates that storage space is still available.

Storing required data permanently

Any data that is to be available for subsequent sessions with the R&S FPS, such as predefined instrument settings, transducer factors or self-alignment data, must

be stored on the instrument permanently, *prior to activating the secure user mode*.

ℹ️ **Self-alignment data**

Note that self-alignment data becomes invalid with time and due to temperature changes. Therefore, to achieve optimal accuracy, it may be preferable to perform a new self-alignment at the start of each new session on the R&S FPS.

Restricted operation

Due to the fact that permanent storage is not possible, the following functions are not available in secure user mode:

● Firmware update
● Activating a new option key

Furthermore, since the "SecureUser" used in secure user mode does not have administrator rights, **administrative tasks** such as LAN configuration and some general instrument settings are not available. Refer to the description of the basic instrument setup (SETUP menu) to find out which functions are affected.

ℹ️ **RemoteDesktop restricted for "SecureUser" by default**

For security reasons, the "SecureUser" is not allowed Remote Desktop access to the R&S FPS by default. You must explicitly add the "SecureUser" to the Remote Desktop group (see chapter 5.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 73). If you do not allow this user RemoteDesktop access, the "SecureUser" will only be able to operate the R&S FPS using remote commands or via the miniature display.

Activating and deactivating secure user mode

Only a user with administrator rights can activate (and deactivate) the secure user mode. Once activated, a restart is required. The special user "SecureUser" is then logged on to the R&S FPS automatically (using the automatic login function, see chapter 2.2.3.1, "The Automatic Login Function", on page 19). While the secure user mode is active, a message is displayed in the status bar at the bottom of the screen, and in the miniature display "SecUsr" is displayed.

In order to deactivate the secure user mode, the "SecureUser" must log off and the "Instrument" user (administrator) must log on.

> **Switching users when using the automatic login function**
>
> In the "Start" menu, select the arrow next to the "Shut down" button and then "Log off".
>
> The "Login" dialog box is displayed, in which you can enter the different user account name and password.

The secure user mode setting and automatic login is automatically deactivated when the "Instrument" user logs on. The "SecureUser" is no longer available.

For administrators ("Instrument" user), the secure user mode setting is available in the general system configuration settings (SETUP key > "System Configuration" softkey > "Config" tab > "Secure User Mode": "ON", see the R&S FPS User Manual).

Alternatively, you can activate or deactivate the secure user function via the miniature display (see "Enable SecureUser / Disable SecureUser" on page 41. In this case, you must enter the administrator ("Instrument" user) password.
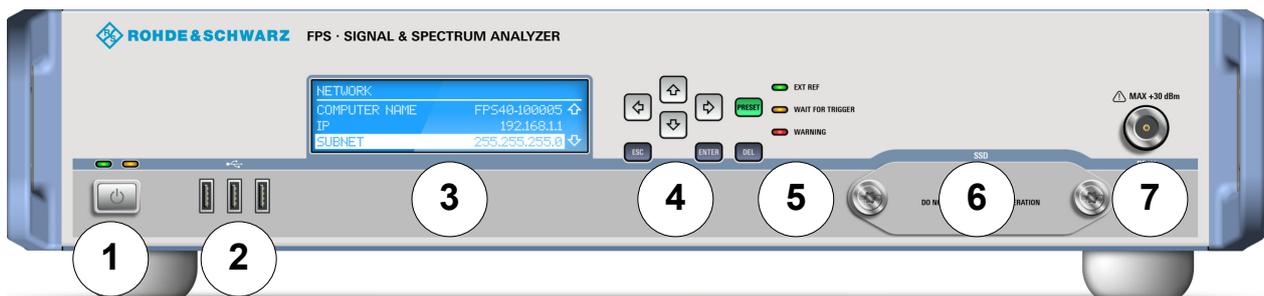
Remote control

Initially after installation of the R&S FPS-K33 option, secure user mode must be enabled manually once before remote control is possible.

3   Instrument Tour

3.1   Front Panel View

This chapter describes the front panel, including all function keys and connectors.

Fig. 3-1: Front panel view

1 = On/Off button
2 = USB connectors
3 = Mini display
4 = Navigation and data input controls
5 = Status LEDs
6 = Solid State Disk (SSD) containing instrument firmware
7 = RF Input 50 Ω connector (optionally front or rear panel)

NOTICE

Instrument damage caused by cleaning agents

Cleaning agents contain substances that may damage the instrument. For example, cleaning agents that contain a solvent may damage the front panel labeling, plastic parts, or the display.

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

The outside of the instrument can be cleaned sufficiently using a soft, lint-free dust cloth.

On / off button

The POWER key is located on the lower left corner of the front panel. It starts up and shuts down the instrument.

Mini display

```
NETWORK
COMPUTER NAME          FPS40-100005  ⇧
IP                       192.168.1.1
SUBNET                  255.255.255.0 ⇩
```

The R&S FPS is equipped with a miniature display on the front panel that pro-
vides basic information and allows for very basic instrument configuration (such
as changing the IP address). For details see chapter 4, "Miniature Display",
on page 37.

USB

The front panel provides three female USB connectors (USB-A) to connect devi-
ces like an external monitor, a mouse (recommended: R&S PSL-Z10, order num-
ber 1157.7060.03) or a keyboard (recommended: R&S PSL-Z2, order number
1157.6870.03). In addition, a memory stick can be connected to store and reload
instrument settings and measurement data.

> The rear panel provides further USB connectors, including a male (USB-B)
> connector. See chapter 3.2.10, "USB", on page 35.

Navigation Keys

The navigation keys can be used to navigate through menus or entries in the dis-
play.

Data Input Controls

Type of key	Description
ESC key	Exits the current function without storing changes
ENTER key	Stores the current entry and closes the edit mode
DEL key	Deletes the character to the left of the cursor

Status LEDs

Indicate the instrument's operating status:

Table 3-1: Status LEDs

Label	Description
EXT REF	External reference connected and active
WAIT FOR TRIGGER	Measurement waiting for trigger
WARNING	Warning or system error

Removable Solid State Disk (SSD)

The removable solid state disk contains the instrument firmware and all measurement data from the R&S FPS, allowing you to store the data securely in an external location.

RF INPUT 50Ω

A device under test (DUT) can be connected to the R&S FPS to provide RF input which is then analyzed. The DUT is connected to the instrument's RF INPUT via a cable equipped with an appropriate connector.

The RF Input connector may be provided on the front or rear panel, as requested by the customer.

> **NOTICE**
>
> **Risk of instrument damage**
>
> Do not overload the input. For maximum allowed values, see the data sheet. For AC-coupling, a DC input voltage of 50 V must never be exceeded. For DC-coupling, DC voltage must not be applied at the input. In both cases, noncompliance will destroy the input mixers.

3.2   Rear Panel View

This figure shows the rear panel view of the R&S FPS. The individual elements are described in more detail in the subsequent sections.
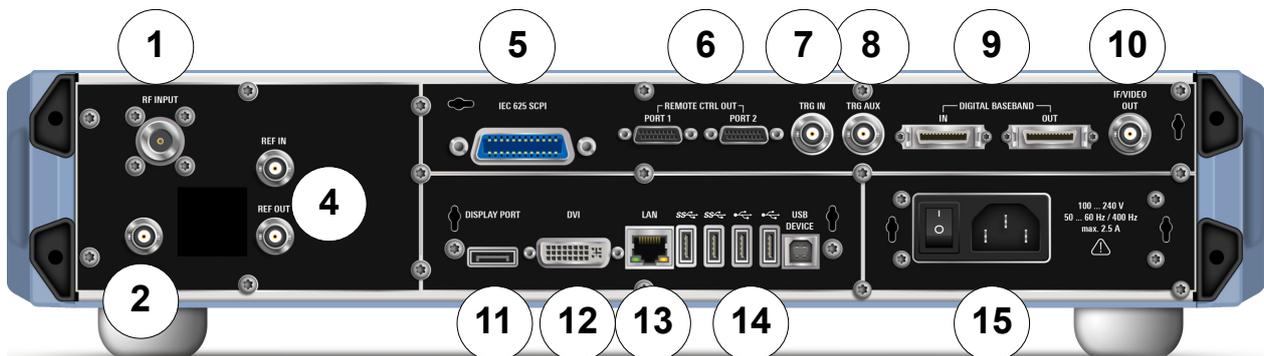
Fig. 3-2: Rear panel view

1 = RF Input 50 Ω connector (optionally front or rear panel)
2 = NOISE SOURCE CONTROL
4 = REF INPUT/OUTPUT connectors
5 = IEC 625 (GPIB) SCPI interface
6 = PCIe Remote Control Out Ports 1/2
7 = TRG IN connector
8 = TRG AUX connector
9 = DIGITAL BASEBAND INPUT/OUTPUT connectors (option B17, currently not available)
10 = IF/VIDEO out connector
11 = DISPLAY PORT for external display
12 = DVI connector for external display
13 = LAN connector
14 = USB (DEVICE) connectors
15 = AC Power Supply Connection and Main Power Switch

3.2.1   RF INPUT 50Ω

A device under test (DUT) can be connected to the R&S FPS to provide RF input which is then analyzed. The DUT is connected to the instrument's RF INPUT via a cable equipped with an appropriate connector.

The RF Input connector may be provided on the front or rear panel, as requested by the customer.

NOTICE

Risk of instrument damage

Do not overload the input. For maximum allowed values, see the data sheet. For AC-coupling, a DC input voltage of 50 V must never be exceeded. For DC-coupling, DC voltage must not be applied at the input. In both cases, noncompliance will destroy the input mixers.

3.2.2   NOISE SOURCE CONTROL

The noise source control female connector is used to provide the supply voltage for an external noise source, e.g., to measure the noise figure and gain of amplifiers and frequency converting devices.

Conventional noise sources require a voltage of +28 V in order to be switched on and 0 V to be switched off. The output supports a maximum load of 100 mA.

3.2.3   REF INPUT / REF OUTPUT

The REF INPUT connectors are used to provide an external reference signal to the R&S FPS.

The REF OUTPUT connectors can be used to provide an external reference signal (or the OCXO reference signal) from the R&S FPS to other devices that are connected to this instrument.

Connector	Reference signal	Usage
REF INPUT	1...20 MHz 0...10 dBm	To provide an external reference signal on the R&S FPS.
REF OUTPUT	10 MHz 10 dBm	To provide the internal reference signal from the R&S FPS to another device continuously. Also used to provide OCXO reference signal to another device.

3.2.4   GPIB (SCPI) Remote Control Connector

The IEC 625 GPIB interface is in compliance with IEEE488 and SCPI. A computer for remote control of the R&S FPS can be connected via this interface. For

more details refer to

3.2.5   Remote Control Output (PCIe) Connectors

Two PCIe output connectors are provided to control connected devices remotely from the R&S FPS, for example as external tracking generators. Note that these connectors **cannot be used for input** to control the R&S FPS remotely from a PC, for example.

For details on controlling an external generator via the PCIe connectors see the R&S FPS User Manual.

3.2.6   TRIGGER INPUT / OUTPUT

The female TRG IN connector for external trigger or gate input is used to control the measurement by means of an external signal. The voltage levels can range from 0.5 to 3.5 V. The default value is 1.4 V. The typical input impedance is 10 kΩ.

The female BNC TRG AUX connector can be used to receive a second external signal or to provide a signal to another device. The signal is TTL compatible (0 V / 5 V). You can control the connector usage in the "Trigger" settings (TRIG key).

3.2.7   IF/VIDEO OUTPUT

The female BNC connector can be used for various outputs:

* Intermediate frequency (IF) output of approximately 20 MHz
* Video output (1V)

Which output is provided is defined in the software (INPUT/OUTPUT key). For details see the User Manual.

3.2.8   DISPLAY PORT and DVI

You can connect an external monitor or other display device to the R&S FPS to operate the instrument from a remote PC (see also).

Two different types of connectors are provided for this purpose:

- DISPLAY PORT
- DVI (Digital visual interface)

3.2.9 LAN

The LAN interface can be used to connect the R&S FPS to a local network for remote control, printouts and data transfer. The assignment of the RJ-45 connector supports twisted-pair category 5 UTP/STP cables in a star configuration (UTP stands for *unshielded twisted pair*, and STP for *shielded twisted pair*).

For details see chapter 5, "Controlling the R&S FPS Remotely", on page 47.

3.2.10 USB

The rear panel provides four additional female USB (USB-A) connectors to connect devices like a keyboard, a mouse or a memory stick (see also "USB" on page 30). The two left-most connectors provide USB 3.0 interfaces.

Furthermore, a male USB DEVICE connector (USB-B) is provided, for example to connect a printer.

3.2.11 AC Power Supply Connection and Main Power Switch

An AC power supply connector and main power switch are located in a unit on the rear panel of the instrument.

Main power switch function:

Position 1: The instrument is in operation.

Position O: The entire instrument is disconnected from the AC power supply.

For details refer to chapter 2.1.4, "Connecting the AC Power", on page 15.

3.3   Additional Hardware Options Without External Connectors

Some additional hardware options are available which have no external connectors and are not visible on the outside of the R&S FPS.

3.3.1   OCXO Option (R&S FPS-B4)

This option generates a 10 MHz reference signal with a very precise frequency. If installed, and if no external signal is used, this signal is used as an internal reference.

Warm-up time for OCXO

When the instrument is switched on, the OCXO requires an extended warm-up time (see data sheet). No warm-up time is required when starting from standby mode.

3.3.2   Bandwidth Extension 160 MHz (R&S FPS-B160)

The signal analysis bandwidth of the R&S FPS can be extended by a hardware option (R&S FPS-B160). The bandwidth extension allows for a linear bandwidth up to a maximum of 160 MHz with an output sample rate of up to 10 GHz. While the extension can be activated or deactivated manually in the R&S FPS base unit (I/Q Analyzer application), it is activated automatically in some applications that also support I/Q data analysis. See the application-specific documentation for details.

4   Miniature Display

The R&S FPS is equipped with a miniature display on the front panel (see also "Mini display" on page 30).

The display provides the following information:

- The serial number, firmware version and model of the instrument
- The IP address of the instrument
- The GPIB address of the instrument
- System messages, for example when errors occur

Furthermore, it provides the following functions directly on the instrument:

- Configuring network settings, including LXI and GPIB parameters
- Performing selftests, self alignment
- Resetting the instrument to a predefined state
- Changing display settings

The miniature front panel display is meant as a service interface, not for measurement display. If the display fails for any reason, switch the instrument off and back on again to restore the display.

Note that any error messages *caused by the Windows 7 operating system* are not displayed on the miniature front panel display. They are only visible on an external monitor or via RemoteDesktop from a controller PC. Thus, if operation of the R&S FPS seems to fail for no obvious reason, try connecting a monitor or a controller PC to check for any messages awaiting confirmation or action.

(See chapter 2.3, "Connecting USB Devices", on page 22 or chapter 5.6, "How to Set Up Remote Desktop", on page 66)

4.1   Functions and Settings in the Mini Display Menu

The following functions and settings are available via the menu in the R&S FPS's mini display.

Some of the following functions are also available in manual mode via the softfrontpanel, see the "General Instrument Setup" and "Network and Remote Operation" sections in the R&S FPS User Manual.

Network

Configures the settings for operation in a local area network (LAN), for example to control the instrument from a remote PC or use a network printer.

NOTICE! Risk of network problems. All network parameters can be edited by the administrator ("Instrument" user) only. Beware that changing the computer name has major effects in a network.

For details, see chapter 5, "Controlling the R&S FPS Remotely", on page 47.

Computer Name ← Network

Each instrument is delivered with an assigned computer name, but this name can be changed. The naming conventions of Windows apply. If too many characters and/or numbers are entered, an error message is displayed in the status line.

The default instrument name is a non-case-sensitive string with the following syntax:

<Type><variant>-<serial_number>

For example `FPS13-123456`

The serial number can be found on the rear panel of the instrument. It is the third part of the device ID printed on the bar code sticker:

DHCP ← Network

Switches between DHCP server available (On) or not available (Off). If a DHCP server is available in the network, the IP address and subnet mask of the instrument are obtained automatically from the DHCP server.

IP Address ← Network

Defines the IP address. The TCP/IP protocol is preinstalled with the IP address 10.0.0.10. If the DHCP server is available ("DHCP On"), the setting is read-only.

The IP address consists of four number blocks separated by dots. Each block contains 3 numbers in maximum (e.g. 100.100.100.100), but also one or two numbers are allowed in a block (as an example see the preinstalled address).

Subnet Mask ← Network

Defines the subnet mask. The TCP/IP protocol is preinstalled with the subnet mask 255.255.255.0. If the DHCP server is available ("DHCP On"), this setting is read-only.

The subnet mask consists of four number blocks separated by dots. Each block contains 3 numbers in maximum (e.g. 100.100.100.100), but also one or two numbers are allowed in a block (as an example see the preinstalled address).

System commands
Provides basic system functions.

Preset ← System commands
When delivered, the R&S FPS has a default configuration. You can restore this defined initial state at any time as a known starting point for measurements. This is often recommendable as a first step in troubleshooting when unusual measurement results arise.

Remote command:
`*RST` or `SYSTem:PRESet`

Self align ← System commands
Starts recording correction data for the instrument. If the correction data acquisition fails or if the correction values are deactivated, a corresponding message is displayed in the status field.

Selftest ← System commands
If the R&S FPS fails you can perform a self test of the instrument to identify any defective modules.

Once the self test is started, all modules are checked consecutively and the test result is displayed.

LAN Reset ← System commands
Resets the LAN configuration to its default settings (LCI function).

According to the LXI standard, an LCI must set the following parameters to a default state.

Parameter	Value
TCP/IP Mode	DHCP + Auto IP Address
Dynamic DNS	Enabled
ICMP Ping	Enabled
Password for LAN configuration	LxiWebIfc

Reboot ← System commands
Reboots the instrument, including the operating system.

Enable NormalUser / Disable NormalUser ← **System commands**
Activates or deactivates the "NormalUser" account.

The NormalUser can only be activated by a user with administrator rights.

If enabled, the R&S FPS requires a reboot and then automatically logs in using the "NormalUser" account (indicated by "NormUsr" in the miniature display.).

The "NormalUser" is a standard user account with limited functionality. In particular, administrative tasks such as LAN configuration or general instrument settings are not available. Refer to the description of the basic instrument setup (SETUP menu) to find out which functions are affected.

If disabled, the R&S FPS requires a reboot. The R&S FPS attempts to login using the "Instrument" (administrator) account. You must enter the administrator ("Instrument" user) password on the R&S FPS (default: "894129"). For details see "To enter a password" on page 45.

Note: Deactivated auto-login function. If the auto-login function is deactivated and the R&S FPS is rebooted, you require an external monitor and keyboard and a RemoteDesktop access on the R&S FPS to enter the password. Otherwise, the Windows operating system will not complete login and the R&S FPS remains inoperable.
For details see chapter 2.2.3.1, "The Automatic Login Function", on page 19

Enable SecureUser / Disable SecureUser ← **System commands**
Activates or deactivates the secure user mode.

The secure user mode can only be activated or deactivated by a user with administrator rights. You must enter the administrator ("Instrument" user) password on the R&S FPS (default: "894129"). For details see "To enter a password" on page 45.

If enabled, the R&S FPS requires a reboot and then automatically logs in using the "SecureUser" account (indicated by "SecUsr" in the miniature display.)

For a "SecureUser", data that the R&S FPS normally stores on the solid-state drive is redirected to volatile memory instead. Data that is stored in volatile memory can be accessed by the user during the current instrument session; however, when the instrument's power is removed, all data in volatile memory is erased. Administrative tasks are not allowed by the "SecureUser".

Before you activate secure user mode, store any instrument settings that are required beyond the current session, such as predefined instrument settings, transducer files, or self-alignment data.

If disabled, the R&S FPS requires a reboot and then automatically logs in using the "Instrument" (administrator) account.

Note: Deactivated auto-login function. If the auto-login function is deactivated and the R&S FPS is rebooted, you require an external monitor and keyboard and a RemoteDesktop access on the R&S FPS to enter the password. Otherwise, the Windows operating system will not complete login and the R&S FPS remains inoperable.

For details see chapter 2.2.3.1, "The Automatic Login Function", on page 19

For details on the secure user mode see chapter 2.6, "Protecting Data Using the Secure User Mode", on page 25.

GPIB

Alternatively to connecting the R&S FPS to a LAN, the GPIB interface can be used to connect a remote PC.

GPIB Address ← GPIB

Defines the GPIB address. Values from 0 to 30 are allowed. The default address is 20.

LXI parameters

On the R&S FPS the LXI Class C functionality is already installed and enabled; thus, the instrument can be accessed via any web browser (e.g. the Microsoft Internet Explorer), for example to change the LAN settings using the LXI Web browser interface.

Note that LXI parameters are not available for the "SecureUser" or "NormalUser" accounts (see "Enable NormalUser / Disable NormalUser" on page 41 and "Enable SecureUser / Disable SecureUser" on page 41).

Version ← LXI parameters

Displays the current LXI version on the R&S FPS (read-only).

Features ← LXI parameters

Displays the extended LXI features installed on the R&S FPS (read-only).

Computer Name ← LXI parameters

Each instrument is delivered with an assigned computer name, but this name can be changed. The naming conventions of Windows apply. If too many characters and/or numbers are entered, an error message is displayed in the status line.

The default instrument name is a non-case-sensitive string with the following syntax:

<Type><variant>-<serial_number>

For example `FPS13-123456`

The serial number can be found on the rear panel of the instrument. It is the third part of the device ID printed on the bar code sticker:

MAC ← LXI parameters
Media Access Control address (MAC address), a unique identifier for the network card in the R&S FPS

IP ← LXI parameters
IP address of the R&S FPS as defined in the operating system (see also "IP Address" on page 39).

ICMP/VXI-11 Discovery ← LXI parameters
"ICMP" indicates whether the ping responder is active or not.

If "VXI-11 Discovery" is enabled, connected devices are detected automatically using the VXI-11 protocol.

System messages
Displays the system messages generated by the R&S FPS.

The messages are displayed in the order of their occurrence; the most recent messages are placed at the top of the list.

Display
Provides functions for the display itself.

Backlight saving ← Display
If enabled, the backlight of the display is turned off to save energy.

Normal/inverse color ← Display
Switches between a display with light characters on a dark background (normal) or dark characters on a light background (inverted).

Info
Provides information on the R&S FPS installation.

This information can be useful when problems occur with the instrument and you require support from Rohde & Schwarz.

Serial ← Info
Serial number of the R&S FPS

FW version ← Info
Currently installed firmware version

Model ← Info
Instrument model

uC version ← Info
Microcontroller version

4.2 Working with the Miniature Instrument Display

Using the miniature display on the front panel of the R&S FPS you can change basic instrument settings and perform hardware functions directly on the instrument, without additional devices such as a controller PC or external monitor.

To display a particular setting in the menu

The information and configuration settings are displayed in a hierarchical menu structure.

► To navigate within the menu structure, do one of the following:

● Press the <Up Arrow> and <Down Arrow> keys to scroll through the menus.
● Press the ENTER key to select a particular menu item (either to edit a setting or to select the submenu).
● Press the ESC key to move back up in the menu structure.

To edit a configuration value

1. Navigate to the required menu item as described in .

2. Press the ENTER key to select the displayed configuration setting and switch to edit mode.

3. To change the value, do one of the following:

   - Press the <Up Arrow> and <Down Arrow> keys to scroll through the available entry values (e.g. digits in an IP address).
   - Press the <Left Arrow> and <Right Arrow> keys to scroll within the entry (e.g. to the second or third part of the IP address).
   - Press the DEL key to delete the character to the left of the cursor.

4. Press the ENTER key again to store the entry and exit the edit mode.

To enter a password

For some functions you must enter the administrator ("Instrument" user) password on the R&S FPS (default: "894129").

1. Navigate to the required menu item as described in "To display a particular setting in the menu" on page 44.

2. Press the ENTER key to select the function.

3. For each character in the password:

   a) Press the <Up Arrow> and <Down Arrow> keys to scroll through the available characters.
   b) When the required character appears, press the <Right Arrow> key to move to the next character.
      The currently selected character is displayed normally, all others are hidden by asterisks (*) for discretion.

4. When the password is complete, press the ENTER key again to store the entry and exit the edit mode.

4.3   Configuring the Display Settings

This section describes how to configure basic display settings on the R&S FPS. For further basic instrument settings see the R&S FPS User Manual.

To change the display colors

You can switch between a display with light characters on a dark background (normal) or dark characters on a light background (inverted).

1. In the R&S FPS's mini display menu, navigate to "Display" > "Normal/inverse colors" and press the ENTER key.

2. Use the <Left Arrow> and <Right Arrow> keys to toggle the setting.

3. Press the ENTER key again to store the entry and exit the edit mode.

To turn off the display backlight

You can turn off the backlight of the display to save energy.

1. In the R&S FPS's mini display menu, navigate to "Display" > "Backlight saving" and press the ENTER key.

2. Use the <Left Arrow> and <Right Arrow> keys to toggle the setting.

3. Press the ENTER key again to store the entry and exit the edit mode.

5   Controlling the R&S FPS Remotely

Since the R&S FPS was designed without a screen (except for the mini display for basic information and settings), it will typically be used to perform measurements under remote control. However, the developers of such programs will find it convenient to get familiar with the instrument and its functions using manual operation initially, and then design the programs accordingly. Once developed and tested, the programs can be executed from a remote PC, with no manual interaction required. The computer that is used for remote control is called "controller" here.

All instrument functions and settings, as well as any background information, are described for manual operation, assuming an external keyboard, mouse and monitor are connected, or a controller PC with Remote Desktop is being used.

Various methods for remote control are supported:

- Connecting the instrument to a (LAN) network (see chapter 5.2, "How to Configure a Network", on page 55)

- Using the LXI browser interface in a LAN network (see chapter 5.2.3, "How to Configure the LAN Using the LXI Browser Interface", on page 58)

- Using the Windows Remote Desktop application in a LAN network (see chapter 5.6, "How to Set Up Remote Desktop", on page 66)

PCIe connectors

Note that the PCIe *output* connectors are provided to control connected devices remotely from the R&S FPS, for example as external tracking generators. They **cannot be used for input** to control the R&S FPS remotely from a PC, for example.

Remote operation

Remote operation of the instrument from a connected computer is possible using SCPI commands. Sending remote commands requires the instrument to be configured in a LAN network or connected to a PC via the GPIB interface as described in chapter 5.2, "How to Configure a Network", on page 55 and chapter 5.5, "How to Start a Remote Control Session from a PC", on page 66.

Manual operation via Remote Desktop

Remote Desktop is a Windows application which can be used to access and control the instrument from a remote computer through a LAN connection. While the R&S FPS is in operation, the instrument's graphical results and control elements are displayed on the remote computer, and Remote Desktop provides access to all of the applications, files, and network resources of the instrument. Thus, remote (manual) operation of the instrument is possible. The following tasks can be performed using Remote Desktop:

● Access to the control functions via a virtual front panel

● Printout of measurement results directly from the controller

● Storage of measured data on the controller's hard disk

This documentation provides basic instructions on setting up the Remote Desktop for the R&S FPS. For details refer to the Windows 7 operating system documentation.

5.1   Remote Control Interfaces and Protocols

The instrument supports different interfaces and protocols for remote control. The following table gives an overview.

Table 5-1: Remote control interfaces and protocols

Inter-face	Protocols, VISA*) address string	Remarks

Local Area Network (LAN)	• **HiSLIP** High-Speed LAN Instrument Protocol (IVI-6.1)
	`TCPIP::host address::hislip0[::INSTR]`
	• **VXI-11**
	`TCPIP::host address::inst0[::INSTR]`
	Library: VISA
	• **socket communication** (Raw Ethernet, simple Telnet)
	`TCPIP::host address[::`
	`LAN device name]::<port>::SOCKET`
	Library: VISA or socketcontroller
		A LAN connector is located on the rear panel of the instrument.
		
		The interface is based on TCP/IP and supports various protocols.
		
		For a description of the protocols refer to:
		5.1.1.1 VXI-11 Protocol
		5.1.1.2 HiSLIP Protocol
		5.1.1.3 Socket Communication

GPIB (IEC/ IEEE Bus Interface)	VISA*) address string: `GPIB::primary address[::INSTR]` (no secondary address)	A GPIB bus interface according to the IEC 625.1/ IEEE 488.1 standard is located on the rear panel of the instrument. For a description of the interface refer to 5.1.2 GPIB Interface (IEC 625/ IEEE 418 Bus Interface).

USB	VISA*) address string:
	`USB::<vendor ID>::<product_ID>::`
	`<serial_number>[::INSTR]`
		USB connectors are located on the front and rear panel of the instrument.
		
		For a description of the interface refer to 5.1.3 USB Interface.

PCIe		Two PCIe connectors are located on the rear panel of the instrument. Currently this interface is only available to control an external generator, which requires option R&S FPS-B10

*) VISA is a standardized software interface library providing input and output functions to communicate with instruments. A VISA installation on the controller is a prerequisite for remote control using the indicated interfaces.

(See also chapter 5.1.4, "VISA Libraries", on page 54).

Within this interface description, the term GPIB is used as a synonym for the IEC/IEEE bus interface.

5.1.1   LAN Interface

To be integrated in a LAN, the instrument is equipped with a LAN interface, consisting of a connector, a network interface card and protocols. The network card can be operated with the following interfaces:

- 10 Mbit/s Ethernet IEEE 802.3
- 100 Mbit/s Ethernet IEEE 802.3u
- 1Gbit/s Ethernet IEEE 802.3ab

For remote control via a network, the PC and the instrument must be connected via the LAN interface to a common network with TCP/IP network protocol. They are connected using a commercial RJ45 cable (shielded or unshielded twisted pair category 5). The TCP/IP network protocol and the associated network services are preconfigured on the instrument. Software for instrument control and the VISA program library must be installed on the controller.

VISA library

Instrument access is usually achieved from high level programming platforms using VISA as an intermediate abstraction layer. VISA encapsulates the low level VXI, GPIB, LAN or USB function calls and thus makes the transport interface transparent for the user. See chapter 5.1.4, "VISA Libraries", on page 54 for details.

The R&S FPS supports various LAN protocols such as LXI, RSIB, raw socket or the newer HiSLIP protocol.

IP address

Only the IP address or a valid DNS host name is required to set up the connection. The host address is part of the "VISA resource string" used by the programs to identify and control the instrument.

The VISA resource string has the form:

```
TCPIP::host address[::LAN device name][::INSTR]
```

or

```
TCPIP::host address::port::SOCKET
```

where:

- **TCPIP** designates the network protocol used
- **host address** is the IP address or host name of the device
- **LAN device name** defines the protocol and the instance number of a sub-instrument;
    - `inst0` selects the VXI-11 protocol (default)
    - `hislip0` selects the newer HiSLIP protocol
- **INSTR** indicates the instrument resource class (optional)
- **port** determines the used port number
- **SOCKET** indicates the raw network socket resource class

Example:

- Instrument has the IP address *192.1.2.3*; the valid resource string using VXI-11 protocol is:
  ```
  TCPIP::192.1.2.3::INSTR
  ```
- A raw socket connection can be established using:
  ```
  TCPIP::192.1.2.3::5025::SOCKET
  ```

Identifying instruments in a network

If several instruments are connected to the network, each instrument has its own IP address and associated resource string. The controller identifies these instruments by means of the resource string.

For details on configuring the LAN connection, see chapter 5.2, "How to Configure a Network", on page 55.

5.1.1.1   VXI-11 Protocol

The VXI-11 standard is based on the ONC RPC (Open Network Computing Remote Procedure Call) protocol which in turn relies on TCP/IP as the network/transport layer. The TCP/IP network protocol and the associated network services

are preconfigured. TCP/IP ensures connection-oriented communication, where the order of the exchanged messages is adhered to and interrupted links are identified. With this protocol, messages cannot be lost.

5.1.1.2   HiSLIP Protocol

The HiSLIP (**Hi**gh **S**peed **L**AN **I**nstrument **P**rotocol) is the successor protocol for VXI-11 for TCP-based instruments specified by the IVI foundation. The protocol uses two TCP sockets for a single connection - one for fast data transfer, the other for non-sequential control commands (e.g. `Device Clear` or `SRQ`).

HiSLIP has the following characteristics:

- High performance as with raw socket network connections
- Compatible IEEE 488.2 support for Message Exchange Protocol, Device Clear, Serial Poll, Remote/Local, Trigger, and Service Request
- Uses a single IANA registered port (4880), which simplifies the configuration of firewalls
- Supports simultaneous access of multiple users by providing versatile locking mechanisms
- Usable for IPv6 or IPv4 networks

> Note that HiSLIP data is sent to the device using the "fire and forget" method with immediate return, as opposed to VXI-11, where each operation is blocked until a VXI-11 device handshake returns. Thus, a successful return of a VISA operation such as `viWrite()` does not guarantee that the instrument has finished or started the requested command, but is delivered to the TCP/IP buffers.

For more information see also the application note at: http://www.rohde-schwarz.com/appnote/1MA208.

5.1.1.3   Socket Communication

An alternative way for remote control of the software is to establish a simple network communication using sockets. The socket communication, also referred to as "Raw Ethernet communication", does not necessarily require a VISA installation on the remote controller side. It is available by default on all operating systems.

The simplest way to establish socket communication is to use the built-in telnet program. The telnet program is part of every operating system and supports a communication with the software on a command-by-command basis. For more convenience and to enable automation by means of programs, user-defined sockets can be programmed.

Socket connections are established on a specially defined port. The socket address is a combination of the IP address or the host name of the instrument and the number of the port configured for remote-control. All R&S FPS use port number 5025 for this purpose. The port is configured for communication on a command-to-command basis and for remote control from a program.

5.1.2 GPIB Interface (IEC 625/IEEE 418 Bus Interface)

A GPIB interface is integrated on the rear panel of the instrument.

By connecting a PC to the R&S FPS via the GPIB connection you can send remote commands to control and operate the instrument.

To be able to control the instrument via the GPIB bus, the instrument and the controller must be linked by a GPIB bus cable. A GPIB bus card, the card drivers and the program libraries for the programming language used must be provided in the controller. The controller must address the instrument with the GPIB bus address (see chapter 5.2.4, "How to Change the GPIB Instrument Address", on page 61). You can set the GPIB address and the ID response string. The GPIB language is set as SCPI by default and cannot be changed for the R&S FPS.

Notes and Conditions

In connection with the GPIB interface, note the following:

- Up to 15 instruments can be connected
- The total cable length is restricted to a maximum of 15 m or 2 m times the number of devices, whichever is less; the cable lenth between two instruments should not exceed 2 m.
- A wired "OR"-connection is used if several instruments are connected in parallel.
- Any connected IEC-bus cables should be terminated by an instrument or controller.

5.1.3   USB Interface

For remote control via the USB connection, the PC and the instrument must be connected via the USB type B interface. A USB connection requires the VISA library to be installed. VISA detects and configures the R&S instrument automatically when the USB connection is established. You do not have to enter an address string or install a separate driver.

USB address

The used USB address string is:

`USB::<vendor ID>::<product ID>::<serial number>[::INSTR]`

where:

- <vendor ID> is the vendor ID for Rohde & Schwarz (0x0AAD)
- <product ID> is the product ID for the Rohde & Schwarz instrument
- <serial number> is the individual serial number on the rear of the instrument

Table 5-2: Product IDs for R&S FPS

Instrument model	Product ID
FPS4	F9
FPS7	FA
FPS13	FB
FPS30	FC
FPS40	FD

Example:

`USB::0x0AAD::0x00FB::100001::INSTR`

0x0AAD is the vendor ID for Rohde&Schwarz

0x00FB is the product ID for the R&S FPS13

100001 is the serial number of the particular instrument

5.1.4   VISA Libraries

VISA is a standardized software interface library providing input and output functions to communicate with instruments. The I/O channel (LAN or TCP/IP, USB, ...) is selected at initialization time by means of the channel–specific address string

("VISA resource string") indicated in table 5-1, or by an appropriately defined VISA alias (short name).

A VISA installation is a prerequisite for remote control using the following interfaces:

- chapter 5.1.1, "LAN Interface", on page 50
- chapter 5.1.2, "GPIB Interface (IEC 625/IEEE 418 Bus Interface)", on page 53
- chapter 5.1.3, "USB Interface", on page 54

For more information about VISA refer to the user documentation.

5.2　How to Configure a Network

NOTICE

Risk of network failure

Before connecting the instrument to the network or configuring the network, consult your network administrator. Errors may affect the entire network.

The R&S FPS is equipped with a network interface and can be connected to an Ethernet LAN (local area network). Provided the appropriate rights have been assigned by the network administrator and the Windows 7 firewall configuration is adapted accordingly, the interface can be used, for example:

- To transfer data between a controller and the tester, e.g. in order to run a remote control program; see the "Remote Control" chapter in the R&S FPS User Manual
- To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool); see chapter 5.6, "How to Set Up Remote Desktop", on page 66
- To connect external network devices (e.g. printers)
- To transfer data from a remote computer and back, e.g. using network folders

A precondition for operating or monitoring the R&S FPS remotely is that it is connected to a LAN network or a PC connected to the GPIB interface. This is described here.

> **Windows Firewall Settings**
>
> A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. Rohde & Schwarz highly recommends the use of the firewall on your instrument. R&S instruments are shipped with the Windows firewall enabled and preconfigured in such a way that all ports and connections for remote control are enabled. For more details on firewall configuration see the R&S White Paper "Malware Protection" (available at http://www.rohde-schwarz.com/appnote/1EF73) and the Windows 7 help system.

5.2.1 How to Connect the Instrument to the Network

There are two methods to establish a LAN connection to the instrument:

* A non-dedicated network (Ethernet) connection from the instrument to an existing network made with an ordinary RJ-45 network cable. The instrument is assigned an IP address and can coexist with a computer and with other hosts on the same network.

* A dedicated network connection (Point-to-point connection) between the instrument and a single computer made with a (crossover) RJ-45 network cable. The computer must be equipped with a network adapter and is directly connected to the instrument. The use of hubs, switches, or gateways is not required, however, data transfer is still performed using the TCP/IP protocol. An IP address has to be assigned to the instrument and the computer, see chapter 5.2.2, "How to Assign the IP Address", on page 57.
Note: As the R&S FPS uses a 1 GBit LAN, a crossover cable is not necessary (due to Auto-MDI(X) functionality).

► To establish a non-dedicated network connection, connect a commercial RJ-45 cable to one of the LAN ports.
To establish a dedicated connection, connect a (crossover) RJ-45 cable between the instrument and a single PC.

If the instrument is connected to the LAN, Windows 7 automatically detects the network connection and activates the required drivers.

The network card can be operated with a 1 GBit Ethernet IEEE 802.3u interface.

5.2.2   How to Assign the IP Address

Depending on the network capacities, the TCP/IP address information for the instrument can be obtained in different ways.

● If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), all address information can be assigned automatically.

● If the network does not support DHCP, or if the instrument is set to use alternate TCP/IP configuration, the addresses must be set manually.

By default, the instrument is configured to use dynamic TCP/IP configuration and obtain all address information automatically. This means that it is safe to establish a physical connection to the LAN without any previous instrument configuration.

NOTICE

Risk of network errors

Connection errors can affect the entire network. 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 instrument to the LAN. Contact your network administrator to obtain a valid IP address.

Assigning the IP address directly on the R&S FPS

1. In the R&S FPS's mini display, navigate to "Network" > "DHCP".

2. If DHCP is "Off", you must enter the IP address manually, as described in the following steps.
   Note: When DHCP is changed from "On" to "Off", the previously set IP address and subnet mask are retrieved.
   If DHCP is "On", the IP address of the DHCP server is obtained automatically. The configuration is saved, and you are prompted to restart the instrument. You can skip the remaining steps.
   Note: When a DHCP server is used, a new IP address may be assigned each time the instrument is restarted. This address must first be determined on the instrument itself. Thus, when using a DHCP server, it is recommended that you use the permanent computer name, which determines the address via the DNS server.

3. In the R&S FPS's mini display, navigate to "Network" > "IP".

4. Enter the "IP Address", for example *10.0.0.10*. The IP address consists of four number blocks separated by dots. Every block contains 3 numbers in maximum.
   Enter the required address: Use the <Up Arrow> and <Down Arrow> keys to scroll through the digits 1-10 and the <Left Arrow> and <Right Arrow> keys to move between the individual numbers and blocks.

5. Enter the "Subnet Mask", for example *255.255.255.0*. The subnet mask consists of four number blocks separated by dots. Every block contains 3 numbers in maximum.

6. Press the ENTER key to store the entry and exit the edit mode.

7. In the R&S FPS's mini display, navigate to "System commands" > "Reboot system" to restart the system.

5.2.3   How to Configure the LAN Using the LXI Browser Interface

LAN eXtensions for Instrumentation (LXI) is an instrumentation platform for measuring instruments and test systems that is based on standard Ethernet technology. LXI is intended to be the LAN-based successor to GPIB, combining the advantages of Ethernet with the simplicity and familiarity of GPIB. The LXI browser interface allows for easy configuration of the LAN.

The instrument's LXI browser interface works correctly with all W3C compliant browsers.

Restrictions

Only user accounts with administrator rights can make use of the LXI functionality. For details see chapter 2.2.3, "Login", on page 18.

In order to configure the LAN interface using the LXI Browser Interface, a controller PC or an external monitor, mouse and keyboard must be connected to the R&S FPS. The settings required to set up this function are available directly on the R&S FPS, via the mini display.

► In the web browser on the Remote Desktop, open the `http://<instrument-hostname>` or `http://<instrument-ip-address>` page, e.g. *http://10.113.10.203*.
   The default password to change LAN configurations is *LxiWeblfc*.

The "Instrument Home Page" (welcome page) opens.
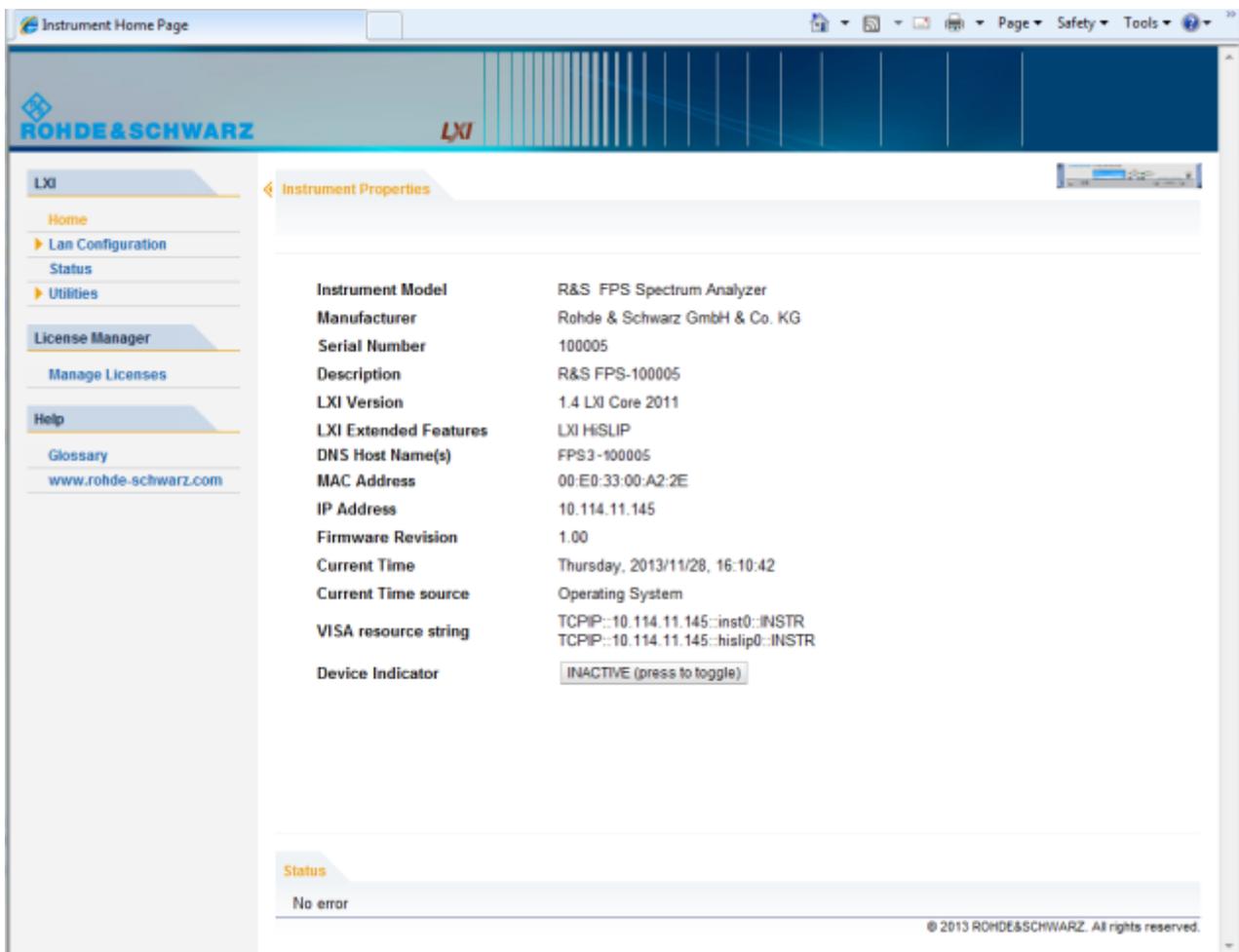
The instrument home page displays the device information required by the LXI standard including the VISA resource string in read-only format.

The most important control elements in the navigation pane of the browser interface are the following

- "LAN Configuration" opens the menu with configuration pages.
- "Status" displays information about the LXI status of the instrument.
- "Help > Glossary" opens a document with a glossary of terms related to the LXI standard.

5.2.3.1 LAN Configuration

The LAN configuration consists of three parts:

- "IP configuration" provides all mandatory LAN parameters.

- "Advanced LAN Configuration" provides LAN settings that are not declared mandatory by the LXI standard.
- "Ping Client" provides the ping utility to verify the connection between the instrument and other devices.

IP Configuration

The "LAN Configuration > IP configuration" web page displays all mandatory LAN parameters and allows their modification.

The "TCP/IP Mode" configuration field controls how the IP address for the instrument gets assigned (see also chapter 5.2.2, "How to Assign the IP Address", on page 57). For the manual configuration mode, the static IP address, subnet mask, and default gateway are used to configure the LAN. The automatic configuration mode uses DHCP server or Dynamic Link Local Addressing (Automatic IP) to obtain the instrument IP address.

> **Changing the LXI password**
>
> Changing the LAN configuration is password-protected. The default password is *LxiWebIfc* (notice upper and lower case characters).
>
> To check or change the LXI password using the R&S FPS's mini display, navigate to "LXI parameters" > "Password".

Advanced LAN Configuration

The "LAN Configuration > Advanced LAN Configuration" parameters in the LXI web configuration are used as follows:

- The "Negotiation" configuration field provides different Ethernet speed and duplex mode settings. In general, the "Auto Detect" mode is sufficient.
- "ICMP Ping" must be enabled to use the ping utility.
- "VXI-11" is the protocol that is used to detect the instrument in the LAN. According to the standard, LXI devices must use VXI-11 to provide a detection mechanism; other additional detection mechanisms are permitted.
- mDNS and DNS-SD are two additional protocols: Multicast DNS and DNS Service Discovery. They are used for device communication in zero configuration networks working without DNS and DHCP

Ping Client

Ping is a utility that verifies the connection between the LXI-compliant instrument and another device. The ping command uses the ICMP echo request and echo reply packets to determine whether the LAN connection is functional. Ping is useful for diagnosing IP network or router failures. The ping utility is not password-protected.

To initiate a ping between the LXI-compliant instrument and a second connected device:

1. Enable "ICMP Ping" on the "Advanced LAN Configuration" web page (enabled after an LCI).

2. Enter the IP address of the second device **without the ping command and without any further parameters** into the "Destination Address" field (e.g. *10.113.10.203*).

3. Select "Submit".

5.2.4   How to Change the GPIB Instrument Address

In order to operate the instrument via remote control, it must be addressed using the GPIB address. The remote control address is factory-set to 20, but it can be changed if it does not fit in the network environment. For remote control, addresses 0 through 30 are allowed. The GPIB address is maintained after a reset of the instrument settings.

To change the GPIB address

1. In the R&S FPS's mini display menu, navigate to "GPIB" > "GPIB address" and press the ENTER key.

2. Enter the required address: Use the <Up Arrow> and <Down Arrow> keys to scroll through the digits 1-10 and the <Left Arrow> and <Right Arrow> keys to move between the first and second digits.

3. Press the ENTER key again to store the entry and exit the edit mode.

Remote command:

SYST:COMM:GPIB:ADDR 18

5.3 How to Log on to the Network

Windows 7 requires that users identify themselves by entering a user name and password in a login window. You can set up two types of user accounts, either an administrator account with unrestricted access to the computer/domain or a standard user account with limited access. The instrument provides an auto-login function for the administrator account, i.e. login with unrestricted access is carried out automatically in the background. By default, the user name for the administrator account is "Instrument", and the user name for the standard user account is "NormalUser". In both cases the initial password is "894129". You can change the password in Windows 7 for any user at any time. Some administrative tasks require administrator rights (e.g. firmware updates or the configuration of a LAN network).

At the same time you log on to the operating system, you are automatically logged on to the network. As a prerequisite, the user name and the password must be identical on the instrument and on the network.

5.3.1 How to Create Users

After the software for the network has been installed, the instrument issues an error message the next time it is switched on because there is no user named "instrument" (= default user ID for Windows 7 automatic login) in the network. Thus, a matching user must be created in the R&S FPS and in the network, the password must be adapted to the network password, and the automatic login mechanism must then be deactivated.

In order to configure users for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.

The network administrator is responsible for creating new users in the network. A new user can be created on the instrument using the "User Account" dialog box:

1.

   Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select "Control Panel" and then select "User Accounts."

3. Select "Give other users access to this computer" and then "Add".
    The "Add New User" dialog box is displayed.

4. Enter the name of the new user in the text field and select "Next".

5. Define the level of access you want to allow the new user:
    ● Select "Standard" to create an account with limited rights.
    ● Select "Administrator" to create an account with administrator rights.

    Note: Full firmware functionality requires administrator rights.

6. Select the "Finish" button.
    The new user is created.

5.3.2   How to Change the User Password

In order to change the user passwords for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.

After the new user has been created on the instrument, the password must be adapted to the network password. This is also done using the "User Accounts" dialog box.

1.

    Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. Select CTRL + ALT + DELETE, then select "Change a password".

3. Enter the user account name.

4. Enter the old password.

5. Enter the new password in the upper text line and repeat it in the following line.

6. Select ENTER.
    The new password is now active.

5.3.3   How to Activate or Deactivate the Automatic Login Mechanism

In order to activate or deactivate the automatic login mechanism on the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.

Deactivating the automatic login mechanism

When shipped, the instrument is already configured to automatically log on under Windows 7. To deactivate the automatic login mechanism, perform the following steps:

1.

    Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select "Run".
    The "Run" dialog box is displayed.

3. Enter the command `C:\R_S\INSTR\USER\NO_AUTOLOGIN.REG`.

4. Select the ENTER key to confirm.
    The automatic login mechanism is deactivated. The next time you switch on the instrument, you are prompted to enter your user name and password before the firmware is started.

Reactivating the automatic login mechanism

1.

    Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select "Run".
    The "Run" dialog box is displayed.

3. Enter the command `C:\R_S\INSTR\USER\AUTOLOGIN.REG`.

4. Select the ENTER key to confirm.

The automatic login mechanism is reactivated. It will be applied the next time the instrument is switched on.

5.4 How to Share Directories (only with Microsoft Networks)

Sharing directories makes data available for other users. This is only possible in Microsoft networks. Sharing is a property of a file or directory.

> In order to configure shared directories on the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.

1.

   Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select "Programs", "Accessories" and then select "Windows Explorer".

3. Select the desired folder with the right mouse button.

4. In the context menu, select "Sharing with > Specific people".
   The dialog box for sharing a directory is displayed.

5. Select a user from the list or add a new name and select the "Add" button.

6. Select the "Share" button.

7. Select "Done" to close the dialog box.
   The drive is shared and can be accessed by the selected users.

5.5   How to Start a Remote Control Session from a PC

When you switch on the instrument, it is always in manual operation state ("local" state) and can be operated via Remote Desktop from an external PC.

1. Send an addressed command (`GTR` - Go to Remote) from a controller to the instrument.

   The instrument is switched to remote control ("remote" state). Operation via the soft front panel (on the Remote Desktop) is disabled. (The keys on the R&S FPS remain enabled.) The instrument remains in the remote state until it is reset to the manual state via the remote control interface.
   Switching from manual operation to remote control and vice versa does not affect the other instrument settings.

2. To obtain optimum performance during remote control, send the `SYSTem:DISPlay:UPDate OFF` command to hide the display of results and diagrams on the controller PC or external monitor (default setting in remote control).

3. To enable manual operation via the soft front panel on the Remote Desktop again, switch the instrument to local mode using the remote command `GTL` (Go to Local), that is, deactivate the `REN` line of the remote control interface.

5.6   How to Set Up Remote Desktop

Remote Desktop is a Windows application which can be used to access and control the instrument from a remote computer through a LAN connection. While the instrument is in operation, the instrument uses the display on the remote computer, and Remote Desktop provides access to all of the applications, files, and network resources of the instrument. Thus, remote operation of the R&S FPS is possible.

With Windows 7, Remote Desktop Client is part of the operating system. For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on.

This section provides basic instructions on setting up the Remote Desktop for the R&S FPS. For details refer to the Windows 7 operating system documentation.

5.6.1 How to Configure the R&S FPS for Remote Operation via Remote Desktop

By default, the R&S FPS is configured to allow Remote Desktop access by any user (except for the "SecureUser", see chapter 5.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 73), and to use a fixed IP address.

To change the settings for remote operation, you must connect an external monitor, mouse and keyboard, or connect a controller PC and set up a Remote Desktop connection with the default settings as described in chapter 5.6.3, "How to Start and Close the Remote Desktop", on page 71.

To change the settings for Remote Desktop access

To avoid problems, use a fixed IP address (see chapter 5.2.2, "How to Assign the IP Address", on page 57).

When a DHCP server is used, a new IP address is assigned each time the instrument is restarted. This address must first be determined on the instrument itself. Thus, using a DHCP server is not suitable for remote operation of the R&S FPS via Remote Desktop.

1.

    Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

2. In the "Start" menu, select the "Control Panel" and then "System and Security".

3. In the "System" area, select "Allow remote access".
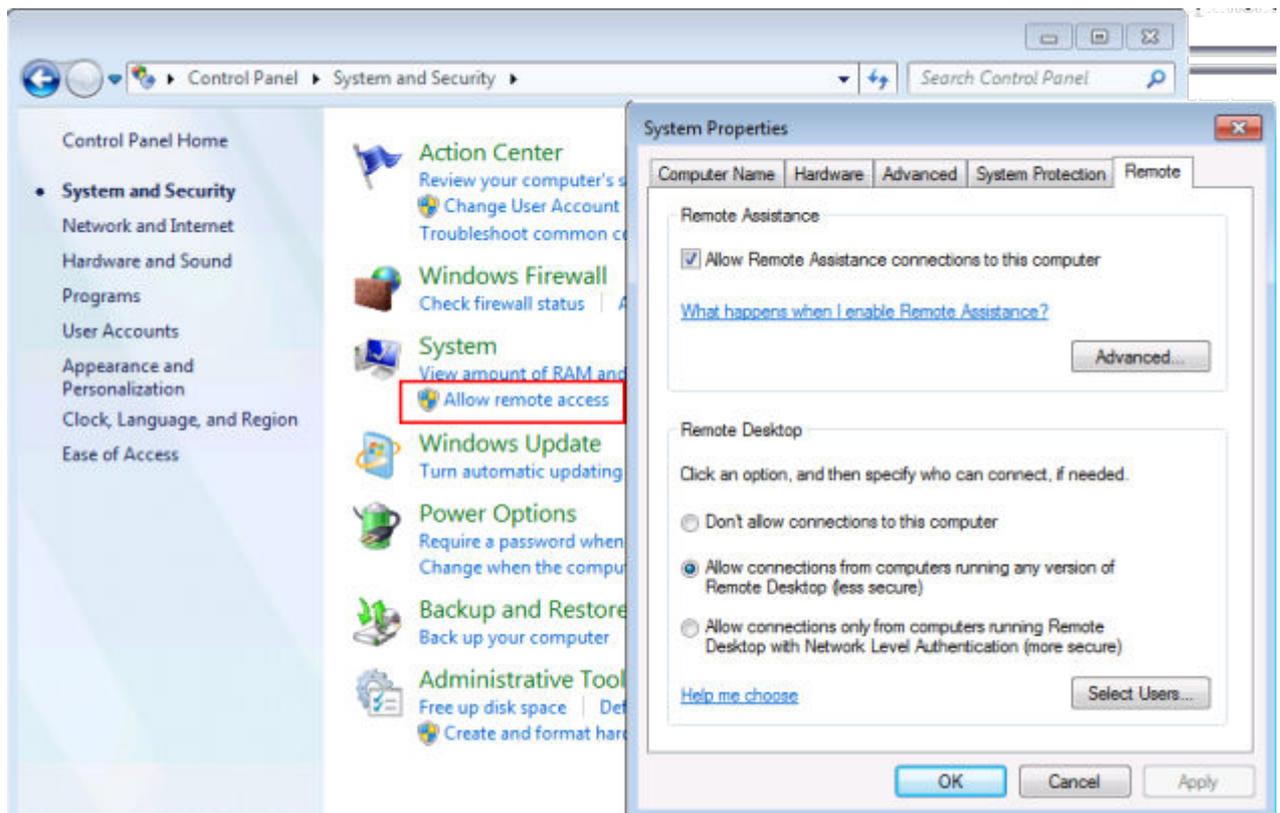
4. In the "Remote" tab, in the "Remote Desktop" area, activate the "Allow connections from computers running Remote Desktop" option.

5. Define which users are to be given access to the R&S FPS via Remote Desktop.
   If the secure user mode is deactivated, the "SecureUser" account is also deactivated. Thus, the procedure described here will not work for the "SecureUser". Instead, see chapter 5.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 73.
   Note: Administrator user accounts (e.g. "Instrument") are automatically enabled for Remote Desktop.
   a) Select the "Select Users" button.
   b) Select the users or create new user accounts as described in chapter 5.3.1, "How to Create Users", on page 62.
   c) Select "OK" to confirm the settings.

6. The R&S FPS is now ready for connection setup with the Remote Desktop program of the controller.

5.6.2   How to Configure the Controller

ℹ️ **Remote Desktop Client**

With Windows 7, Remote Desktop Client is part of the operating system and can be accessed via "Start > Programs > Accessories > Remote Desktop Connection".

For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on.

---

1. In the "Start" menu of the controller, select "All Programs > Accessories > Remote Desktop Connection".
   The "Remote Desktop Connection" dialog box is displayed.

2. Select the "Options >>" button.
   The dialog box is expanded to display the configuration data.
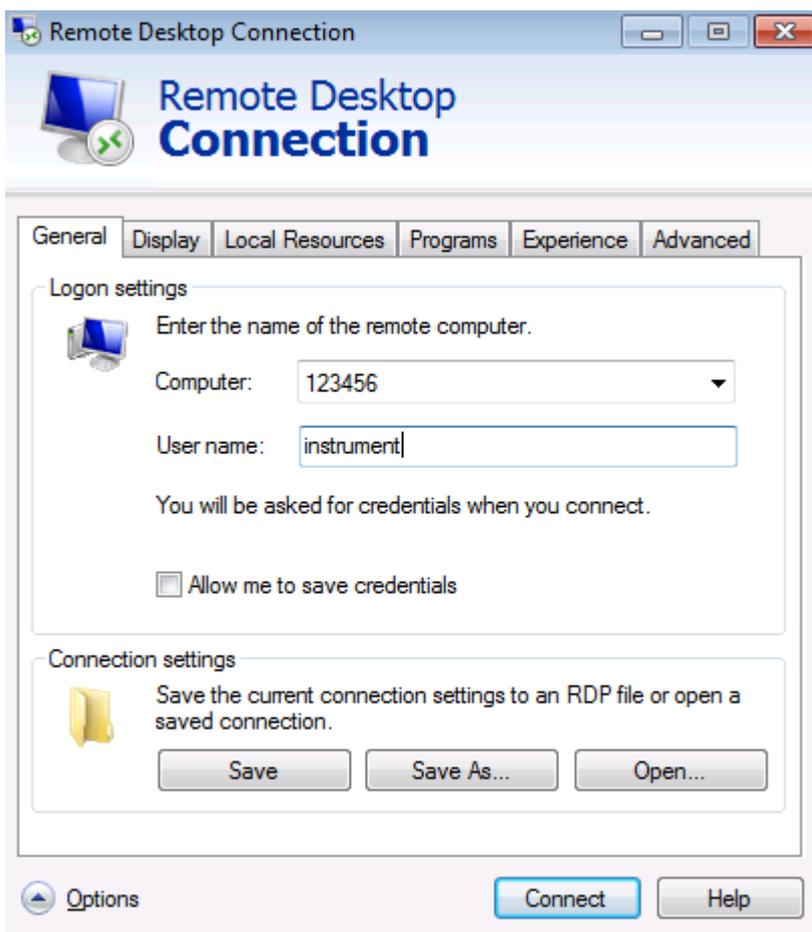
3. Open the "Experience" tab.

The settings on this tab are used to select and optimize the connection speed.

4. In the list, select the appropriate connection (for example: LAN (10 Mbps or higher)).
   Depending on your selection (and how powerful the connection is), the options are activated or deactivated.

5. To improve the performance, you can deactivate the "Desktop background", "Show window contents while dragging" and "Menu and window animation" options.

6. Open the "Local Resources" tab to enable printers, local drives and serial interfaces.

7. If you will need to access drives of the controller from the R&S FPS (e.g. in order to store settings or to copy files from the controller to the R&S FPS), activate the "Disk drives" option.
   Windows will then map drives of the controller to the corresponding network drives.

8. To use printers connected to the controller while accessing them from the R&S FPS, activate the "Printers" options. Do not change the remaining settings.

9. Open the "Display" tab.
   The options to configure the R&S FPS screen display are displayed.

10. Under "Remote desktop size", you can set the size of the R&S FPS window on the desktop of the controller.

11. Under "Colors", do not change the settings.

12. Set the "Display the connection bar when I use the full screen" option:
    If activated, a bar showing the network address of the R&S FPS will appear at the top edge of the screen. You can use this bar to reduce, minimize or close the window.
    If deactivated, the only way you can return to the controller desktop from the R&S FPS screen in full screen mode is to select "Disconnect" from the "Start" menu.

5.6.3   How to Start and Close the Remote Desktop

To set up a connection from the controller to the R&S FPS

1. On the controller, in the "Remote Desktop Connection" dialog box (see chapter 5.6.2, "How to Configure the Controller", on page 69), open the "General" tab.

2. In the "Computer" field, enter the IP address of the R&S FPS (see chapter 5.2.2, "How to Assign the IP Address", on page 57 to determine the IP address).
   In the "User name" field, enter *instrument* to log in as an administrator, or *Normal User* to log in as a standard user.
   In the "Password" field, enter *894129*.

3. To save the connection configuration for later use:
   a) Select the "Save As" button.
      The "Save As" dialog box is displayed.
   b) Enter the name for the connection information (`*.RDP`).

4. To load an existing connection configuration:
   a) Select the "Open" button.
      The "Open" dialog box is displayed.
   b) Select the `*.RDP` file.

5. Select the "Connect" button.
   The connection is set up.

6. If the "Disk drives" option is activated on the "Local Resources" tab, a warning is displayed indicating that the drives are enabled for access from the R&S FPS.
   Select "OK" to confirm the warning.

7. After a few moments, the R&S FPS screen is displayed and manual operation is possible.

   For details on manual operation see chapter 6, "Operating the Instrument in Manual Mode", on page 77.

8. If a dark screen appears or a dark square appears in the upper left-hand corner of the screen, you must restart the R&S FPS in order to see the modified screen resolution.
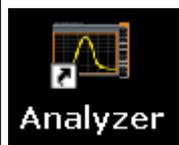
	• Select the key combination ALT + F4. • The R&S FPS firmware is shut down, which may take a few seconds. • On the desktop, double-click the "Analyzer" icon.

The firmware restarts and then automatically opens the graphical user interface from which you can access all instrument functions and settings.
For more information see

9. After the connection is established, the R&S FPS screen is displayed in the "Remote Desktop" application window.
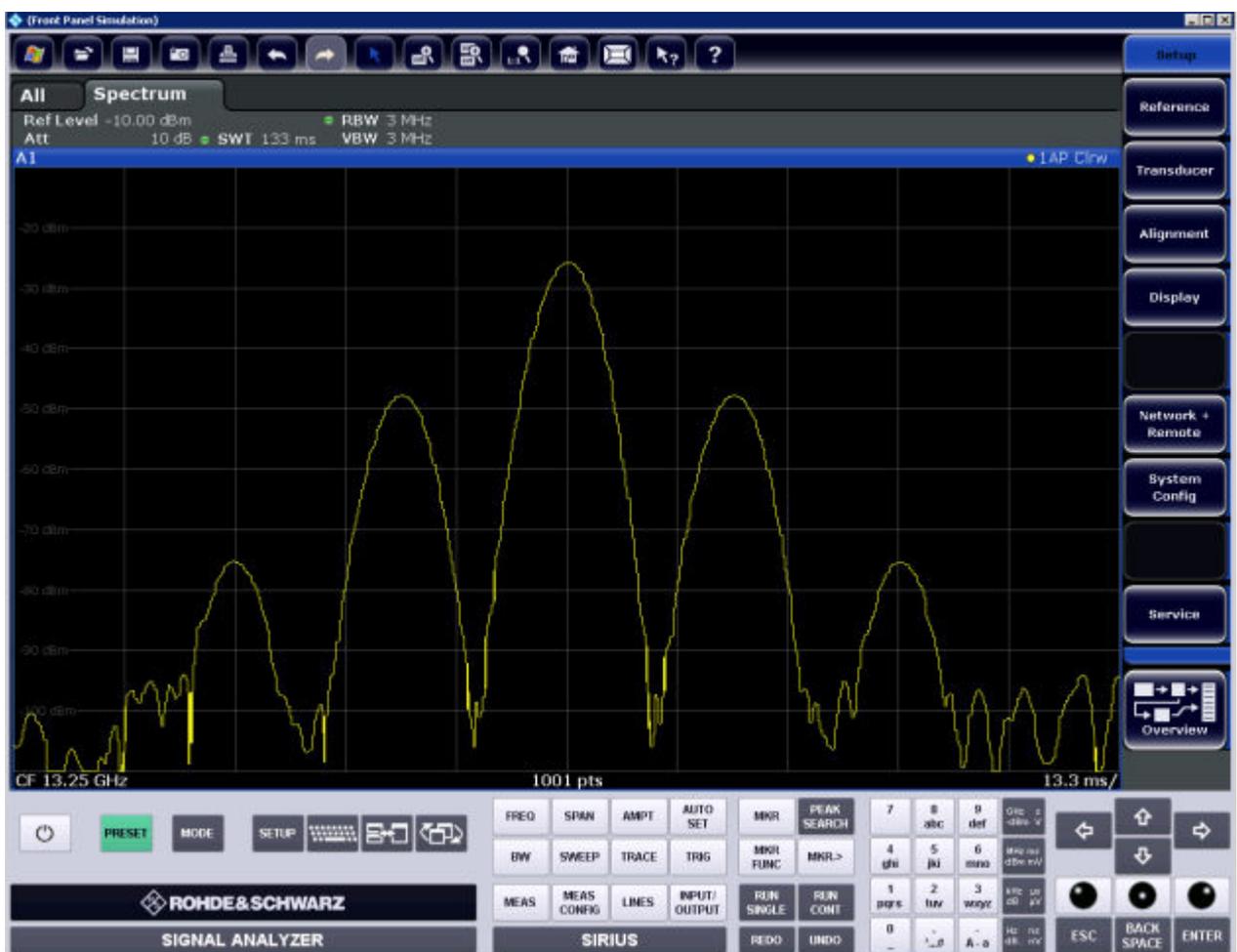
To terminate Remote Desktop control

► On the controller, close the "Remote Desktop" window at any time.
The connection to the R&S FPS is terminated.

Restoring the connection to the R&S FPS

Follow the instructions above for setting up a connection to the R&S FPS. If the connection is terminated and then restored, the R&S FPS remains in the same state.

5.6.4 How to Shut Down the R&S FPS via Remote Desktop

1. Select the R&S FPS's soft front panel on the Remote Desktop and close the application with the key combination ALT + F4.

   A safety query is displayed to warn you that the instrument cannot be reactivated via remote operation and asks you whether you want to continue the shutdown process.

2. Confirm the safety query with "Yes".
   The connection with the controller is terminated and the R&S FPS is shut down.

5.6.5 How to Add or Remove Users to the Remote Desktop Users Group

Only users in the Remote Desktop Users Group are allowed to connect to the R&S FPS via Remote Desktop. You can add the users to this group directly when you allow remote access on the R&S FPS, as described in chapter 5.6, "How to Set Up Remote Desktop", on page 66. Furthermore, you can add or remove users to this group at any time.

In order to add or remove users to the Remote Desktop users group for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See chapter 5.6, "How to Set Up Remote Desktop", on page 66.

> **Secure User Mode**
>
> For security reasons, the "SecureUser" used in secure user mode is not allowed Remote Desktop access to the R&S FPS by default (see chapter 2.6, "Protecting Data Using the Secure User Mode", on page 25). You must explicitly add the "SecureUser" to the Remote Desktop group. If you do not allow this user RemoteDesktop access, the "SecureUser" will only be able to operate the R&S FPS using remote commands or via the miniature display.

1. If necessary, disable the "SecureUser" on the R&S FPS (miniature display: "System commands > Disable SecureUser").

2. Login using the administrator ("Instrument" user) account.

3. Start a RemoteDesktop connection to the R&S FPS as described in "To set up a connection from the controller to the R&S FPS" on page 71.

4.

    Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS.

5. Open the Windows Explorer.

6. Select the directory:
   `Control Panel\All Control Panel Items\`
   `Administrative Tools.`

7. Double-click "Computer Management".
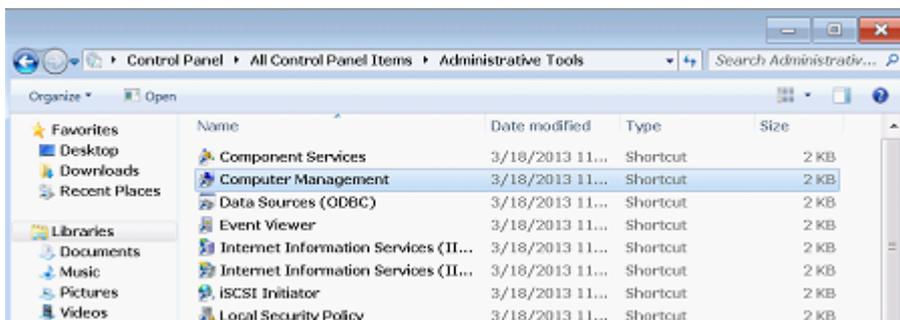
8. In the "Computer Management" dialog box, select "Local Users and Groups \Users" on the left side.
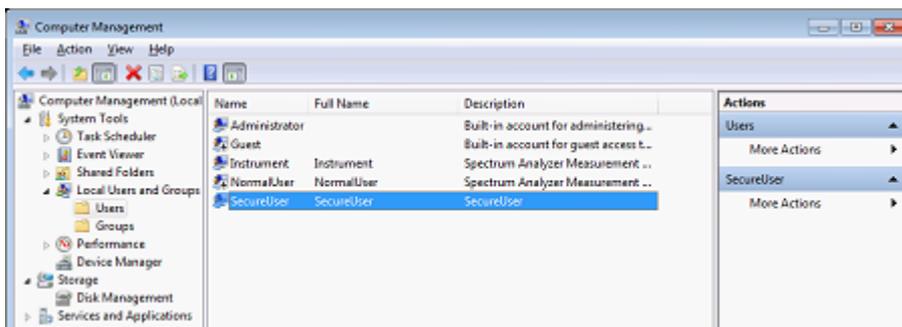
9. Double-click the user to be added, for example: "SecureUser".

10. In the "SecureUser Properties" dialog box, switch to the "Member of" tab and click "Add".
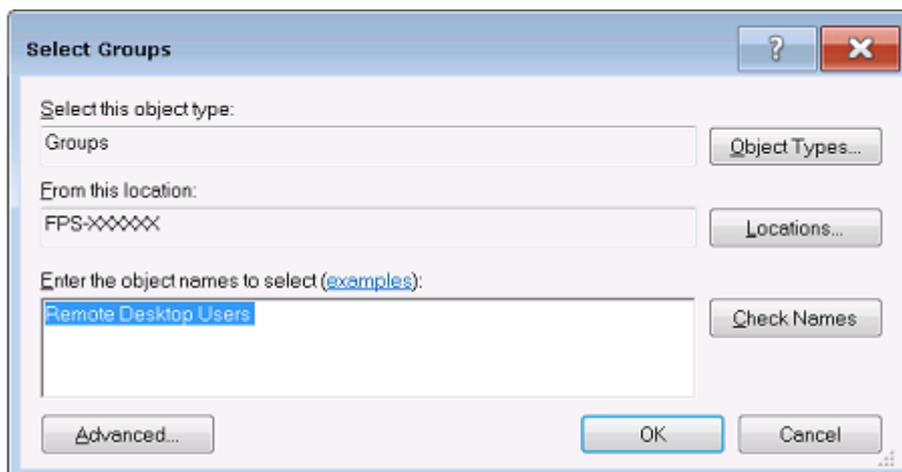
11. In the "Select Groups" dialog box, enter the "Remote Desktop Users" group and select "OK".

12. Select "Apply".

13. Select "OK" and close all dialog boxes.

14. Reboot the R&S FPS firmware so the changes become effective.

    The new user (e.g. "SecureUser") should now be able to access the R&S FPS via RemoteDesktop.

6   Operating the Instrument in Manual Mode

The R&S FPS is completely remote-controlled; it does not provide a display for manual measurement control. The miniature display on the front panel of the R&S FPS allows only for very basic instrument configuration (see chapter 4, "Miniature Display", on page 37).

However, although the R&S FPS does not have a built-in display for manual measurement control, it is possible to operate it interactively in manual mode using a graphical user interface on an external monitor or a controller PC.

It is recommended that you use the manual mode initially to get familiar with the instrument and its functions before using it in pure remote mode. Thus, this section describes in detail how to operate the instrument manually using a controller PC and mouse, or an external monitor, mouse and keyboard. It describes what kind of information is displayed in the diagram area, how to use the soft front panel keys and other interface elements, and how to use the Online Help.

6.1   Graphical User Interface Elements (Soft Front Panel)

All tasks necessary to operate the instrument can be performed using the graphical user interface provided by the soft front panel, a virtual front panel displayed on the external monitor or the Remote Desktop.

All measurement results are displayed. Additionally, the display provides status and setting information, allows you to switch between various measurement tasks, and provides access to all measurement functions.
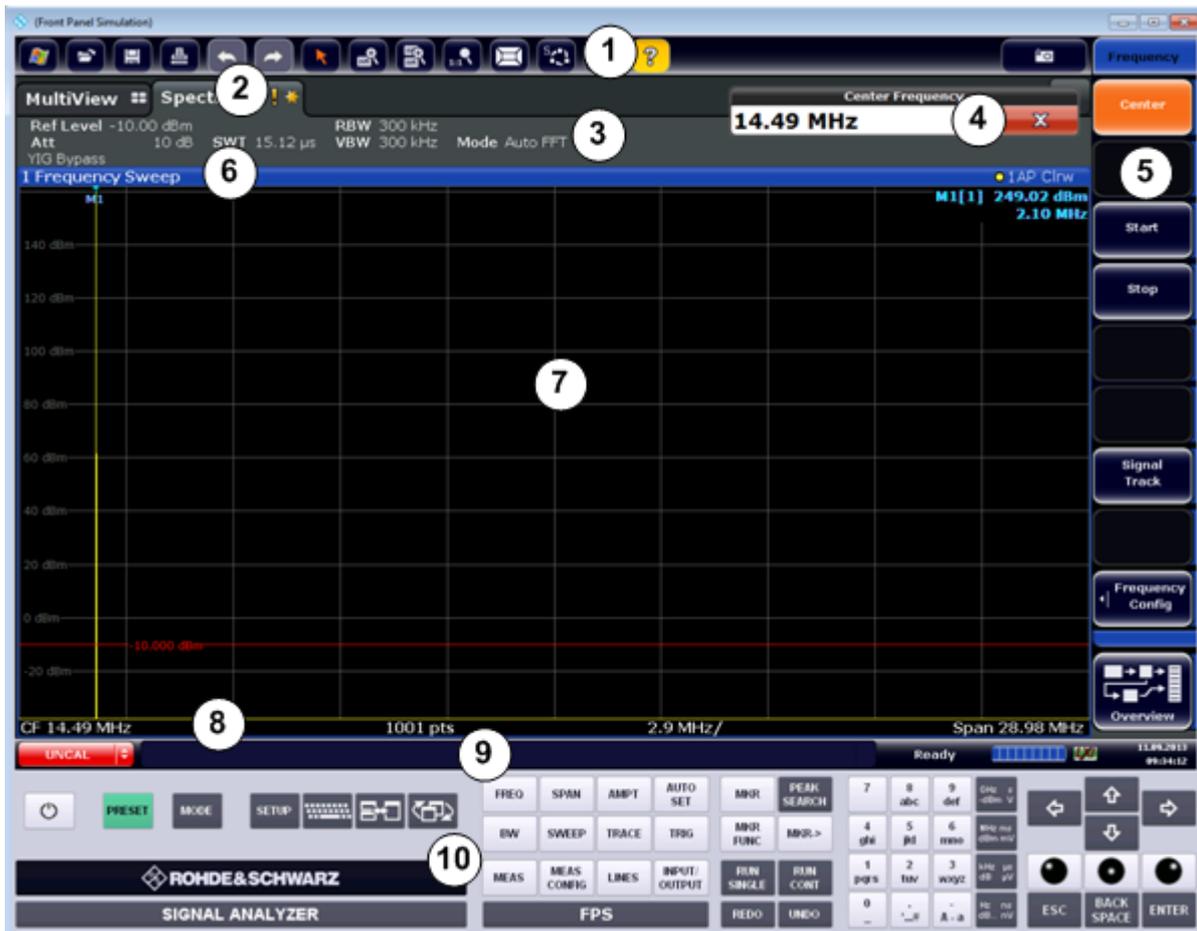
Fig. 6-1: Graphical user interface elements in the R&S FPS's soft front panel

1 = Toolbar with standard application functions, e.g. print, save/open file etc.
2 = Tabs for individual measurement channels
3 = Channel bar for firmware and measurement settings
4 = Input field for measurement setting
5 = Softkeys for function access
6 = Window title bar with diagram-specific (trace) information
7 = Measurement results area
8 = Diagram footer with diagram-specific information, depending on application
9 = Instrument status bar with error messages, progress bar and date/time display
10 = Front panel with keys, keypad, navigation elements

6.1.1   Toolbar

Standard functions can be performed via the icons in the toolbar at the top of the screen.

You can hide the toolbar display in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the R&S FPS User Manual for details.

The following functions are available:

Table 6-1: Standard Application Functions in the Toolbar

Icon	Description
	Windows: displays the Windows "Start" menu and task bar
	Open: opens a file from the instrument ("Save/Recall" menu)
	Store: stores data on the instrument ("Save/Recall" menu)
	Print: defines print settings ("Print" menu)
	Undo: reverts last operation
	Redo: repeats previously reverted operation
	Selection mode: the cursor can be used to select (and move) markers in a zoomed display
	Zoom mode: displays a dotted rectangle in the diagram that can be expanded to define the zoom area
	Multiple zoom mode: multiple zoom areas can be defined for the same diagram
	Zoom off: displays the diagram in its original size
	SmartGrid: activates "SmartGrid" mode to configure the screen layout
	Sequencer: opens the "Sequencer" menu to perform consecutive measurements
	Help (+ Select): allows you to select an object for which context-specific help is displayed
AL	Analysis line (MSRA mode only): opens a dialog box to display and position an analysis line in MSRA measurements (see R&S FPS MSRA User Manual)

Icon	Description
?	Help: displays context-sensitive help topic for currently selected element
📷	Print immediately: prints the current display (screenshot) as configured
In "SmartGrid" mode only:	
✕	Exit "SmartGrid" mode

6.1.2   Softkeys

Softkeys are virtual keys provided by the software. Softkeys are dynamic, i.e. depending on the selected function key, a different list of softkeys is displayed on the right side of the screen.

A list of softkeys for a certain function key is also called a menu. Softkeys can either perform a specific function or open a dialog box.

The "More" softkey indicates that the menu contains more softkeys than can be displayed at once on the screen. When selected, it displays the next set of soft-keys.

Recognizing the softkey status by color

A softkey is highlighted orange when its associated dialog box is open. If it is a toggle softkey, the current state is highlighted blue. If an instrument function is not available temporarily due to a specific setting, the associated softkey is deactivated and its text is colored gray.

Some softkeys belong to a certain (firmware) option. If this option is not installed in your instrument, the associated softkeys are not displayed.

> You can hide the softkey display in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the User Manual for details.

6.1.3   Front Panels

The virtual "Front Panel" provides (static) function keys to access basic instrument functions and softkey menus, as well as a keypad and navigation keys.
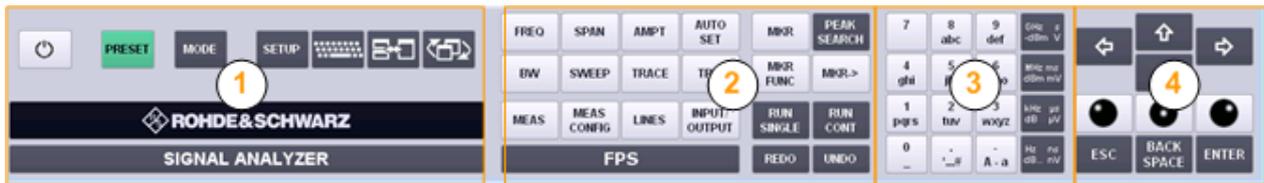
Fig. 6-2: Front panel elements

1 = System keys
2 = Function keys
3 = Keypad
4 = Navigation keys

The measurement and instrument functions and settings can be accessed by selecting the corresponding keys in the front panel. To activate a key, select the key in the display using the mouse pointer.

The virtual front panel is displayed by default when you connect an external monitor or use Remote Desktop with the R&S FPS.

To toggle the front panel display, press the F6 key on the controller PC or an external keyboard.

Mini Front Panel

The Mini Front Panel displays only the basic system and function keys in a detached dialog box that can be moved around the screen.
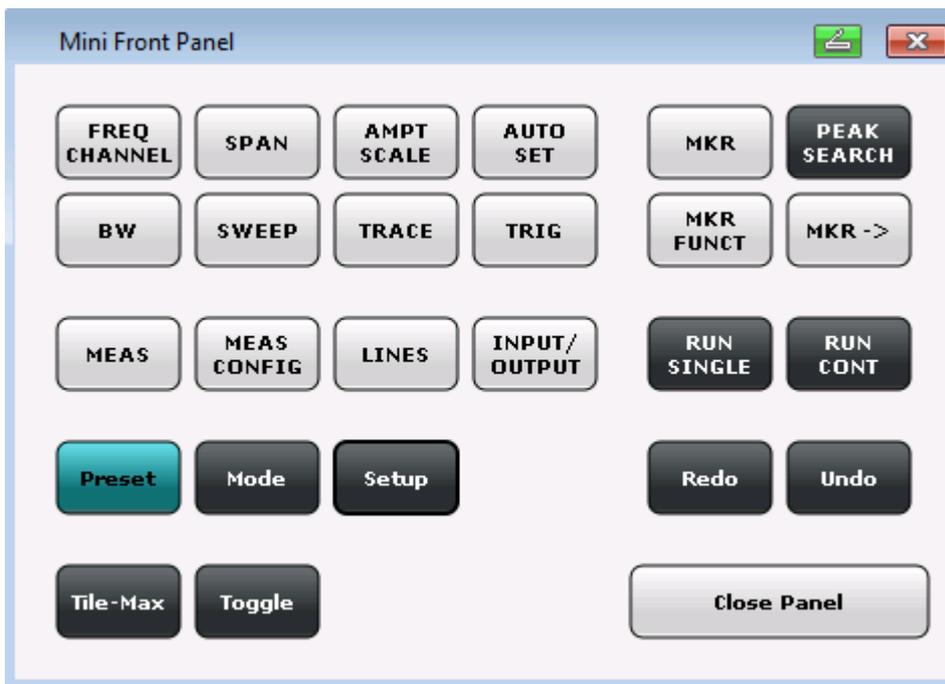
Fig. 6-3: Mini Front Panel

You can close the window by selecting "Close Panel" or the key combination ALT + M (be aware of the keyboard language defined in the operating system!).

To display the front panel or mini front panel

1. If neither the default front panel nor the mini front panel are displayed, press the F6 key on the controller pc or external keyboard to access the virtual system keys.

2. Select the SETUP key and then the "Display" softkey.

3. Select the "Displayed Items" tab.

4. Select "Front Panel: On" or "Mini Front Panel: On".

6.1.3.1 SYSTEM Keys

The virtual SYSTEM keys set the instrument to a defined state, change basic settings, and provide print and display functions.

A detailed description of the corresponding functions is provided in the R&S FPS User Manual.

Table 6-2: SYSTEM keys

SYSTEM key	Assigned functions
PRESET	Resets the instrument to the default state.
MODE	Provides the selection between applications
SETUP	Provides basic instrument configuration functions, e.g.: • Reference frequency (external/internal) • Date, time, display configuration • Firmware update and enabling of options • Information about instrument configuration incl. firmware version and system error messages • Service support functions
	Switches between the on-screen keyboard display: at the top of the screen at the bottom of the screen off
  (Tile-Max)	Switches between maximized and split (tiled) display of the focused area
  (Toggle)	Toggles the focus area between windows.

6.1.3.2 Function Keys

The virtual function keys provide access to the most common measurement settings and functions.

A detailed description of the corresponding functions is provided in the R&S FPS User Manual.

Table 6-3: Function keys

Function key	Assigned functions
Basic measurement settings	
FREQ	Sets the center frequency as well as the start and stop frequencies for the frequency range under consideration. This key is also used to set the frequency offset and the signal track function.
SPAN	Sets the frequency span to be analyzed.
AMPT	Sets the reference level, the displayed dynamic range, the RF attenuation and the unit for the level display. Sets the level offset and the input impedance. Activates the preamplifier (option RF Preamplifier, R&S FPS-B22).
AUTO SET	Enables automatic settings for level, frequency or sweep type mode.
BW	Sets the resolution bandwidth and the video bandwidth.
SWEEP	Sets the sweep time and the number of measurement points. Selects continuous measurement or single measurement.
TRACE	Configures the measured data acquisition and the analysis of the measurement data.
TRIG	Sets the trigger mode, the trigger threshold, the trigger delay, and the gate configuration in the case of gated sweep.
Marker functions	
MKR	Sets and positions the absolute and relative measurement markers (markers and delta markers).
PEAK SEARCH	Performs a peak search for active marker. If no marker is active, normal marker 1 is activated and the peak search is performed for it.
MKR FUNC	Provides additional analysis functions of the measurement markers: Frequency counter (Sig Count) Fixed reference point for relative measurement markers (Ref Fixed) Noise marker (Noise Meas) Phase noise (Phase Noise) n dB down function Peak list

Function key	Assigned functions
MKR->	Used for search functions of the measurement markers (maximum/minimum of the trace).
	Assigns the marker frequency to the center frequency, and the marker level to the reference level.
	Restricts the search area (Search Limits) and characterizes the maximum points and minimum points (Peak Excursion).
Measurement and evaluation functions	
MEAS	Provides the measurement functions.
	Measurement of multicarrier adjacent channel power (Ch Power ACLR)
	Carrier to noise spacing (C/N C/No)
	Occupied bandwidth (OBW)
	Spectrum emission mask measurement (Spectrum Emission Mask)
	Spurious emissions (Spurious Emissions)
	Measurement of time domain power (Time Domain Power)
	Signal statistics: amplitude probability distribution (APD) and cumulative complementary distribution function (CCDF)
	Third-order intercept point (TOI)
	AM modulation depth (AM Mod Depth)
MEAS CONFIG	Provides access to measurement configuration.
LINES	Configures display lines and limit lines.
INPUT/OUTPUT	Displays softkeys for input/output functions.
Measurement start functions	
RUN SINGLE	Starts a single new measurement (Single Sweep Mode).
RUN CONT	Starts a continuous measurement (Continuous Sweep Mode).
Function execution	
UNDO	Reverts last operation
REDO	Repeats previously reverted operation.

UNDO/REDO keys

- The virtual UNDO key reverts the previously performed action, i.e. the status before the previous action is retrieved.
  The undo function is useful, for example, if you are performing a zero span measurement with several markers and a limit line defined and accidentally click the "ACP" softkey. In this case, very many settings would be lost. How-

ever, if you select UNDO immediately afterwards, the previous status is retrieved, i.e. the zero span measurement and all settings.

- The virtual REDO key repeats the previously reverted action, i.e. the most recently performed action is repeated.

> The UNDO function is not available after a PRESET or "RECALL" operation. When these functions are used, the history of previous actions is deleted.
>
> The UNDO/REDO functions are not available for some applications; see Release Notes for details.

6.1.3.3 Keypad

The virtual keypad is used to enter alphanumeric parameters, including the corresponding units (see also chapter 6.4, "Entering Data", on page 98). It contains the following keys:

Table 6-4: Keys on the keypad

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. In the case of an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (GHz/-dBm MHz/ dBm, kHz/dB and Hz/dB)	These keys add the selected unit to the entered numeric value and complete the entry. In the case of level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they have the same function as an ENTER key.

6.1.3.4 Navigation Controls

The navigation controls include a virtual rotary knob, navigation keys, and data input function keys. They allow you to navigate within the display or within dialog boxes.

Rotary knob simulation

The virtual rotary knob has several functions:

- Increments (clockwise direction) or decrements (counter-clockwise direction) the instrument parameter at a defined step width in the case of a numeric entry.
- Shifts the selection bar within focussed areas (e.g. lists).
- Shifts markers, limit lines, etc on the screen.
- Moves the scroll bar vertically, if the scroll bar is focussed.
- Acts like the ENTER key, when it is selected.

To simulate the use of a rotary knob, use the keys displayed beneath the arrow keys:

Table 6-5: Rotary know simulation keys

Icon	Function
●	Turn left
●	Enter
●	Turn right

Navigation keys

The virtual navigation keys can be used alternatively to the rotary knob to navigate through dialog boxes, diagrams or tables.

Arrow Up/Arrow Down Keys

The <arrow up> or <arrow down> keys do the following:
- In a numeric edit dialog box, increase or decrease the instrument parameter.
- In a list, scroll forward and backward through the list entries.
- In a table, move the selection bar vertically.
- In windows or dialog boxes with vertical scroll bar, move the scroll bar.

Arrow Left/Arrow Right Keys

The <arrow left> or <arrow right> keys do the following:
- In an alphanumeric edit dialog box, move the cursor.
- In a list, scroll forward and backward through the list entries.
- In a table, move the selection bar horizontally.
- In windows or dialog boxes with horizontal scroll bar, move the scroll bar.

Data input keys

Some additional virtual keys are provided for data input in dialog boxes and input fields.

Table 6-6: Data input keys

Type of key	Description
ESC key	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button.
	For "Edit" dialog boxes the following mechanism is used:
	• If data entry has been started, it retains the original value and closes the dialog box.
	• If data entry has not been started or has been completed, it closes the dialog box.
BACKSPACE key	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor.
ENTER key	• Concludes the entry of dimensionless entries. The new value is accepted.
	• With other entries, this key can be used instead of the "Hz/dB" unit key.
	• In a dialog box, selects the default or focussed element.

6.1.4   On-screen Keyboard

The on-screen keyboard is an additional means of interacting with the instrument without having to connect an external keyboard.

The on-screen keyboard display can be switched on and off as desired using the "On-Screen Keyboard" function key beneath the screen.

When you press this key, the display switches between the following options:

- Keyboard displayed at the top of the screen
- Keyboard displayed at the bottom of the screen
- No keyboard displayed

You can use the TAB key on the on-screen keyboard to move the focus from one field to another in dialog boxes.

6.2   Understanding the Display Information

The following figure shows a measurement diagram during manual analyzer operation. All different information areas are labeled. They are explained in more detail in the following sections.
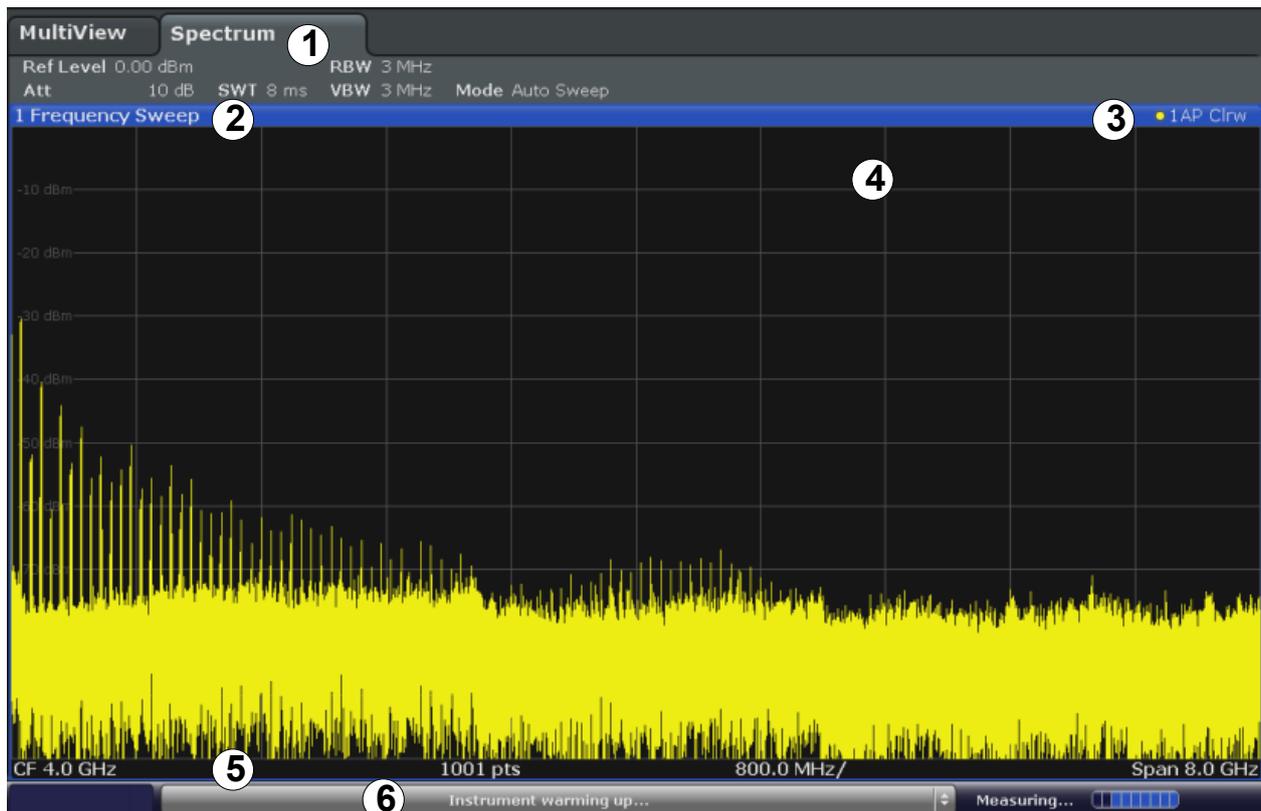
1   = Channel bar for firmware and measurement settings
2+3 = Window title bar with diagram-specific (trace) information
4   = Diagram area with marker information
5   = Diagram footer with diagram-specific information, depending on measurement application
6   = Instrument status bar with error messages, progress bar and date/time display

6.2.1   Channel Bar

Using the R&S FPS you can handle several different measurement tasks (channels) at the same time (although they can only be performed asynchronously). For each channel, a separate tab is displayed on the screen. In order to switch from one channel display to another, simply select the corresponding tab.
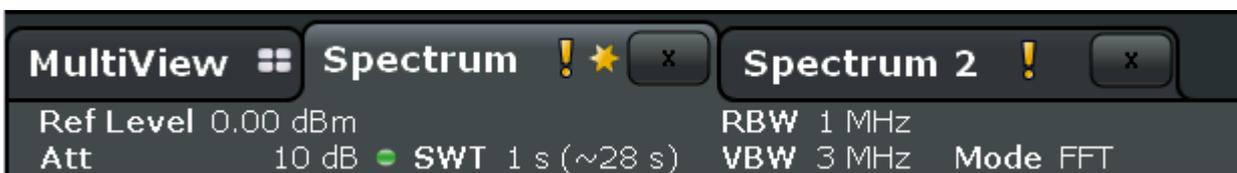
The ⭐ icon on the tab label indicates that the displayed trace no longer matches the current instrument settings. This may be the case, for example, if a trace is frozen and the instrument settings are changed. As soon as a new measurement is performed, the icon disappears.

An orange "IQ" (in MSRA mode only) indicates that the results displayed in the MSRA application(s) no longer match the data captured by the MSRA Master. The "IQ" disappears after the results in the application(s) are refreshed.

Alternatively, if many tabs are displayed, select the tab selection list icon at the right end of the channel bar and select the channel you want to switch to from the list.

Channel-specific settings

Beneath the channel name, information on channel-specific settings for the measurement are displayed in the **channel bar**. A bullet next to the setting indicates that user-defined settings are used, not automatic settings. A green bullet indicates this setting is valid and the measurement is correct. A red bullet indicates an invalid setting that does not provide useful results. Channel information varies depending on the active application.

In the Spectrum application, the R&S FPS shows the following settings:

Table 6-7: Channel settings displayed in the channel bar in the Spectrum application

Ref Level	Reference level
m.+el.Att	Mechanical and electronic RF attenuation that has been set.
Ref Offset	Reference level offset
SWT	Sweep time that has been set.
	If the sweep time does not correspond to the value for automatic coupling, a bullet is displayed in front of the field. The color of the bullet turns red if the sweep time is set below the value for automatic coupling. In addition, the UNCAL flag is shown. In this case, the sweep time must be increased.
Meas Time	Measurement time, calculated from analysis bandwidth and number of samples (for statistics measurements)
RBW	Resolution bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet appears in front of the field.
VBW	Video bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet is displayed in front of the field.
AnBW	Analysis bandwidth (for statistics measurements)
Compatible	Compatible device mode (FSP, FSU, default; default not displayed)
Mode	Indicates which sweep mode type is selected: • "Auto FFT": automatically selected FFT sweep mode • "Auto sweep": automatically selected swept sweep mode • "FFT": manually selected FFT sweep mode

Common settings

In addition to the channel-specific settings, the channel bar above the diagram also displays information on instrument settings that affect the measurement results even though this is not immediately apparent from the display of the mea-

sured values. This information is displayed in gray font and only when applicable for the current measurement, as opposed to the channel-specific settings that are always displayed.
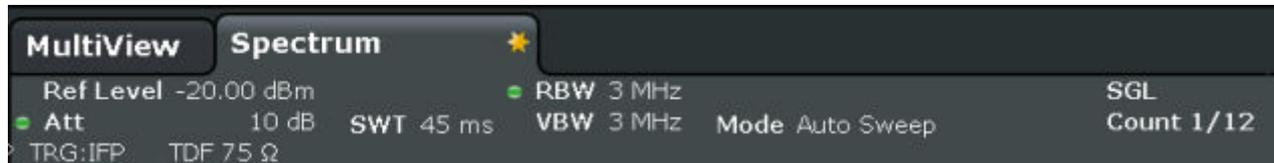
The following types of information may be displayed, if applicable.

Table 6-8: Common settings displayed in the channel bar

SGL	The sweep is set to single sweep mode.
Sweep Count	The current signal count for measurement tasks that involve a specific number of subsequent sweeps (see "Sweep Count" setting in "Sweep settings" in the User Manual)
TRG	Trigger source (for details see "Trigger settings" in the User Manual) ● **EXT**: External ● **IFP**: IF power (+trigger bandwidth) ● **RFP**: RF power ● **VID**: Video
6dB/RRC/ CHN	Filter type for sweep bandwidth (see "Bandwidth settings" in the User Manual)
YIG Bypass	The YIG filter is deactivated.
PA	The preamplifier is activated.
GAT	The frequency sweep is controlled via the TRIGGER INPUT connector.
TDF	A transducer factor is activated.
75 Ω	The input impedance of the instrument is set to 75 Ω.
FRQ	A frequency offset ≠ 0 Hz is set.
DC/AC	An external DC or AC calibration signal is in use.

<NOR | APR> Ext. Gen	An external generator is being controlled by the R&S FPS (requires option R&S FPS-B10).
	NOR: the measurements are normalized with the results of the external generator calibration
	APR (approximation): the measurements are normalized with the results of the external generator calibration; however, the measurement settings have been changed since calibration
	If neither label is displayed, no calibration has been performed yet or normalization is not active.
	For details see the "External Generator Control" section in the R&S FPS User Manual.
LVL	A level offset is applied to the external generator signal (only if external generator control is active).

6.2.2   Window Title Bar

Each channel in the R&S FPS display may contain several windows. Each window can display either a graph or a table as a result of the channel measurement. Which type of result evaluation is displayed in which window is defined in the display configuration (see chapter 6.5, "Displaying Results", on page 101). The window's title bar indicates which type of evaluation is displayed.

6.2.3   Trace Information in Window Title Bar

Information on the displayed traces is indicated in the window title bar.
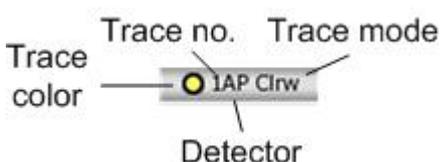
Trace color		Color of trace display in diagram
Trace no.		Trace number (1 to 6)
Detector		Selected detector:
	AP	AUTOPEAK detector
	Pk	MAX PEAK detector
	Mi	MIN PEAK detector
	Sa	SAMPLE detector
	Av	AVERAGE detector

	Rm	RMS detector
Trace Mode		**Sweep mode:**
	Clrw	CLEAR/WRITE
	Max	MAX HOLD
	Min	MIN HOLD
	Avg	AVERAGE (Lin/Log/Pwr)
	View	VIEW
Norm/NCor		Correction data is not used.

6.2.4   Marker Information

Marker information is provided either in the diagram grid or in a separate marker table, depending on the configuration.

Marker information in diagram grid

Within the diagram grid, the x and y-axis positions of the last 2 markers or delta markers that were set, if available, as well as their index are displayed. The value in the square brackets after the index indicates the trace to which the marker is assigned. (Example: M2[1] defines marker 2 on trace 1.) For more than 2 markers, a separate marker table is displayed beneath the diagram by default.

Marker information in marker table

In addition to the marker information displayed within the diagram grid, a separate marker table may be displayed beneath the diagram. This table provides the following information for all active markers:

Type	Marker type: N (normal), D (delta), T (temporary, internal)
Ref	Reference (for delta markers)
Trc	Trace to which the marker is assigned
X-value	x-value of the marker
Y-value	y-value of the marker
Func	Activated marker or measurement function
Func. Result	Result of the active marker or measurement function

The functions are indicated with the following abbreviations:

FXD	Fixed reference marker
PHNoise	Phase noise measurement
CNT	Signal count
TRK	Signal tracking
NOIse	Noise measurement
MDepth	AM modulation depth
TOI	Third order intercept measurement

6.2.5   Frequency and Span Information in Diagram Footer

The diagram footer (beneath the diagram) contains the following information, depending on the current application:

Label	Information
CF	Center frequency
Span	Frequency span (frequency domain display)
ms/	Time per division (time domain display)
Pts	Number of sweep points or (rounded) number of currently displayed points in zoom mode

6.2.6   Instrument and Status Information

Global instrument settings, the instrument status and any irregularities are indicated in the status bar beneath the diagram.

> **Hiding the status bar**
>
> You can hide the status bar display, e.g. in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items").
>
> See the User Manual for details.

The following information is displayed:

Instrument status

EXT REF ⊙	The instrument is configured for operation with an external reference.

Progress

The progress of the current operation is displayed in the status bar.

Measuring...

Date and time

The date and time settings of the instrument are displayed in the status bar.

22.09.2011
10:39:44

> You can hide the date and time display in the status bar, or the entire status bar ("Setup > Display > Displayed Items").
>
> For details see the R&S FPS User Manual.

6.2.7   Error Information

If errors or irregularities are detected, a keyword and an error message, if available, are displayed in the status bar.

UNCAL   Sync failed

> Note that the status bar is only visible on an external monitor or via RemoteDesktop from a controller PC (see chapter 2.3, "Connecting USB Devices", on page 22 or chapter 5.6, "How to Set Up Remote Desktop", on page 66).

Depending on the type of message, the status message is indicated in varying colors.

Table 6-9: Status bar information - color coding

Color	Type	Description
red	Fatal	A serious error occurred in the application; regular operation is no longer possible.
red	Error	An error occurred during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be completed correctly.
orange	Warning	An irregular situation occurred during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
gray	Information	Information on the status of individual processing steps.
gray	Message	An event or state has occurred that may lead to an error during further operation.
green	No errors	No messages displayed.

If any error information is available for a measurement channel, the ⚠ icon is displayed next to the channel name.

This is particularly useful when the MultiView tab is displayed, as the status bar in the MultiView tab always displays the information for the currently selected measurement only.

The following keywords are used:

IF OVLD	Overload of the IF signal path after the input mixer. • Increase the reference level.
INPUT OVLD	The signal level at the RF input connector exceeds the maximum. The RF input is disconnected from the input mixer to protect the device. In order to re-enable measurement, decrease the level at the RF input connector and reconnect the RF input to the mixer input.
LOUNL	Error in the instrument's frequency processing hardware was detected.
NO REF	Instrument was set to an external reference but no signal was detected on the reference input.
OVEN	OCXO reference frequency (option R&S FPS-B4) has not yet reached its operating temperature. The message usually disappears a few minutes after power has been switched on.
RF OVLD	Overload of the input mixer. • Increase the RF attenuation (for RF input). • Reduce the input level (for digital input)

UNCAL	One of the following conditions applies: • Correction data has been switched off. • No correction values are available, for example after a firmware update. • Record the correction data by performing a self alignment (For details refer to chapter 2.4, "Performing a Self Alignment and a Self Test", on page 23).
WRONG_FW	The firmware version is out-of-date and does not support the currently installed hardware. Until the firmware version is updated, this error message is displayed and self-alignment fails. (For details refer to the R&S FPS User Manual).

6.3   Changing the Focus

Any selected function is always performed on the currently focused element in the display, e.g. a dialog field, diagram, or table row. Which element is focused is indicated by a blue frame (diagram, window, table) or is otherwise highlighted (softkey, marker etc.). Moving the focus is most easily done by selecting the element in the display using the mouse pointer. Alternatively, use the "Tab" key on the on-screen keyboard to move the focus from one element to the next on the display.

To move the focus between any displayed diagrams or tables in a window, select the "Change focus" key. The focus moves from the diagram to the first table to the next table etc. and then back to the diagram, within the same window.

6.4   Entering Data

Data can be entered in dialog boxes using an external keyboard or the keyboard of the controller PC.

6.4.1   Entering Numeric Parameters

If a field requires numeric input, the keypad provides only numbers.

1. Enter the parameter value using the keypad, or change the currently used parameter value by using the rotary knob (small steps) or the UP or DOWN keys (large steps) in the soft front panel.

2. After entering the numeric value via keypad, select the corresponding unit key.
   The unit is added to the entry.

3. If the parameter does not require a unit, confirm the entered value by selecting the ENTER key or any of the unit keys.
   The editing line is highlighted in order to confirm the entry.

6.4.2 Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see chapter 6.1.4, "On-screen Keyboard", on page 88).

Alternatively, you can use the virtual keypad. Every alphanumeric key represents several characters and one number. The decimal point key (.) represents special characters, and the sign key (-) toggles between capital and small letters. For the assignment refer to table 6-10. In principle, the input of alphanumeric parameters works like writing an SMS on your cell phone.

To enter numbers and (special) characters via the virtual keypad

1. Select the key once to enter the first possible value.

   All characters available via this key are displayed in a popup.

2. To choose a different value provided by this key, select the key again, until your desired value is displayed.

   With each key stroke the next possible value of this key is displayed. If all possible values have been displayed, the series starts with the first value again. For information on the series refer to table 6-10.

3. To change from capital to small letters and vice versa, select the sign key (-).

4. After entering a value, wait for 2 seconds (to use the same key again), or start the next entry by selecting another key.

To enter a blank

► Select the "Space" bar, or select the "0" key and wait 2 seconds.

To correct an entry

1. Using the arrow keys, move the cursor to the right of the entry you want to delete.

2. Select the BACKSPACE key.

   The entry to the left of the cursor is deleted.

3. Enter your correction.

To complete the entry

► Select the ENTER key or the rotary knob.

To cancel the entry

► Select the ESC key.
   The dialog box is closed without changing the settings.

Table 6-10: Keys for alphanumeric parameters

Key name (upper inscription)	Series of (special) characters and number provided
7	7 µ Ω ° € ¥ $ ¢
8	A B C 8 Ä ÆÅ Ç
9	D E F 9 É
4	G H I 4
5	J K L 5
6	M N O 6 Ň Ö
1	P Q R S 1
2	T U V 2 Ü
3	W X Y Z 3
0	\<blank> 0 – @ + / \ < > = % &
.	. * : _ , ; " ' ? ( ) #
–	\<toggles between capital and small letters>

6.5   Displaying Results

The R&S FPS provides several instrument applications for different analysis tasks and different types of signals, e.g. 3G FDD, I/Q analysis or basic spectrum analysis. For each application, a new measurement channel is created and displayed in a separate tab on the screen.

The results of a measurement channel can be evaluated in many different ways, both graphically and numerically. For each evaluation method the results are displayed in a separate window in the tab.

The R&S FPS allows you to configure the display to suit your specific requirements and optimize analysis.

6.5.1   Activating channels

When you activate an application, a new measurement channel is created which determines the measurement settings for that application. The same application can be activated with different measurement settings by creating several channels for the same application. Whenever you switch channels, the corresponding measurement settings are restored. Each channel is displayed in a separate tab on the screen.

An additional tab ("MultiView") provides an overview of all currently active channels at once.

Only one measurement can be performed at any time, namely the one in the currently active channel. However, in order to perform the configured measurements consecutively, a Sequencer function is provided.
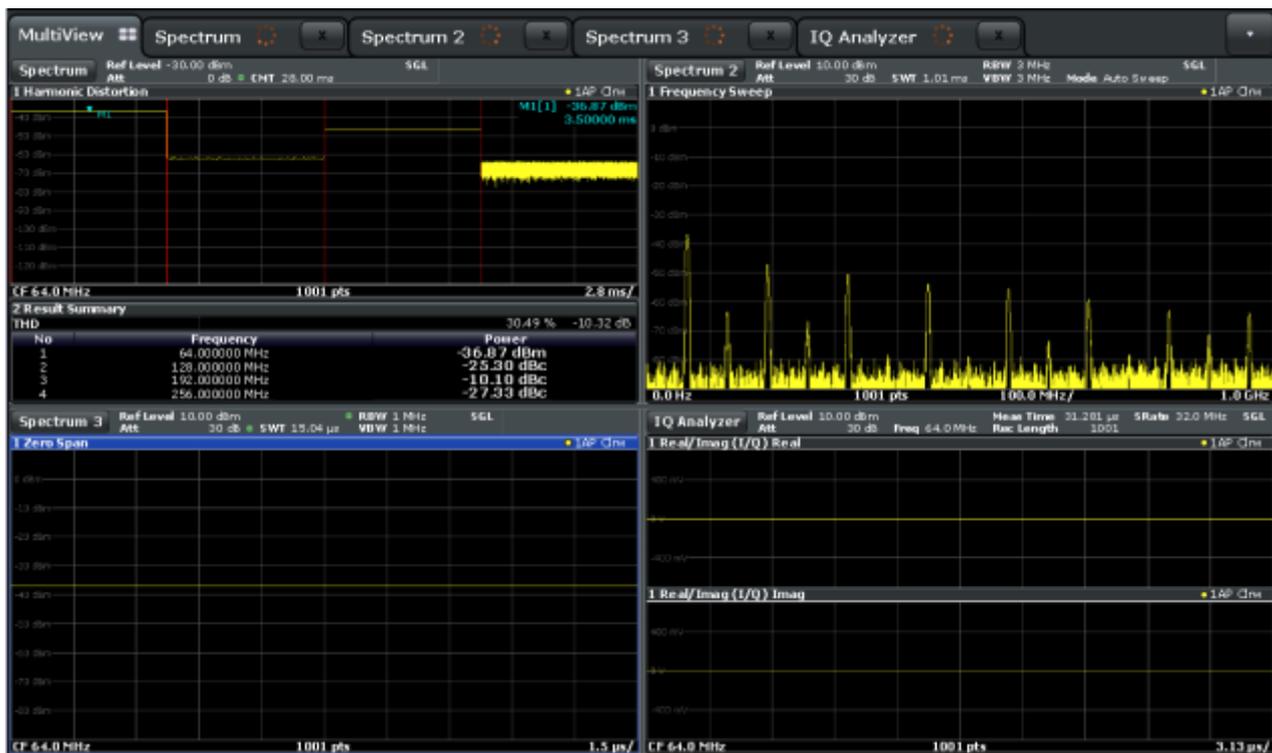
To start a new channel

1. Select the MODE key in the soft front panel.

2. In the "Mode" dialog box, select the required application on the "New Channel" tab.
   A new tab is displayed for the new channel.

To change the application in an active channel

1. Select the tab of the channel you want to change.

2. Select the MODE key.

3. In the "Mode" dialog box, select the new application to be displayed on the "Replace Current Channel" tab.
   The selected application is displayed in the current channel.

6.5.2   Laying out the Result Display with the SmartGrid

Measurement results can be evaluated in many different ways, for example graphically, as summary tables, statistical evaluations etc. Each type of evaluation is displayed in a separate window in the channel tab. Up to 16 individual windows can be displayed per measurement channel (i.e. per tab). To arrange the

diagrams and tables on the screen, the Rohde & Schwarz SmartGrid function helps you find the target position simply and quickly.

(For details on evaluation methods see the User Manual.)

Principally, the layout of the windows on the screen is based on an underlying grid, the SmartGrid. However, the SmartGrid is dynamic and flexible, allowing for many different layout possibilities. The SmartGrid functionality provides the following basic features:

- Windows can be arranged in columns or in rows, or in a combination of both.
- Windows can be arranged in up to four rows and four columns.
- Windows are moved simply by dragging them to a new position on the screen, possibly changing the layout of the other windows, as well.
- All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. The same evaluation method can be displayed in multiple windows simultaneously.
- New windows are added by dragging an evaluation icon from the evaluation bar to the screen. The position of each new window depends on where you drop the evaluation icon in relation to the existing windows.
- All display configuration actions are only possible in SmartGrid mode. When SmartGrid mode is activated, the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

6.5.2.1 Background Information: The SmartGrid Principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the Smart-Grid where you drop the window determines its position on the screen.
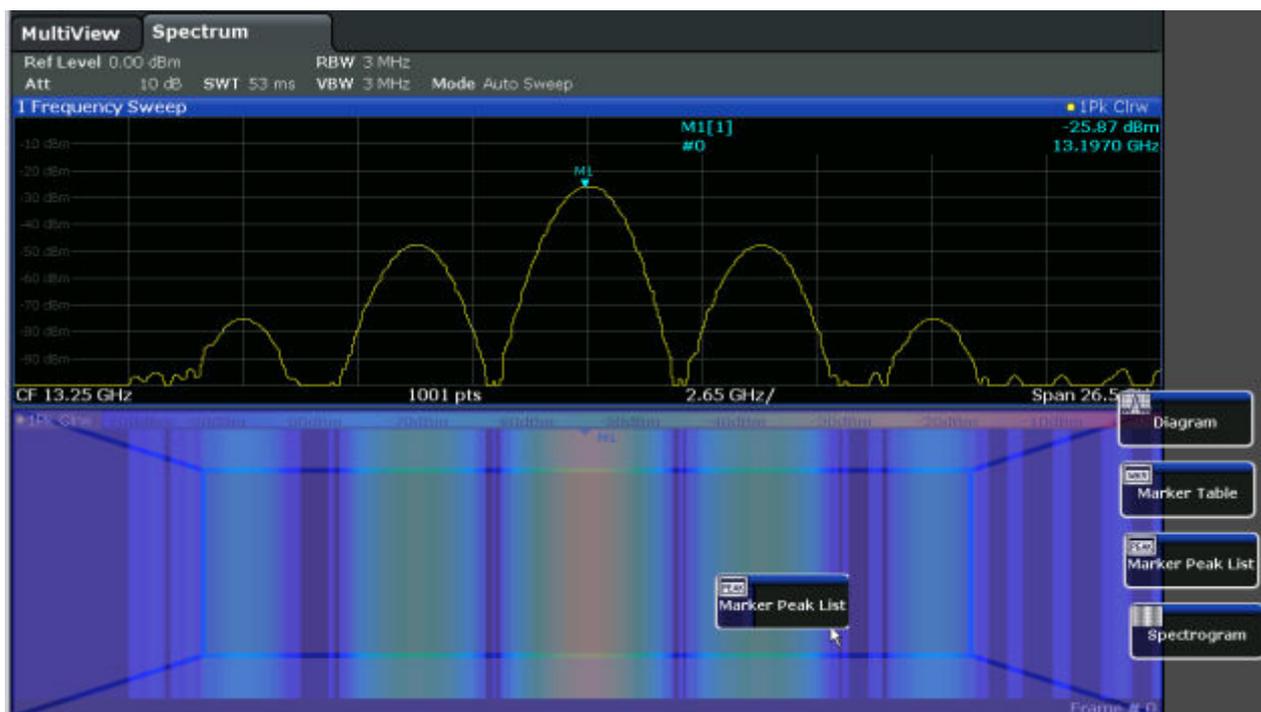
Fig. 6-4: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows: above/below, right/left or replacement (as illustrated in figure 6-5). If an existing window would be replaced, the drop area is highlighted in a darker color shade.

Positioning the window

The screen can be divided into up to four rows. Each row can be split into up to four columns, where each row can have a different number of columns. However, rows always span the entire width of the screen and may not be interrupted by a column. A single row is available as the drop area for the window in the Smart-Grid. The row can be split into columns, or a new row can be inserted above or below the existing row (if the maximum of 4 has not yet been reached).
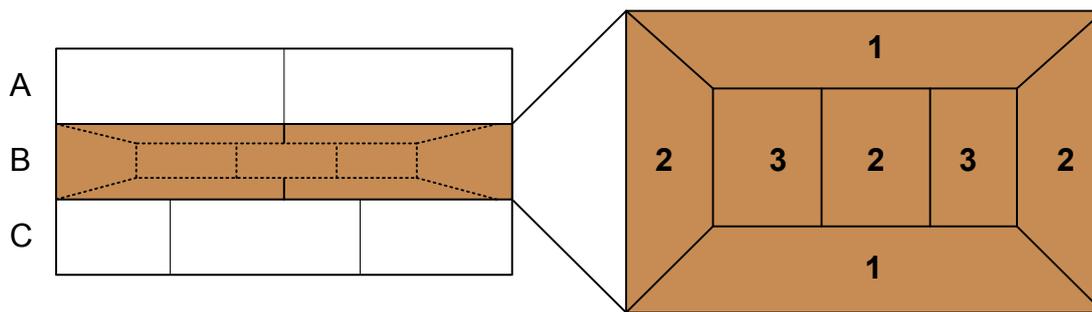
Fig. 6-5: SmartGrid window positions

1 = Insert row above or below the existing row
2 = Create a new column in the existing row
3 = Replace a window in the existing row

SmartGrid functions

Once the evaluation icon has been dropped, icons in each window provide delete and move functions.

The "Move" icon allows you to move the position of the window, possibly changing the size and position of the other displayed windows.

The "Delete" icon allows you to close the window, enlarging the display of the remaining windows.

6.5.2.2   How to Activate SmartGrid Mode

All display configuration actions are only possible in SmartGrid mode. In Smart-Grid mode the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

► To activate SmartGrid mode, do one of the following:

●

  Select the "SmartGrid" icon from the toolbar.
● Select the "Display Config" button in the configuration "Overview".
● Select the "Display Config" softkey from the MEAS CONFIG menu.

The SmartGrid functions and the evaluation bar are displayed.

To close the SmartGrid mode and restore the previous softkey menu select the "Close" icon in the right-hand corner of the toolbar, or press any key.

6.5.2.3   How to Add a New Result Window

Each type of evaluation is displayed in a separate window. Up to 16 individual windows can be displayed per measurement channel (i.e. per tab).

1. Activate SmartGrid mode.

   All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar.

2. Select the icon for the required evaluation method from the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. Set the mouse pointer in the evaluation bar between the icons and move it up or down until the required icon appears.

3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See chapter 6.5.2.5, "How to Arrange the Result Windows", on page 106 for more information on positioning the window).

6.5.2.4   How to Close a Result Window

► To close a window, activate SmartGrid mode and select the "Delete" icon for the window.

6.5.2.5   How to Arrange the Result Windows

1. Select an icon from the evaluation bar or the "Move" icon for an existing evaluation window.

2. Drag the evaluation over the SmartGrid.
   A blue area shows where the window will be placed.

3. Move the window until a suitable area is indicated in blue.

4. Drop the window in the target area.

   The windows are rearranged to the selected layout, and "Delete" and "Move" icons are displayed in each window.

5. To close a window, select the corresponding "Delete" icon.

6.5.3 Changing the Size of Windows

Each channel tab may contain several windows to evaluate the measurement results using different methods. A "splitter" allows you to change the size of neighboring windows.
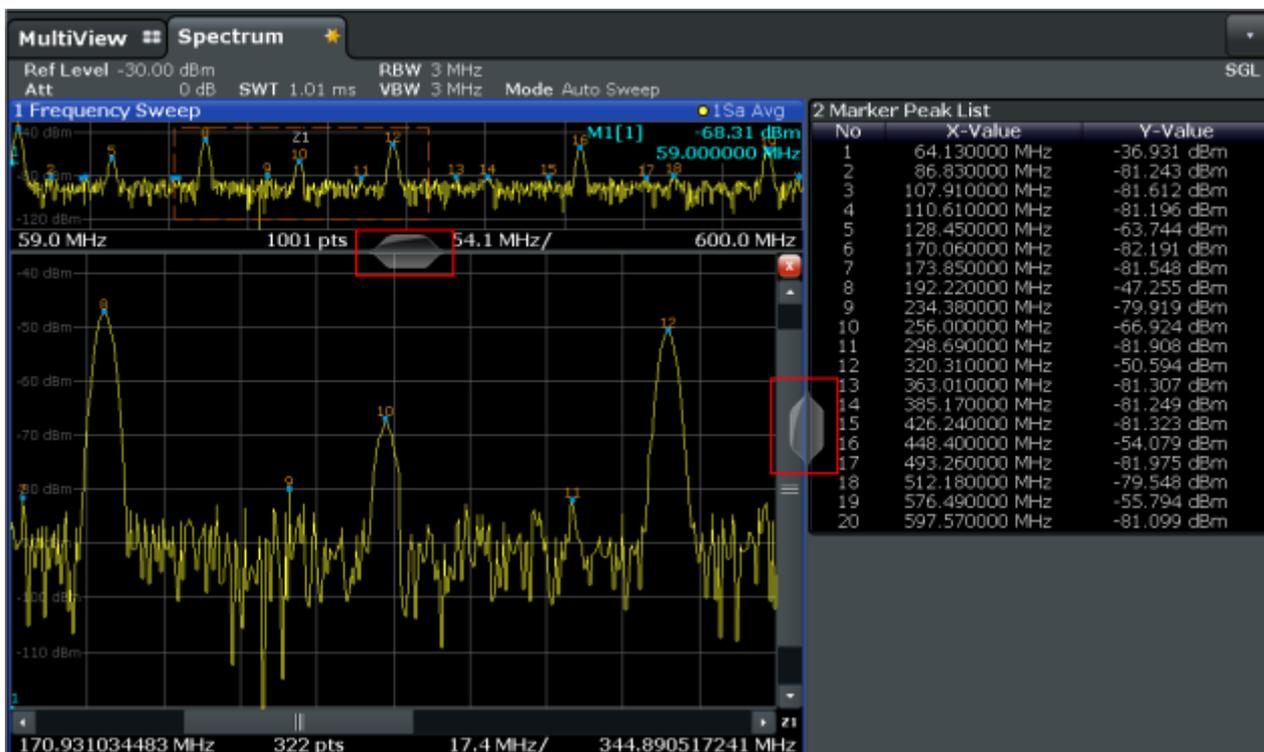
The splitters are not available in SmartGrid mode.

► To change the size of two neighboring windows, drag the splitter between the windows in either direction.

6.5.4 Switching Between a Split and Maximized Window Display

To get an overview of the results, displaying several windows at the same time may be helpful. However, the individual windows may become rather small. In this case it is useful to maximize an individual window to the entire screen temporarily in order to analyze the results in more detail.

To switch between a split and a maximized display without having to close and re-open windows, select the SPLIT/MAXIMIZE key. In maximized display, the currently focused window is maximized. In split display, all active windows are displayed.

6.5.5 Changing the Display

The display can be optimized for your individual needs. The following display functions are available and are described in detail in the User Manual.

● Displaying or hiding a simulation of the entire front panel of the instrument on the screen ("Soft Front Panel")

● Displaying the main function hardkeys in a separate window on the screen ("Mini Front Panel")

● Hiding or showing various screen elements

● Selecting a display theme and colors

● Changing the display update rate

● Zooming into the diagram

6.6   Getting Help

If any questions or problems concerning the R&S FPS arise, an extensive online help system is provided on the instrument and can be consulted at any time. The help system is context-sensitive and provides information specifically for the current operation or setting to be performed. In addition, general topics provide an overview on complete tasks or function groups as well as background information.

6.6.1   Calling Up Help

The online help can be opened at any time by selecting one of the "Help" icons on the toolbar or by selecting the F1 key on an external or the online keyboard.

Calling context-sensitive help

► To display the "Help" dialog box for the currently focused screen element, e.g. a softkey or a setting in an opened dialog box, select the "Help" icon on the toolbar.

The "Help" dialog box "View" tab is displayed. A topic containing information about the focused screen element is displayed.
If no context-specific help topic is available, a more general topic or the "Contents" tab is displayed.

For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

► To display a help topic for a screen element not currently focused:
  a) Select the "Help pointer" icon on the toolbar.

The pointer changes its shape to a "?" and an arrow.
  b) Select the screen element to change the focus.

A topic containing information about the selected (now focused) screen element is displayed.

6.6.2   Using the Help Window

The Help window contains several tabs:

- "View" - shows the selected help topic
- "Contents" - contains a table of help contents
- "Index" - contains index entries to search for help topics
- "Search" - provides text search

The Help toolbar provides some buttons:

- To browse the topics in the order of the table of contents: Up arrow = previous topic, Down arrow = next topic
- To browse the topics visited before: Left arrow = back, Right arrow = forward
- To increase or decrease the font

To search for a topic in the index

The index is sorted alphabetically. You can browse the list, or search for entries in the list.

1. Switch to the "Index" tab.

2. Select the "Keyboard" icon besides the entry field.

3. Enter the first characters of the keyword you are interested in.
   The entries containing these characters are displayed.

4. Double-click the suitable index entry.
   The "View" tab with the corresponding help topic is displayed.

To search topics for a text string

1. Switch to the "Search" tab.

2. Select the "Keyboard" icon besides the entry field.

3. Enter the string you want to find.

If you enter several strings with blanks between, topics containing all words are found (same as AND operator).

For advanced search, consider the following:

● To find a defined string of several words, enclose it in quotation marks. For example, a search for *"trigger qualification"* finds all topics with exactly *"trigger qualification"*. A search for *trigger qualification* finds all topics that contain the words *trigger* and *qualification*.

● Use "Match whole word" and "Match case" to refine the search.

● Use operators AND, OR, and NOT.

To close the Help window

► Select the "Close" icon in the upper right corner of the help window.
Or:
Press the ESC key on the front panel.

7   Obtaining Technical Support

If problems occur, the instrument generates error messages which in most cases will be sufficient for you to detect the cause of an error and find a remedy.

Error messages are described in the "Troubleshooting" section of the user manuals.

In addition, our customer support centers are there to assist you in solving any problems that you may encounter with your R&S FPS. We will find solutions more quickly and efficiently if you provide us with the information listed below.

- **System Configuration:** The "System Configuration" dialog box (in the "Setup" menu of the soft front panel) provides information on:
  - **Hardware Info:** hardware assemblies
  - **Versions and Options:** the status of all software and hardware options installed on your instrument
  - **System Messages:** messages on any errors that may have occurred

  An .xml file with information on the system configuration ("device footprint") can be created automatically (using the `DIAGnostic:SERVice:SINFo` command or as described in "To collect the support information" on page 112).

- **Error Log:** The `RSError.log` file (in the log directory of the main installation directory) contains a chronological record of errors.

- **Support file:** a *.zip file with important support information can be created automatically. The *.zip file contains the system configuration information ("device footprint"), the current eeprom data and a screenshot of the screen display.

To collect the support information

1. Select the SETUP key in the soft front panel on the Remote Desktop.

2. Select "Service > R&S Support" and then "Create R&S Support Information".

   The file is stored as `C:\R_S\instr\user\service.zip`.

   Attach the support file to an e-mail in which you describe the problem and send it to the customer support address for your region as listed in the Internet (http://www.rohde-schwarz.com/en/service-support/ customer_support_107711.html).

Packing and transporting the instrument

If the instrument needs to be transported or shipped, e.g. due to damage during delivery, observe the notes described in chapter 2.1.1, "Unpacking and Checking the Instrument", on page 11.

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