R&S®FPL1000
Spectrum Analyzer
Getting Started

1179465702

Version 10

This manual applies to the following R&S®FPL1000 models with firmware version 1.80 and later:

- R&S®FPL1003 (1304.0004K03) - FPL1000 with maximum frequency 3 GHz
- R&S®FPL1007 (1304.0004K07) - FPL1000 with maximum frequency 7.5 GHz
- R&S®FPL1014 (1304.0004K14) - FPL1000 with maximum frequency 14 GHz
- R&S®FPL1026 (1304.0004K26) - FPL1000 with maximum frequency 26.5 GHz

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

- R&S FPL1-B4, OCXO (1323.1902.02)
- R&S FPL1-B5, Additional Interfaces (1323.1883.02)
- R&S FPL1-B9, Internal Generator (1323.1925Kxx)
- R&S FPL1-B10, GPIB interface (1323.1890.02)
- R&S FPL1-B22, preamplifier (1323.1719.02)
- R&S FPL1-B25, electronic attenuator (1323.1990.02)
- R&S FPL1-B30, DC power supply (1323.1877.02)
- R&S FPL1-B31, Li-Ion battery pack and charger (1323.1725.02)
- R&S FPL1-K9, Power Sensor Support (1323.1754.02)

Contents

1 Safety and Regulatory Information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the Chapter 1.1, "Safety Instructions", on page 7.

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Where do I find safety information?

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

- In Chapter 1.1, "Safety Instructions", on page 7. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety Instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed safety instructions. If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

If any part of the product is damaged or broken, stop using the product. Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. Contact Rohde & Schwarz customer service at http://www.customersupport.rohde-schwarz.com.

Lifting and carrying the product

The maximum weight of the product is provided in the data sheet. To move the product safely, you can use lifting or transporting equipment such as lift trucks and forklifts. Follow the instructions provided by the equipment manufacturer.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides a carrying bag designed for your product, you can use the product outdoors.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

Always place the product on a stable, flat and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack.

Connecting to power

The product is an overvoltage category II product and has to be connected to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Be aware that electrically powered products have risks, such as electric shock, fire, personal injury or even death.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.

- If a product has an exchangeable fuse, its type and characteristics are indicated next to the fuse holder. Before changing the fuse, switch off the instrument and disconnect it from the power source. How to change the fuse is described in the product documentation.

- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.

- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.

- If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.

- Only connect the product to a power source with a fuse protection of maximum 20 A.

- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.

Cleaning the product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

⚠	Potential hazard	Read the product documentation to avoid personal injury or product damage.
⚡	Electrical hazard	Indicates live parts. Risk of electric shock, fire, personal injury or even death.
🔥	Hot surface	Do not touch. Risk of skin burns. Risk of fire.
⏚	Protective conductor terminal	Connect this terminal to a grounded external conductor or to protective ground. This protects you against electric shock should an electric problem occur.

Handling batteries safely

The product contains lithium polymer or lithium ion cells or batteries. The use of the word battery in the following always means all types. Only the battery contents are potentially hazardous. As long as a battery is undamaged and the seals remain intact, there is no danger.

Impact, shock or heat can cause damage such as dents, punctures and other deformations. A damaged battery poses a risk of personal injury. Handle a damaged or leaking battery with extreme care. Immediately ventilate the area since the battery releases harmful gases. If you come into contact with the battery fluid, immediately remove all contaminated clothing. Irritation can occur if the battery fluid comes in contact with your skin or eyes. Immediately and thoroughly rinse your skin or eyes with water and seek medical aid.

For safe handling, follow these rules:

- Do not short-circuit the battery.
- Do not mechanically damage the battery. Do not open or disassemble the battery.
- Do not expose the battery to high temperatures such as open flames, hot surfaces and sunlight.
- Only use the battery with the designated Rohde & Schwarz product.
- Only use the appropriate Rohde & Schwarz charger to charge the batteries. If the batteries are improperly charged, there is a risk of explosion. For charging and discharging temperature ranges, see the product documentation.
- Store the battery at room temperature (approximately 20 °C) enclosed in the original packaging.

- Dispose of batteries separately from normal household waste as specified by the local waste disposal agency.

If you disregard these rules, you risk serious personal injury or even death due to explosion, fire or hazardous chemical substances. The product documentation provides further details.

When replacing a defective battery, only use the same Rohde & Schwarz battery type. When returning batteries to Rohde & Schwarz subsidiaries, choose a carrier qualified to transport dangerous goods and follow the carrier's transport stipulations in line with IATA-DGR, IMDG-Code, ADR or RID. If you need assistance, contact the carrier or Rohde & Schwarz customer service.

Connecting headphones

Take the following measures to prevent hearing damage. Before using headphones, check the volume and reduce it if necessary. If you monitor varying signal levels, take off the headphones and wait until the signal has settled. Then adjust the volume.

1.2　Labels on R&S FPL1000

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 9
- Product and environment safety, see Table 1-1
- Identification of the product, see Chapter 5.2.14, "Device ID", on page 49

Table 1-1: Labels regarding R&S FPL1000 and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see the product user manual, chapter "Disposal".
	Labeling in line with directive 2006/66/EC for disposal of batteries after they have come to the end of their service life. For more information, see the R&S FPL1000 user manual, chapter "Disposal".

1.3   Korea Certification Class A

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

2   Documentation Overview

This section provides an overview of the R&S FPL1000 user documentation. Unless specified otherwise, you find the documents on the R&S FPL1000 product page at:

www.rohde-schwarz.com/manual/FPL1000

2.1   Getting Started Manual

Introduces the R&S FPL1000 and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc.

A printed version is delivered with the instrument. A PDF version is available for download on the Internet.

2.2   User Manuals and Help

Separate user manuals are provided for the base unit and the firmware applications:

- Base unit manual
  Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.

- Firmware application manual
  Contains the description of the specific functions of a firmware application, including remote control commands. Basic information on operating the R&S FPL1000 is not included.

The contents of the user manuals are available as help in the R&S FPL1000. The help offers quick, context-sensitive access to the complete information for the base unit and the firmware applications.

All user manuals are also available for download or for immediate display on the Internet.

2.3   Service Manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

https://gloris.rohde-schwarz.com

2.4   Instrument Security Procedures

Deals with security issues when working with the R&S FPL1000 in secure areas. It is available for download on the Internet.

2.5   Printed Safety Instructions

Provides safety information in many languages. The printed document is delivered with the product.

2.6   Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S FPL1000. It also lists the firmware applications and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/FPL1000

2.7 Release Notes and Open Source Acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The open-source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/FPL1000

2.8 Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/FPL1000

2.9 Calibration Certificate

The document is available on https://gloris.rohde-schwarz.com/calcert. You need the device ID of your instrument, which you can find on a label on the rear panel.

3   Key Features

The R&S FPL1000 sets standards in RF performance and usability. Outstanding key features are:

One instrument for multiple applications

- Spectrum analysis
- Signal analysis of analog and digitally modulated signals
- Power measurements with power sensors
- Noise figure and gain measurements

Solid RF performance

- Low spurious response
- Low displayed average noise level (DANL)
- 40 MHz signal analysis bandwidth
- Low level measurement uncertainty
- Precise spectral measurements due to low phase noise

Intuitive user interface

- High-resolution display
- Multipoint touchscreen
- Flexible arrangement of results and MultiView
- Toolbar
- Quiet operation

Fully portable

- Battery pack and 12 V/24 V power supply
- Carrying bag and shoulder harness
- Low power consumption

4   Preparing for Use

Here, you can find basic information about setting up the instrument for the first time.

4.1   Lifting and Carrying

The carrying handles are designed to lift or carry the instrument. Do not apply excessive external force to the handles.

See "Lifting and carrying the product" on page 8.

4.2   Unpacking and Checking

1. Unpack the R&S FPL1000 carefully.

2. Retain the original packing material. Use it when transporting or shipping the R&S FPL1000 later.

3. Using the delivery notes, check the equipment for completeness.

4. Check the equipment for damage.

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

4.3   Choosing the Operating Site

Specific operating conditions ensure proper operation and avoid damage to the product and connected devices. For information on environmental conditions such as ambient temperature and humidity, see the data sheet.

See also "Choosing the operating site" on page 8.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the data sheet under "General data".

- Class B equipment is suitable for use in:
  - Residential environments
  - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments.
  If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

4.4   Setting Up the R&S FPL1000

The R&S FPL1000 is designed for use either on a bench top or in a rack, or as a portable instrument (with optional battery operation) in a transport bag in the field.
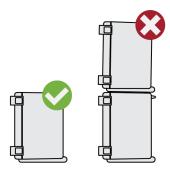
See also:
- "Setting up the product" on page 8
- "Intended use" on page 7

4.4.1   Placing the R&S FPL1000 on a Bench Top

To place the product on a bench top

1. Place the product on a stable, flat and level surface. Ensure that the surface can support the weight of the product. For information on the weight, see the data sheet.

2. **CAUTION!** Foldable feet can collapse. See "Setting up the product" on page 8.

   Always fold the feet completely in or out. With folded-out feet, do not place anything on top or underneath.

3. **CAUTION!** The product can fall over and cause injury. The top surface is too small for stacking. Never stack another product on top of the product.

   As an alternative, you can mount several products in a rack.

4. **NOTICE!** Overheating can damage the product.

   Prevent overheating as follows:

   - Keep a minimum distance of 10 cm between the fan openings of the product and any object in the vicinity.
   - Do not place the product next to heat-generating equipment such as radiators or other products.

4.4.2   Mounting the R&S FPL1000 in a Rack

To prepare the rack

1. Observe the requirements and instructions in "Setting up the product" on page 8.

2. **NOTICE!** Insufficient airflow can cause overheating and damage the product. Design and implement an efficient ventilation concept for the rack.

To mount the R&S FPL1000 in a rack

1. Use an adapter kit to prepare the R&S FPL1000 for rack mounting.

   a) Order the rack adapter kit designed for the R&S FPL1000. For the order number, see the data sheet.
   b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.

2. Lift the R&S FPL1000 to shelf height.

3. Grab the handles and push the R&S FPL1000 onto the shelf until the rack brackets fit closely to the rack.

4. Tighten all screws in the rack brackets with a tightening torque of 1.2 Nm to secure the R&S FPL1000 in the rack.

To unmount the R&S FPL1000 from a rack

1. Loosen the screws at the rack brackets.

2. Remove the R&S FPL1000 from the rack.

3. If placing the R&S FPL1000 on a bench top again, unmount the adapter kit from the R&S FPL1000. Follow the instructions provided with the adapter kit.

4.4.3 Portable Operation

An optional carrying bag designed specifically for the R&S FPL1000 allows you to protect the instrument while working in the field. The bag includes ventilation areas at the position of the ventilation outlets in the casing to ensure air circulation. The transparent cover allows you to operate the instrument without removing it from the bag. With the help of the optional vest holster, you can carry the R&S FPL1000 in its bag and keep your hands free. Together with the optional battery pack (see), and packed in the dedicated carrying bag, the R&S FPL1000 is ideally suited for operation directly in the field, even in rough environments.

► Inspect the carrying bag for wear and tear before placing the instrument in it.

For details on optional accessories, see the R&S FPL1000 data sheet.

4.5 Connecting to Power

There are various options to supply power to the R&S FPL1000.

- The R&S FPL1000 is equipped with an AC power supply connector.
- The R&S FPL1000 can also be equipped with an optional (internal) DC power supply connector (R&S FPL1-B30).
- The R&S FPL1000 allows for battery operation if option R&S FPL1-B31 is installed.

4.5.1 Connecting the AC Power

The R&S FPL1000 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.

For safety information, see "Connecting to power" on page 9.

To connect the AC power

1. Plug the AC power cable into the AC power connector on the rear panel of the instrument. Only use the AC power cable delivered with the R&S FPL1000.

2. Plug the AC power cable into a power outlet with ground contact.

   The required ratings are listed next to the AC power connector and in the data sheet.

For details on the connector, refer to Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 44.

4.5.2 Connecting an Optional DC Power Supply (R&S FPL1-B30)

The R&S FPL1000 can also be equipped with an optional DC power supply connector (R&S FPL1-B30). If installed, the R&S FPL1000 can be operated by a DC voltage of +12 V to +24 V. For details on the connector see Chapter 5.2.2, "Li-Ion Battery Packs and DC Power Connector", on page 45.

If you use an external power supply unit to supply safety extra-low DC voltage (SELV) to the instrument, be sure to meet the requirements for reinforced/double insulation in accordance with DIN/EN/IEC 61010 (UL 3111, CSA C22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA C22.2 No. 950). Provide current limitation in accordance with DIN EN 61010-1 Appendix F2.1. Use a cable no longer than 3 m.

Also see "Connecting to power" on page 9.

DC connection

► Connect the DC power connector on the rear panel of the R&S FPL1000 to the DC power source using a cable as described above.

4.5.3   Optional Battery Pack (R&S FPL1-B31)

As an alternative to the fixed AC or DC power supply, the R&S FPL1000 also allows for battery operation. The "Battery Pack" option R&S FPL1-B31 comprises two Li-ion batteries and an internal charger. The internal charger charges the batteries whenever the instrument is connected to AC or DC power. During operation, if neither DC nor AC power is supplied, the R&S FPL1000 automatically switches to battery operation.

The battery pack can be retrofitted by Rohde&Schwarz service.

For safety information, see "Handling batteries safely" on page 10.

Charging batteries

Charge the batteries before using battery operation for the first time. Following a long storage period, it can be necessary to charge and discharge the batteries several times to reach full capacity.

For batteries from third parties, follow the instructions provided by the manufacturer. For batteries manufactured by Rohde & Schwarz, observe the following:

● If inserted in the R&S FPL1000, batteries are charged via the common AC or DC power supply.

● You can also use the external battery charger R&S FSV-B34 to charge up to 4 batteries.

● Charge in a temperature range from +0 °C to +45 °C. If the temperature is above or below these values, or the temparature varies strongly, charging is interrupted. If the battery temperature rises above +53 °C, charging is stopped.

● Try not to overcharge the battery too often because overcharging reduces the service life of the battery.

When the battery is being charged in standby mode, the [Power] LED blinks. During operation, the status bar indicates that the battery is being charged.

Spare battery pack (R&S FPL1-Z4)

In addition to the internal battery pack (option R&S FPL1-B31), spare batteries are available for the R&S FPL1000. The spare battery pack R&S FPL1-Z4 comprises two additional Li-ion batteries.

Outside the R&S FPL1000, batteries can be charged using the external battery charger R&S FSV-B34. Even during battery operation, you can exchange the internal batteries while the R&S FPL1000 is running, as long as one battery remains in the instrument. However, it is not recommended to operate the R&S FPL1000 with only one battery for a longer period.

4.6   Switching On or Off

Table 4-1: Overview of power states

Status	LED on Power key	Position of main power switch
Off	⚪ gray	[0]
Standby	🟠 orange	[I]
Ready	🟢 green	[I]

To switch on the R&S FPL1000

The R&S FPL1000 is off but connected to power.

1. Set the switch on the power supply to position [I].
   See Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 44.

   The LED of the Power key is orange.
   See Chapter 5.1.2, "Power Key", on page 38.

2. Press the Power key.

   The LED changes to green.

The instrument operates on battery, DC, or AC power, whichever is supplied. The R&S FPL1000 boots.

After booting, the instrument is ready for operation.

To shut down the product

The product is in the ready state.

► Press the [Power] key.

The operating system shuts down. The LED changes to orange.

To disconnect from power

The R&S FPL1000 is in the standby state.

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.

   Set the switch on the power supply to position [0].
   See Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 44.

   The LED of the standby key is switched off.

2. Disconnect the R&S FPL1000 from the power source.

4.7 Connecting to LAN

You can connect the instrument to a LAN for remote operation via a PC.

For details on the connector, see Chapter 5.2.12, "LAN", on page 49.

Provided the network administrator has assigned you the appropriate rights and adapted the Windows firewall configuration, you can use the interface, for example:

* To transfer data between a controlling device and the test device, e.g. to run a remote control program
* To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool)
* To connect external network devices (e.g. printers)
* To transfer data from a remote computer and back, e.g. using network folders

Network environment

Before connecting the product to a local area network (LAN), consider the following:

- Install the latest firmware to reduce security risks.

- For internet or remote access, use secured connections, if applicable.

- Ensure that the network settings comply with the security policies of your company. Contact your local system administrator or IT department before connecting your product to your company LAN.

- When connected to the LAN, the product may potentially be accessed from the internet, which may be a security risk. For example, attackers might misuse or damage the product. For more information about IT security and how to operate the product in a secure LAN environment, see the Rohde & Schwarz white paper 1EF96: Malware Protection Windows 10.

► **NOTICE!** Risk of network failure.
  Consult your network administrator before performing the following tasks:
  - Connecting the instrument to the network
  - Configuring the network
  - Changing IP addresses
  - Exchanging hardware

  Errors can affect the entire network.

  Connect the R&S FPL1000 to the LAN via the LAN interface on the rear panel of the instrument.

  Windows automatically detects the network connection and activates the required drivers.

  By default, the R&S FPL1000 is configured to use DHCP and no static IP address is configured.

💡 The default instrument name is <Type><variant>-<serial_number>, for example, FPL1003-123456. For information on determining the serial number, see Chapter 5.2.14, "Device ID", on page 49.

For more information on LAN configuration, see the R&S FPL1000 user manual.

4.8 Connecting a Keyboard

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

However, you can also connect foreign language keyboards; currently the following languages are supported for the R&S FPL1000:

● German

● Swiss

● French

● Russian

To configure the keyboard language

1. To access the Windows operating system, press the Windows key on the external keyboard.

2. Select "Start > Settings > Time & language > Region & language > Add a language" .

4.9 Connecting an External Monitor

You can connect an external monitor (or projector) to the "DVI" connector on the rear panel of the R&S FPL1000 (see also Chapter 5.2.13, "DVI", on page 49).
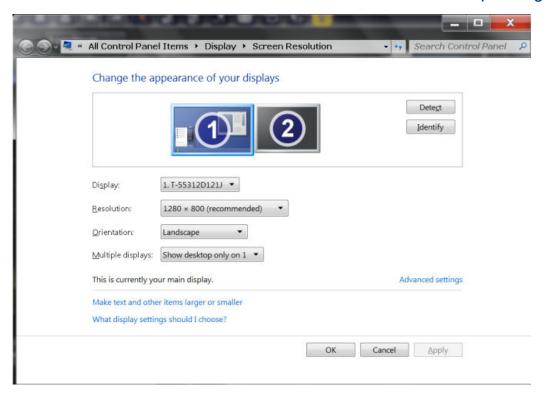
ⓘ **Screen resolution and format**

The touchscreen of the R&S FPL1000 is calibrated for a 16:10 format. If you connect a monitor or projector using a different format (e.g. 4:3), the calibration is not correct and the screen does not react to your touch actions properly.

The touchscreen has a screen resolution of 1280x800 pixels. Usually, the display of the external monitor is a duplicate of the instrument's monitor.

If you configure the external monitor to be used as the *only* display in the Windows configuration dialog box ("Show only on 2"), the maximum screen resolution of the monitor is used. In this case, you can maximize the R&S FPL1000 application window and see even more details. You cannot change the monitor's screen resolution via the standard Windows configuration dialog box.

The R&S FPL1000 supports a minimum resolution of 1280x768 pixels.

1. Connect the external monitor to the R&S FPL1000.

2. Press the [Setup] key.

3. Press the "Display" softkey.

4. Select the "Configure Monitor" tab in the "Display" dialog box.

   The standard Windows "Screen Resolution" dialog box is displayed.

5. If necessary, change the screen resolution. Consider the information in the note above.

6. Select the instrument for display:

   - "Display 1" : internal monitor only
   - "Display 2" : external monitor only
   - "Duplicate" : both internal and external monitor

7. Tap "Apply" to try out the settings before they are accepted permanently, then you can easily return to the previous settings, if necessary.

8. Select "OK" if the settings are suitable.

4.10   Windows Operating System

The instrument contains the Windows 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 a keyboard or a printer are installed or if the network configuration does not comply with the default settings. After the R&S FPL1000 is started, the operating system boots and the instrument firmware is started automatically.

Tested software

The drivers and programs used on the instrument under Windows are adapted to the instrument. Only install update software released by Rohde & Schwarz to modify existing instrument software.

You can install additional software on the instrument; however, additional software can impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.

The following program packages have been tested:

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

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.

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. Rohde & Schwarz instruments are shipped with the Windows firewall enabled and preconfigured in such a way that all ports and connections for remote control are enabled.

Note that changing firewall settings requires administrator rights.

Virus protection

Take appropriate steps to protect your instruments from infection. Use strong firewall settings and scan any removable storage device used with a Rohde & Schwarz instrument regularly. It is also recommended that you install anti-virus software on the instrument. 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. However, Rohde & Schwarz does recommend running it during non-critical hours.

For details and recommendations, see the following Rohde & Schwarz white paper:

- 1EF96: Malware Protection Windows 10

To access the "Start" menu

The Windows "Start" menu provides access to the Windows functionality and installed programs.

► Select the "Windows" icon in the toolbar, or press the "Windows" key or the [CTRL + ESC] key combination on the (external) keyboard.

The "Start" menu and the Windows taskbar are displayed.

💡 The Windows taskbar also provides quick access to commonly used pro-
grams, for example Paint or WordPad. IECWIN, the auxiliary remote control
tool provided free of charge and installed by Rohde & Schwarz, is also avail-
able from the taskbar or "Start" menu.

For details on the IECWIN tool, see the "Network and Remote Control"
chapter of the R&S FPL1000 user manual.

All necessary system settings can be defined in the "Start > Settings" menu.

For required settings, refer to the Windows documentation and to the hardware description.

4.11 Logging On

Windows requires that users identify themselves by entering a user name and password in a login window. By default, the R&S FPL1000 provides two user accounts:

● **"Instrument"**: a standard user account with limited access
● **"Admin"** or **"Administrator"** (depends on firmware image): an administrator account with unrestricted access to the computer/domain

Some administrative tasks require administrator rights (e.g. the configuration of a LAN network). Refer to the description of the basic instrument Setup ([Setup] menu) to find out which functions are affected.

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. An administrator can change the password in Windows for any user at any time via "Start > Settings > Account > SignIn Options > Password > Change".

Auto-login

When shipped, the instrument automatically logs on the default "Instrument" user to Windows using the default password. This function is active until an administrator explicitly deactivates it or changes the password.

ⓘ **Changing the password and use of auto-login function**
Note that when you change the default password, the default auto-login function no longer works!

In this case, you must enter the new password manually to log on.

Adapting the auto-login function to a new password

If you change the password that is used during auto-login, this function no longer works. Adapt the settings for the auto-login function first.

1. Open the
   `C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\user\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 for automatic login.

3. Save the changes to the file.

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

5. Enter the command
   `C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\user\AUTOLOGIN.REG`.

6. Press the [ENTER] key to confirm.
   The auto-login function is reactivated with the changed password. It will be applied the next time the instrument is switched on.

Switching users when using the auto-login function

Which user account is used is defined during login. If auto-login is active, the login window is not displayed. However, you can switch the user account to be used even when the auto-login function is active.

1. Select the "Windows" icon in the toolbar to access the operating system of the R&S FPL1000 (see also "To access the "Start" menu" on page 31).

2. Press [CTRL] + [ALT] + [DEL], then select "Sign out".

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

For information on deactivating and reactivating the auto-login function, see the R&S FPL1000 user manual.

4.12   Checking the Supplied Options

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

1. Press the [SETUP] key.

2. Press 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.

4.13　Performing a Self-Alignment

When strong temperature changes occur in the environment of the R&S FPL1000, or after updating the firmware, you have to perform a self-alignment to align the data to a reference source.

During self-alignment, do not connect a signal to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

Performing a self-alignment

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

A message in the status bar ("Instrument warming up...") indicates that the operating temperature has not yet been reached.

Depending on the installation settings, an automatic self-alignment is performed each time the instrument is switched on. A dialog is displayed indicating how much warm-up time is still required before self-alignment can be performed.

1. Press the [Setup] key.

2. Press 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**
   ● Press the [SETUP] key.
   ● Press the "Alignment" softkey.

4.14　Considerations for Test Setup

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example, double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

► **NOTICE!** Risk of electrostatic discharge. Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).

   Ground yourself to prevent electrostatic discharge damage:

   a) Use a wrist strap and cord to connect yourself to ground.
   b) Use a conductive floor mat and heel strap combination.

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the R&S FPL1000 and connected devices.

5 Instrument Tour

5.1 Front Panel View

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

Figure 5-1: Front panel view of R&S FPL1000

1 = Power key
2 = USB (2.0) connectors
3 = System keys
4 = Touchscreen
5 = Function keys
6 = Keypad + navigation controls
7 = RF input 50 Ω connector
8 = Internal generator output 50 Ω connector (requires option R&S FPL1-B9)

5.1.1 Touchscreen

All measurement results are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, offer-

ing an alternative means of user interaction for quick and easy handling of the instrument.

Figure 5-2: Touchscreen elements

1 = Toolbar with standard application functions, e.g. print, save/open file etc.
2 = Tabs for individual channel setups
3 = Channel Setup bar for firmware and measurement settings
4 = Measurement results area
5 = Window title bar with diagram-specific (trace) information
6 = Softkeys for function access
7 = Diagram footer with diagram-specific information, depending on application
8 = Instrument status bar with error messages and date/time display

Using touchscreen gestures, you can perform the following tasks (among others).

(See Chapter 6, "Trying Out the Instrument", on page 51)

- Changing a setting
- Changing the display
- Changing the displayed result range in a diagram
- Moving a marker

- Zooming into a diagram
- Selecting a new evaluation method
- Scrolling through a result list or table
- Saving or printing results and settings

To imitate a right-click by mouse using the touchscreen, for example to open a context-sensitive menu for a specific item, press the screen for about 1 second.

For details on touchscreen gestures, see Chapter 7.4, "Touchscreen Gestures", on page 88.

5.1.2 Power Key

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

See also "Connecting to power" on page 9 and Chapter 4.5, "Connecting to Power", on page 21.

5.1.3 USB

The front panel provides two female USB connectors (USB-A, 2.0 standard) to connect devices like a keyboard or a mouse. A memory stick can be connected to store and reload instrument settings and measurement data.

The rear panel provides further USB connectors (standard 3.0), see Chapter 5.2.11, "USB", on page 49.

5.1.4 System Keys

System keys set the instrument to a predefined state, change basic settings, and provide print and display functions.

A detailed description of the corresponding functions is provided in the R&S FPL1000 user manual.

Table 5-1: System keys

System key	Assigned functions
[Preset]	Resets the instrument to the default state.
[Setup]	Provides basic instrument configuration functions, e.g.: • Reference frequency (external/internal) • Date, time, display configuration • LAN interface • Firmware update and enabling of options • Information about instrument configuration incl. firmware version and system error messages • Service support functions (self-test etc.) • Self-alignment (with spectrum analysis option)
[Mode]	Manages channel setups
[Print]	Provides configuration settings for the print function
[FILE]	Provides save/recall functions for instrument settings and measurement results
	Switches between the on-screen keyboard display: • At the top of the screen • At the bottom of the screen • Off

5.1.5   Function Keys

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 FPL1000 user manual.

Table 5-2: Function keys

Function key	Assigned functions
[Freq]	Sets the center frequency and 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 (optional) preamplifier
[BW]	Sets the resolution bandwidth and the video bandwidth.

Function key	Assigned functions
[Sweep]	Sets the sweep time and the number of measurement points
	Selects continuous measurement or single measurement
[Trace]	Configures the graphical analysis of the measurement data
[Meas]	Provides the measurement functions:
	Measurement of multicarrier adjacent channel power (Ch Power ACLR)
	Carrier to noise spacing (C/N C/N$_0$)
	Occupied bandwidth (OBW)
	Spectrum emission mask measurement (Spectrum Emission Mask)
	Spurious emissions (Spurious Emissions)
	Measurement of time domain power (Time Domain Power)
	Third-order intercept point (TOI)
	AM modulation depth (AM Mod Depth)
[Meas Config]	Used to configure measurements and data input and output
[Lines]	Configures display lines and limit lines
[Mkr]	Sets and positions the absolute and relative measurement markers (markers and delta markers)
	Selects special marker 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)
[Trig]	Sets the trigger mode, the trigger threshold, the trigger delay, and the gate configuration for gated sweep
[Peak]	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.
[Run Single]	Starts and stops a single new measurement (Single Sweep Mode)
[Run Cont]	Starts and stops a continuous measurement (Continuous Sweep Mode)

5.1.6　Keypad

The keypad is used to enter numeric parameters, including the corresponding units. It contains the following keys:

Table 5-3: Keys on the keypad

Type of key	Description
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. For alphanumeric parameters, inserts a "-" at the cursor position.
Unit keys (GHz/-dBm MHz/dBm, kHz/dB, Hz/dB etc.)	Adds the selected unit to the entered numeric value and complete the entry. For 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.
[ESC]	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)	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor.
[ENTER]	● 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 focused element.

5.1.7　Navigation Controls

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

> 💡 **Navigating in tables**
>
> The easiest way to navigate within tables (both in result tables and configuration tables) is to scroll through the entries with your finger on the touchscreen.

5.1.7.1   Rotary Knob

The rotary knob has several functions:

- For numeric entries: increments (clockwise direction) or decrements (counterclockwise direction) the instrument parameter at a defined step width
- In lists: toggles between entries
- For markers, limit lines, and other graphical elements on the screen: moves their position
- For active scroll bars: moves the scroll bar vertically
- For dialog boxes: Same effect as the Enter key when pressed

5.1.7.2   Navigation Keys

The 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:
- For numeric entries: increments (Arrow Up) or decrements (Arrow Down) the instrument parameter at a defined step width
- In a list: scrolls forward and backward through the list entries
- In a table: moves the selection bar vertically
- In windows or dialog boxes with a vertical scroll bar: moves 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.

5.1.8   RF INPUT 50 Ohm

Provides RF input from a connected device under test (DUT) to the R&S FPL1000, which is then analyzed in an RF measurement. Connect the DUT to the "RF Input" on the R&S FPL1000 via a cable equipped with an appropriate connector. Do not overload the input. For maximum allowed values, see the data sheet.

See also Chapter 4.14, "Considerations for Test Setup", on page 34.

The specific connector type depends on the instrument model:

- R&S FPL1003/1007: N female
- R&S FPL1014: N female
- R&S FPL1026: Test port adapter, 2.92 mm female (standard) or N female

5.1.9   GEN Output 50 Ω

Provides signal output from the (optional) internal generator (requires Internal Generator option R&S FPL1-B9). Output levels range from -60 dBm to +10 dBm, with a resolution of 0.1 dB. For details, see the data sheet.

5.2   Rear Panel View

This figure shows the rear panel view of the R&S FPL1000. The individual elements are described in more detail in the subsequent sections.
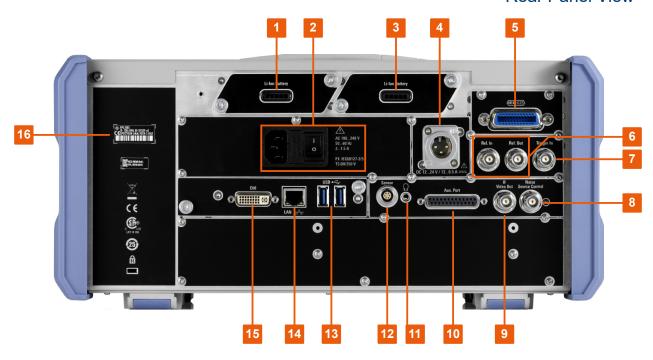
Figure 5-3: Rear panel view

1+3 = Removable, rechargeable Li-ion batteries
2   = AC power supply connection and main power switch with fuse
4   = DC power connector
5   = GPIB (IEC 625) interface
6   = Reference clock connectors
7   = Trigger input connector
8   = Noise source control *)
9   = "IF/Video out" connector *)
10   = Aux. Port *)
11   = Headphones connector *)
12   = Power sensor connector *)
13   = "USB" (3.0) connectors
14   = "LAN" connector
15   = "DVI" connector for external display
16   = Device ID with serial number and other labels

*) requires the "Additional Interfaces" option R&S FPL1-B5.

ⓘ The meanings of the labels on the R&S FPL1000 are described in Chapter 1.2, "Labels on R&S FPL1000", on page 11.

5.2.1 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 "Connecting to power" on page 9 and Chapter 4.5, "Connecting to Power", on page 21.

5.2.2 Li-Ion Battery Packs and DC Power Connector

With the Li-ion battery pack (option R&S FPL1-B31), the R&S FPL1000 can be operated independently of an AC or DC power supply. The instrument can house 2 Li-ion batteries which can be charged both via AC or DC power supply.

For safety information concerning batteries, see "Handling batteries safely" on page 10.

As an alternative, a DC power supply connector (option R&S FPL1-B30) is available. DC power supplies from +12 V to +24 V and from 13 A to 6.5 A can be used. Connect the connector according to the following diagram:

	Pin	Description
	1	Plus
	2	Ground
	3	Not used

If you use an external power supply unit to supply safety extra-low DC voltage (SELV) to the instrument, be sure to meet the requirements for reinforced/double insulation in accordance with DIN/EN/IEC 61010 (UL 3111, CSA C22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA C22.2 No. 950). Provide current limitation in accordance with DIN EN 61010-1 Appendix F2.1.

Also see "Connecting to power" on page 9.

5.2.3 GPIB Interface

The optional GPIB interface (R&S FPL1-B10) is in compliance with IEEE488 and SCPI. A computer for remote control can be connected via this interface. To set up the connection, a shielded cable is recommended.

For more details, refer to "Setting Up Remote Control" in the user manual.

5.2.4   Ref. In / Ref. Out

The Ref. In connectors are used to provide an external reference signal to the R&S FPL1000.

The Ref. Out connectors can be used to provide a reference signal from the R&S FPL1000 to other devices that are connected to this instrument.

Various connectors are provided for different reference signals:

Connector	Reference signal	Usage
Ref. In	10 MHz 10 dBm	To provide an external reference signal on the R&S FPL1000.
Ref. Out	10 MHz 10 dBm	To provide the internal reference signal from the R&S FPL1000 to another device continuously. For the R&S FPL1000, this is also used to provide the optional OCXO reference signal to another device.

5.2.5   Trigger In

Use the female Trigger In connector to input an external trigger or gate data. Thus, you can control the measurement using an external signal. The voltage level is 1.4 V. The typical input impedance is 10 kΩ.

5.2.6   Noise Source Control

The Noise Source Control female connector is used to provide the supply voltage for an external noise source. For example, use it to measure the noise figure and gain of amplifiers and frequency converting devices.

This connector is only available if the R&S FPL1-B5 option is installed.

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

5.2.7   IF/Video Output

The female BNC connector can be used for various outputs in the Spectrum application:

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

Which output is provided is defined in the software ("Overview" > "Output").

This connector is only available if the R&S FPL1-B5 option is installed.

For details, see the user manual.

5.2.8   Aux. Port

A 25-pole SUB-D male connector used as an input and output for low-voltage TTL control signals (max. 5 V). This connector is provided by the "Additional Interfaces" option R&S FPL1-B5.

> **NOTICE**
>
> **Short-circuit hazard**
>
> Always observe the designated pin assignment. A short-circuit can damage the port.

Table 5-4: Pin assignment for optional AUX port

Pin	Signal	Description
1	GND	Ground
2		not used for spectrum analysis
3	GND	Ground
4		not used for spectrum analysis
5	GND	Ground
6		not used for spectrum analysis

Pin	Signal	Description
7	GND	Ground
8 to 11		not used for spectrum analysis
12	GND	Ground
13	+5 V / max. 250 mA	Supply voltage for external circuits
14 to 19	I/O_<no.>	Control lines for user ports (see user manual)
20	GND	Ground
21	READY FOR TRIG-GER	Signal indicating that the instrument is ready to receive a trigger signal. The signal polarity is configurable. (See the R&S FPL1000 user manual.)
22 to 25		not used for spectrum analysis
23	GND	Ground
24 to 25		not used for spectrum analysis

5.2.9   Headphones Connector

The R&S FPL1000 provides demodulators for AM, FM and PM signals, which can be routed to the headphone connector. With headphones or an external loud-speaker connected to the 3.5 mm headphone socket, the displayed signal can be identified acoustically.

This connector is only available if the R&S FPL1-B5 option is installed.

Note the safety information provided in "Connecting headphones" on page 11.

For details, see the user manual.

5.2.10   Sensor Connector

The LEMOSA female connector is used to connect power sensors of the R&S NRP-Zxy family. For a detailed list of supported sensors, see the data sheet.

For details on configuring and using power sensors, see the user manual.

ⓘ   This connector is provided by the "Additional Interfaces" option R&S FPL1-B5.

5.2.11   USB

The rear panel provides two additional female USB (3.0 standard) connectors to connect devices like a keyboard, a mouse or a memory stick (see also Chapter 5.2.11, "USB", on page 49).

5.2.12   LAN

The R&S FPL1000 is equipped with a 1 GBit Ethernet IEEE 802.3u network interface with Auto-MDI(X) functionality. 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 the R&S FPL1000 user manual.

5.2.13   DVI

You can connect an external monitor or other display device to the R&S FPL1000 via the DVI (Digital visual interface) connector to provide an enlarged display.

For details, see Chapter 4.14, "Considerations for Test Setup", on page 34.

5.2.14   Device ID

The unique device identifier is provided as a barcode sticker on the rear panel of the R&S FPL1000.

It consists of the device order number and a serial number.

The serial number is used to define the **default instrument name**, which is:

<Type><variant>-<serial_number>

For example, `FPL1003-123456`.

The instrument name is required to establish a connection to the instrument in a LAN.

6   Trying Out the Instrument

This chapter introduces the most important functions and settings of the
R&S FPL1000 step by step. The complete description of the functionality and its
usage is given in the R&S FPL1000 User Manual. Basic instrument operation is
described in

Prerequisites

- The instrument is set up, connected to the mains system, and started up as
  described in

For these first measurements, you use the internal calibration signal, so you do
not need any additional signal source or instruments. Try out the following:

6.1   Measuring a Basic Signal

We will start out by measuring a basic signal, using the internal calibration signal
as the input.

To display the internal 50 MHz calibration signal

1. Press the [Preset] key to start out in a defined instrument configuration.

2. Press the [Setup] key.

3. Tap the "Service + Support" softkey.

4. Tap the "Calibration Signal" tab.

5. Tap the "Calibration Frequency RF" option. Leave the frequency at the default
   50 MHz.

6. Close the dialog box.

   The calibration signal is now sent to the RF input of the R&S FPL1000. By
   default, a continuous frequency sweep is performed, so that the spectrum of
   the calibration signal is now displayed in the standard level versus frequency
   diagram.
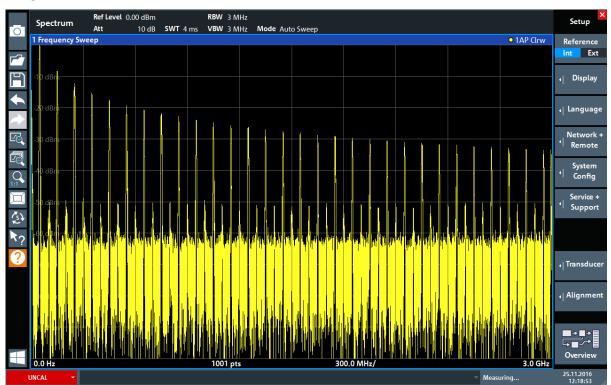
Figure 6-1: Calibration signal as RF input

ⓘ **Instrument warmup time**

Note that the instrument requires an initial warmup time after switching it on.
A message in the status bar ("Instrument warming up...") indicates that the
operating temperature has not yet been reached. Wait until this message is
no longer displayed before you start a measurement to ensure accurate
results.

To optimize the display

To optimize the display for the calibration signal, we will adjust the main measure-
ment settings.

1. Set the center frequency to the calibration frequency:

   a) Tap the "Overview" softkey to display the configuration "Overview" .

   b) Tap the "Frequency" button.

   c) In the "Center" field, enter *50* on the number pad on the front panel.

   d) Press the "MHz" key next to the number pad.

2. Reduce the span to 20 MHz:

   a) In the "Span" field of the "Frequency" dialog box, enter *20 MHz*.

   b) Close the "Frequency" dialog box.

3. Average the trace to eliminate noise:

   a) In the configuration "Overview" , tap the "Analysis" button.

   b) In the "Traces" tab, select the trace mode "Average" .

   c) Enter the "Average Count" : *100*.

   d) Close the "Analysis" dialog box.

   The display of the calibration signal is now improved. The maximum at the center frequency (=calibration frequency) of 50 MHz becomes visible.
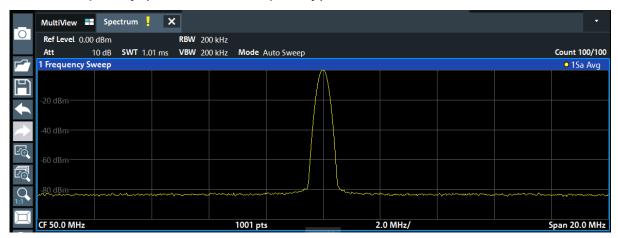
Figure 6-2: Calibration signal with optimized display settings

6.2   Displaying a Spectrogram

In addition to the standard "level versus frequency" spectrum display, the R&S FPL1000 also provides a spectrogram display of the measured data. A spectrogram shows how the spectral density of a signal varies over time. The x-axis shows the frequency, the y-axis shows the time. A third dimension, the power level, is indicated by different colors. Thus you can see how the strength of the signal varies over time for different frequencies.

1. Tap the "Overview" softkey to display the general configuration dialog box.

2. Tap the "Display Config" button.

   The SmartGrid mode is activated, and the evaluation bar with the available evaluation methods is displayed.

3.

   Drag the "Spectrogram" icon from the evaluation bar to the diagram area. The blue area indicates that the new diagram would replace the previous spectrum display. Since we do not want to replace the spectrum, drag the icon to the lower half of the display to add an additional window instead.
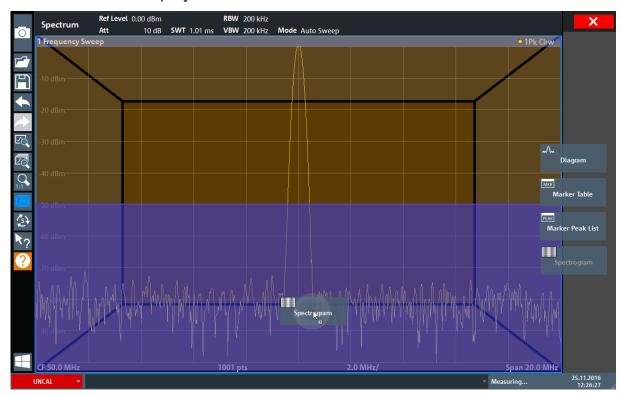
Figure 6-3: Adding a Spectrogram to the display

   Drop the icon.

4. Close the SmartGrid mode by tapping the "Close" icon at the top right corner of the toolbar.

5. Close the "Overview" .

   You see the spectrogram compared to the standard spectrum display. Since the calibration signal does not change over time, the color of the frequency levels does not change over time, i.e. vertically. The legend at the top of the spectrogram window describes the power levels the colors represent.
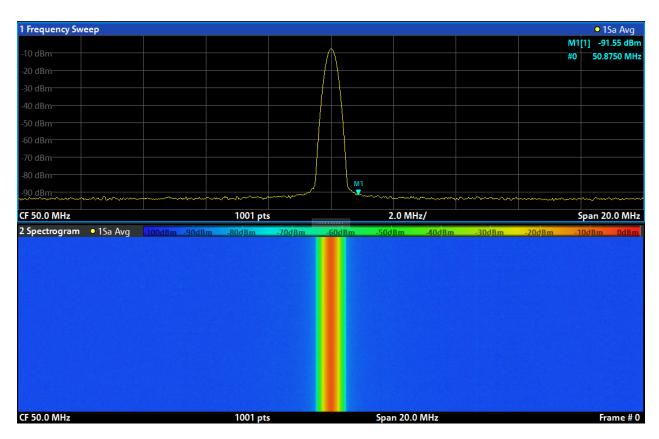
Figure 6-4: Spectrogram of the calibration signal

6.3   Activating Additional Measurement Channels

The R&S FPL1000 features multiple measurement channels, i.e. you can define several measurement configurations in parallel and then switch between the channel setups automatically to perform the measurements sequentially. We will demonstrate this feature by activating additional measurement channels for a different frequency range, a zero span measurement, and an I/Q analysis.

To activate additional measurement channels

1. Press the [Mode] key on the front panel.

2. On the "New Channel Setup" tab of the "Mode" dialog box, tap the "Spectrum" button.
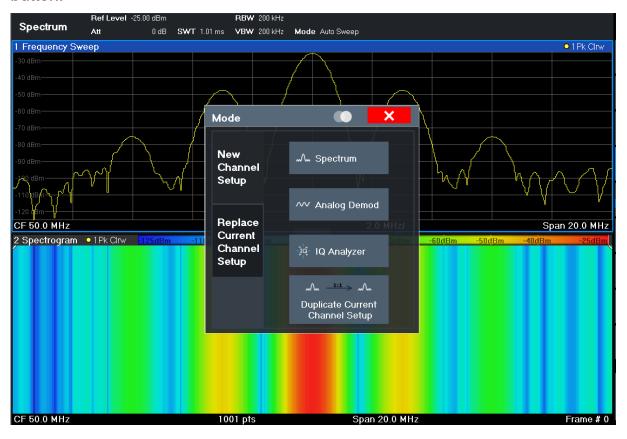
Figure 6-5: Adding a new measurement channel

3. Change the frequency range for this spectrum display:
   In the "Frequency" dialog box, set the **center frequency** to *500 MHz* and the **span** to *1 GHz*.
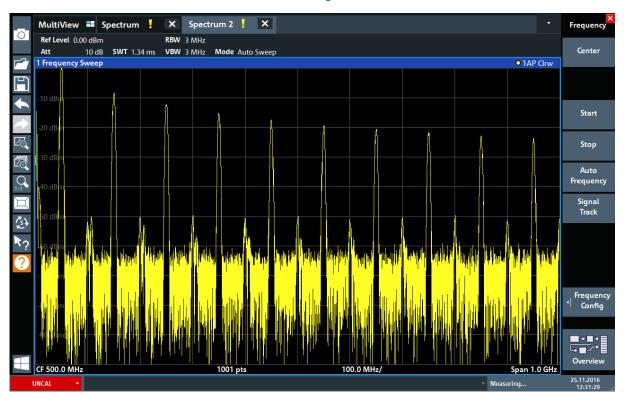
Figure 6-6: Frequency spectrum of the calibration signal with a larger span

4. Repeat the previous steps to activate a third Spectrum window.

5. Change the frequency range for this spectrum display:
   In the "Frequency" dialog box, set the **center frequency** to *50 MHz* and tap
   "Zero Span" .

6. Increase the reference level so you can see the level of the calibration signal
   at 1 dBm.

   a) In the "Amplitude" dialog box, set the "Reference Level" value to *+10 dBm*.

   As the calibration signal does not vary over time, the level versus time dia-
   gram displays a straight line.
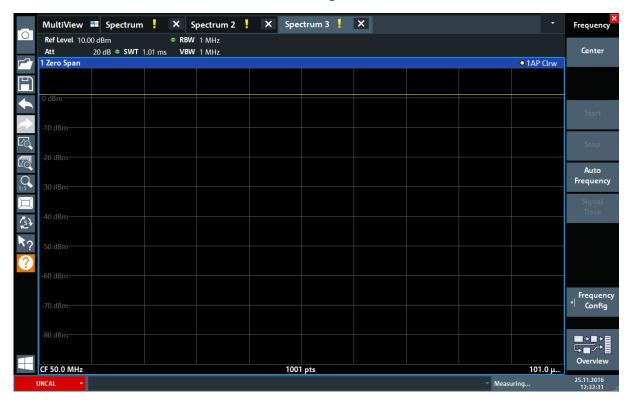
Figure 6-7: Time domain display of the calibration signal

7. Create a new measurement channel for I/Q analysis:

   a) Press the [Mode] key.
   b) Tap the "IQ Analyzer" button to activate a measurement channel for the I/Q Analyzer application.
   c) Tap the "Display Config" softkey to activate the SmartGrid mode.

d) Drag the "Real/Imag (I/Q)" icon from the evaluation bar to the SmartGrid to replace the default "Magnitude" display.

Figure 6-8: Inserting a Real/Imag diagram for I/Q analysis

e) Close the SmartGrid mode.

The "IQ Analyzer" measurement channel displays the real and imaginary signal parts in separate windows.

To display the MultiView tab

An overview of all active measurement channels is provided in the "MultiView" tab. This tab is always displayed if more than one measurement channel is active and cannot be closed.

► Tap the "MultiView" tab.

Figure 6-9: The "MultiView" tab

6.4   Performing Sequential Measurements

Although only one measurement can be performed at any one time, the measurements configured in the active channel setups can be performed sequentially, that means: one after the other, automatically, either once or continuously.

1. Tap the "Sequencer" icon in the toolbar.

2. Toggle the "Sequencer" softkey in the "Sequencer" menu to "On" .

   A continuous sequence is started, i.e. each channel setup measurement is performed one after the other until the Sequencer is stopped.

Figure 6-10: "MultiView" tab with active Sequencer

⚙

In Figure 6-10, the "Spectrum 2" measurement is currently active (indicated by the "channel active" icon in the tab label).

3. Stop the Sequencer by tapping the "Sequencer" softkey again.

6.5   Setting and Moving a Marker
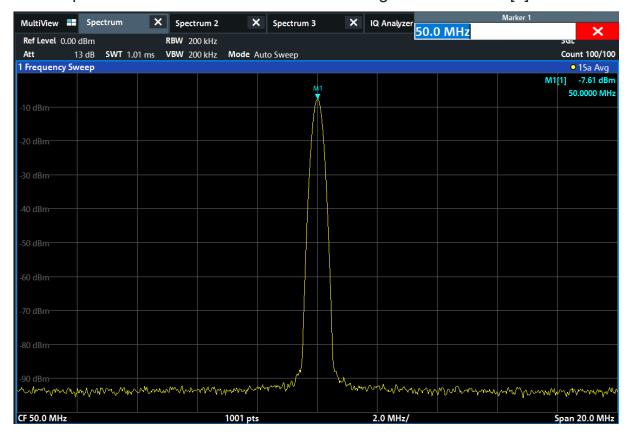
Markers are useful to determine the position of particular effects in the trace. The most common use is to determine a peak, which is the default setting when you activate a marker. We will set a marker on the peak in our first Spectrum measurement.

1. In the "MultiView" tab, double-tap the "Spectrum" window (frequency sweep with spectrogram display) to return to the "Spectrum" measurement channel.

2. Tap the spectrum display to set the focus on that window.

3. Double-tap the spectrum window to maximize it, as we currently do not need the spectrogram display.

4. Press the [Run Single] key on the front panel to perform a single sweep so we have a fixed trace to set a marker on.

5. Press the [Mkr] key on the front panel to display the "Marker" menu.

   Marker 1 is activated and automatically set to the maximum of trace 1. The marker position and value is indicated in the diagram area as M1[1].

6. Now you can move the marker by tapping and dragging it to a different position. The current position is indicated by a dotted blue line. Notice how the position and value change in the marker area of the diagram.

6.6   Displaying a Marker Peak List

The marker peak list determines the frequencies and levels of peaks in the spectrum automatically. We will display a marker peak list for the "Spectrum 2" measurement channel.

1. Tap the "Spectrum 2" tab.

2. Press the [Run Single] key on the front panel to perform a single sweep for which we will determine the peaks.

3. Tap the "SmartGrid" icon in the toolbar to activate SmartGrid mode.

4. Drag the "Marker Peak List" icon from the evaluation bar to the lower half of the display to add a new window for the peak list.

5. Close the SmartGrid mode.

6. To obtain a more conclusive peak list that does not contain noise peaks, for example, define a threshold that is higher than the noise floor:

   a) Press the [Mkr] key on the front panel.
   b) Tap the "Marker Config" softkey in the "Marker" menu.
   c) Tap the "Search" tab in the "Marker" dialog box.
   d) In the "Threshold" field, enter *-68 dBm*.
   e) Tap the "State" box for "Threshold" to activate its use.
      Only peaks that are larger than -90 dBm will be included in the peak list.
   f) Close the "Marker" dialog box.

The marker peak list displays the determined peaks that are above the defined threshold.
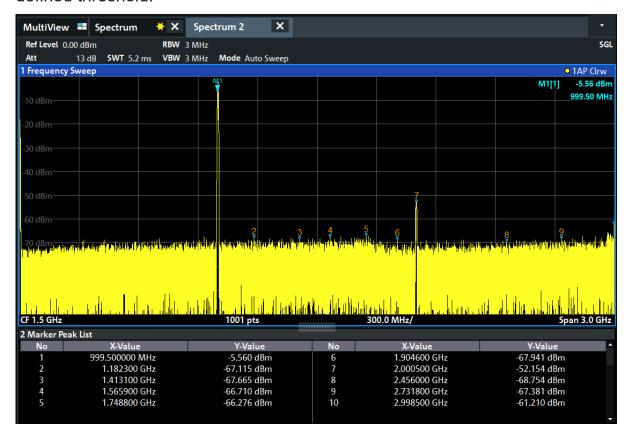
Figure 6-11: Marker Peak List

6.7   Zooming into the Display

To analyze the areas around the peak levels in more detail, we will zoom into the top 3 peaks.

1. Tap the "Multiple Zoom" icon in the toolbar.

   The icon is highlighted to indicate that multiple zoom mode is active.

2. Tap the diagram near the first peak and drag your finger to the opposite corner of the zoom area. A white rectangle is displayed from the point where you tapped to the current position.
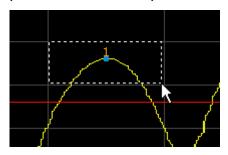
   Figure 6-12: Defining the zoom area

   When you remove your finger, the zoom area is enlarged in a second (sub-)window.
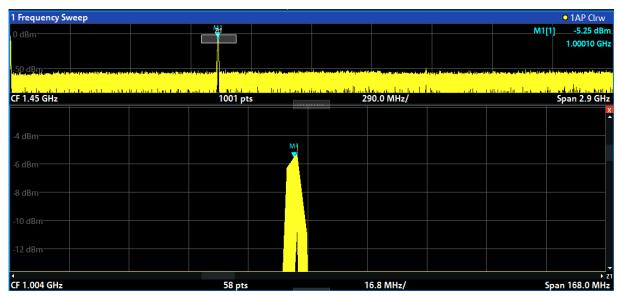
   Figure 6-13: Zoomed display around a peak

3. In Figure 6-14, the enlarged peak is represented by a very thick trace. This is due to the insufficient number of sweep points. The missing sweep points for the zoomed display are interpolated, which provides poor results. To optimize

the results, we will increase the number of sweep points from the default 1001 to 32001.

a) Press the [Sweep] key on the front panel.
b) Tap the "Sweep Config" softkey in the "Sweep" menu.
c) In the "Sweep Points" field, enter *32001*.
d) Close the "Bandwidth" dialog box.
e) Press the [Run Single] key on the front panel to perform a new sweep with the increased number of sweep points.
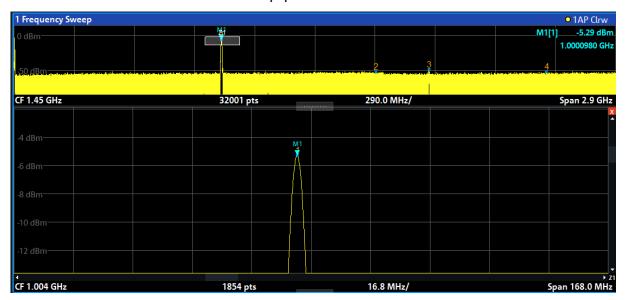
Figure 6-14: Zoomed peak with increased number of sweep points

Note that the trace becomes much more precise.

4. Tap the "Multiple Zoom" icon in the toolbar again and define a zoom area around markers M2, M3 and M4.

Figure 6-15: Multiple zoom windows

5. Tap the "Multiple Zoom" icon in the toolbar again and define a zoom area around marker M5.

6. To increase the size of the third zoom window, drag the "splitter" between the windows to the left or right or up or down.

Figure 6-16: Enlarged zoom window

6.8   Saving Settings

To restore the results of our measurements later, we will store the instrument settings to a file.

To save the instrument settings to a file

1. Tap the "Save" icon in the toolbar.

2. Press the keyboard key on the front panel to display the online keyboard, as you will have to enter text in the next step.

3. In the "Save" dialog box, tap the "File Name" field and enter *MyMultiView-Setup* using the keyboard.

Keep the default "File Type" setting "Instrument with all Channel Setups" to store the configuration of all channel setups.
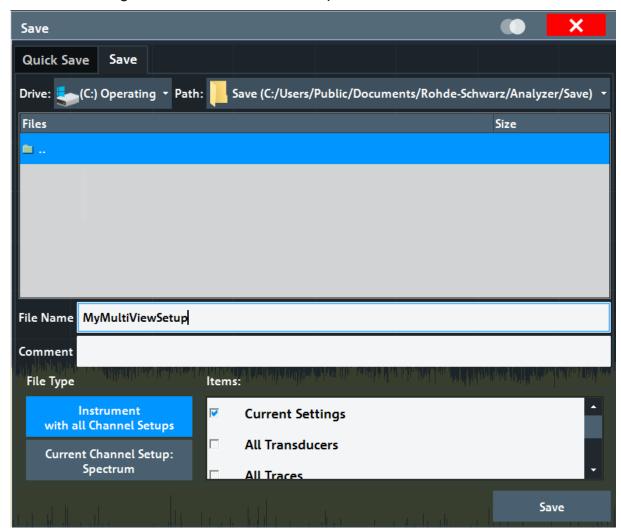
Figure 6-17: Saving the instrument settings to a file

4. Tap the "Save" button.

   The file `MyMultiViewSetup.dfl` is stored in the default directory `C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\Save`.

To load stored instrument settings

You can restore the settings to the instrument at any time using the settings file.

1. Press the [Preset] button to restore the default instrument settings so you can check that the stored user settings are actually restored afterwards.

2. Tap the "Load" icon in the toolbar.

3. In the "Load" dialog box, select the `MyMultiViewSetup.dfl` file in the default directory
   `C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\Save`.

4. Tap the "Load" button.

   All instrument settings are restored and the display should resemble the instrument display right before the settings were stored.

6.9　Printing and Saving Results

Finally, after a successful measurement, we will document our results. First we will export the numeric trace data, then we will create a screenshot of the graphical display.

To export the trace data

1. Press the [Trace] key on the front panel.

2. Tap the "Trace Config" softkey.

3. Tap the "Trace / Data Export" tab.

4. Tap the "Export Trace to ASCII File" button.

5. Enter the file name *MyMultiViewResults*.

   The trace data is stored to `MyMultiViewResults.DAT`

To create a screenshot of the display

1. Tap the "Print immediately" icon in the toolbar.
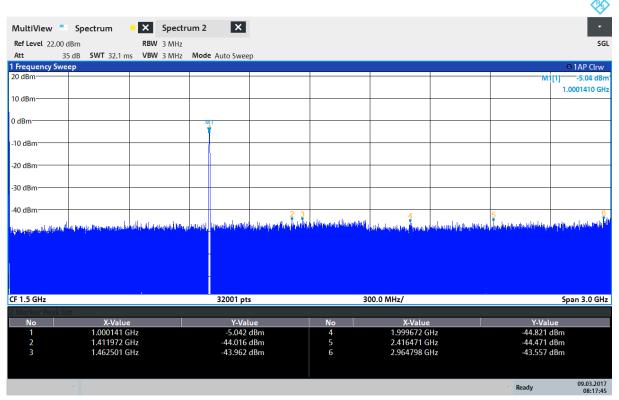
   A screenshot of the current display is created. Note that the colors on the screen are inverted in the screenshot to improve printout results.

2. In the "Save Hardcopy as" > "Portable Network Graphics (PNG)" dialog box, enter a file name, e.g. *MyMultiViewDisplay*.

   The screenshot is stored to `MyMultiViewDisplay.png`.

7 Operating the Instrument

This chapter provides an overview on how to work with the R&S FPL1000.

ⓘ **Remote control**

In addition to working with the R&S FPL1000 interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC. Various methods for remote control are supported:
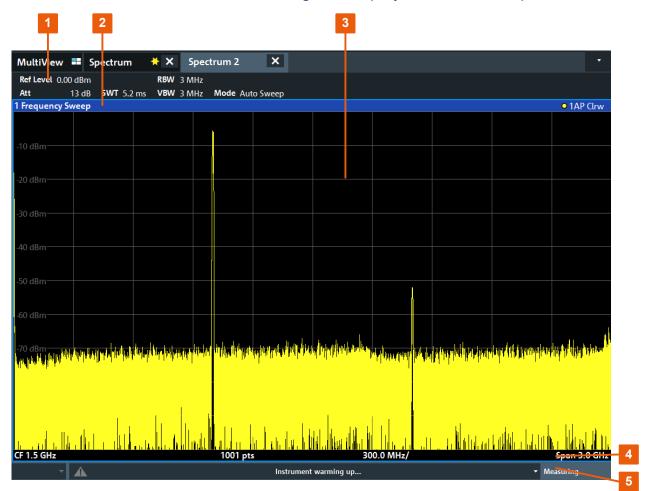
● Connecting the instrument to a (LAN) network

● Using the web browser interface in a LAN network

● Using the Windows Remote Desktop application in a LAN network

● Connecting a PC via the GPIB interface

How to configure the remote control interfaces is described in the R&S FPL1000 user manual.

7.1 Understanding the Display Information - Spectrum Mode

The following figure shows a measurement diagram in Spectrum mode. 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 = Window title bar with diagram-specific (trace) information
3 = Diagram area with marker information
4 = Diagram footer with diagram-specific information, depending on measurement application
5 = Instrument status bar with error messages and date/time display

💡 **Hiding elements in the display**

You can hide some of the elements in the display, for example the status bar or channel bar, to enlarge the display area for the measurement results. ("Setup" > "Display" > "Displayed Items")

For details, see the R&S FPL1000 User Manual.

7.1.1 Channel Setup Bar

Using the R&S FPL1000 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. To switch from one channel display to another, simply select the corresponding tab.

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

MultiView tab

An additional tab labeled "MultiView" provides an overview of all active channels at a glance. In the "MultiView" tab, each individual window contains its own channel bar with an additional button. Tap this button, or double-tap in any window, to switch to the corresponding channel display quickly.

Icons in the channel bar

The ⭐ yellow star icon on the tab label (sometimes referred to as a "dirty flag") indicates that invalid or inconsistent data is displayed, that is: the trace no longer matches the displayed instrument settings. This can happen, for example, when you change the measurement bandwidth, but the displayed trace is still based on the old bandwidth. As soon as a new measurement is performed or the display is updated, the icon disappears.

The ⚠ icon indicates that an error or warning is available for that channel setup. This is particularly useful if the MultiView tab is displayed.

The ⚙ icon indicates the currently active channel during an automatic measurement sequence (**Sequencer** functionality).

Channel-specific settings

Beneath the channel name, information on channel-specific settings for the measurement is displayed in the **channel bar**. Channel information varies depending on the active application.

In the Spectrum application, the R&S FPL1000 shows the following settings:

Table 7-1: Channel settings displayed in the channel bar in the Spectrum application

Ref Level	Reference level
Att	RF attenuation applied to input
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.
	For FFT sweeps, an estimated duration for data capture *and processing* is indicated behind the sweep time in the channel bar.
RBW	Resolution bandwidth that has been set.
	(CISPR) indicates that a CISPR bandwidth filter is being used, e.g. due to an active CISPR trace detector.
	For details see the EMI measurement in the R&S FPL1000 user manual.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet appears in front of the field.
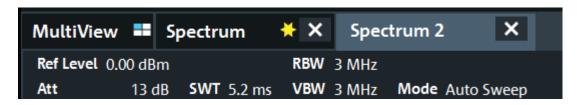
VBW	Video bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet is displayed in front of the field.
Compatible	Compatible device mode (FSL, FSV, default; default not displayed)
Mode	Indicates which sweep mode type is used: • "Auto FFT" : automatically selected FFT sweep mode • "Auto sweep" : automatically selected swept sweep mode
Pwr.Swp	Indicates the power sweep range for power sweep measurements using an optional internal tracking generator

Icons for individual settings

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.

Common settings

The channel bar above the diagram not only displays the channel-specific settings. It also displays information on instrument settings that affect the measurement results even though it is not immediately apparent from the display of the measured 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 are displayed, if applicable.

Table 7-2: 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)
	• **PSE**: Power sensor
	• **TIM**: Time
	• **VID**: Video
PA	The preamplifier is activated.
"YIG Bypass"	The YIG filter is deactivated.
GAT	The frequency sweep is controlled via the "TRIGGER INPUT" connector.
TDF	The specified 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.
CWSource: <level>	Internal generator in operation as independant CW source with specified level (requires option R&S FPL1-B9).
<"NOR" | "APX"> /**Trk.Gen**	Internal generator in operation as tracking generator (requires option R&S FPL1-B9).
	NOR: the measurements are normalized with the results of the internal generator calibration
	APX (approximation): the measurements are normalized with the results of the internal 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 "Internal Generator" section in the R&S FPL1000 User Manual.

Changing the Channel Setup Name

The channel setups are labeled with their default name. If that name already exists, a sequential number is added. You can change the name of the channel setup by double-tapping the name in the channel bar and entering a new name.

7.1.2   Window Title Bar

Each channel in the R&S FPL1000 display can contain several windows. Each window can display either a graph or a table as a result of the channel measurement. The window title bar indicates which type of evaluation is displayed.

Trace Information in Window Title Bar

Information on the displayed traces is indicated in the window title bar.

(1) **Trace color**		Color of trace display in diagram
(2) **Trace no.**		Trace number (1 to 6)
(3) **Detector**		Selected detector:
	AP	AUTOPEAK detector
	Pk	MAX PEAK detector
	Mi	MIN PEAK detector
	Sa	SAMPLE detector
	Av	AVERAGE detector
	Rm	RMS detector
(4) **Trace Mode**		**Sweep mode:**
	Clrw	CLEAR/WRITE
	Max	MAX HOLD
	Min	MIN HOLD
	Avg	AVERAGE (Lin/Log/Pwr)
	View	VIEW
(5) **Smoothing factor**	Smth	Smoothing factor, if enabled.

7.1.3   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-axis and y-axis positions of the last two markers or delta markers that were set are displayed, if available, as well as their index. 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 two 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), PWR (power sensor)
"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
"Function"	Activated marker or measurement function
"Function Result"	Result of the active marker or measurement function

The functions are indicated with the following abbreviations:

"FXD"	Fixed reference marker
"Phase Noise"	Phase noise measurement
"Signal Count"	Signal count
"TRK"	Signal tracking
"Noise Meas"	Noise measurement
"MDepth"	AM modulation depth
"TOI"	Third order intercept measurement

7.1.4   Frequency and Span Information in Diagram Footer
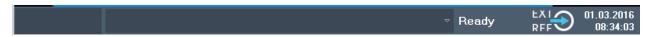
The information in the diagram footer (beneath the diagram) depends on the current application, measurement, and result display.

For a default measurement in the Spectrum mode, the Diagram result display contains the following information, for example:

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

7.1.5　Instrument and Status Information

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

In the MultiView tab, the status bar always displays the information for the currently selected measurement.

The following information is displayed:

Instrument status

EXT REF	The instrument is configured for operation with an external reference.
65 %	Battery loading status

Date and time

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

7.1.6　Error Information

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

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

Table 7-3: Status bar information - color coding

Color	Type	Description
Red	Error	An error occurred at the start or during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be started or 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.
No color	No errors	No message displayed - normal operation.
Green	Measurement successful	Some applications visualize that the measurement was successful by showing a message.

ⓘ If any error information is available for a channel setup, an exclamation mark is displayed next to the channel setup 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 channel setup only.

7.2   Accessing the Functionality

All tasks necessary to operate the instrument can be performed using this user interface. Apart from instrument specific keys, all other keys that correspond to an external keyboard (e.g. arrow keys, ENTER key) operate as specified by Microsoft.

For most tasks, there are at least 2 alternative methods to perform them:

- Using the touchscreen
- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or arrow and position keys.

The measurement and instrument functions and settings can be accessed by selecting one of the following elements:

- System and function keys on the front panel of the instrument

- Softkeys on the touchscreen
- Context menus for specific elements on the touchscreen
- Icons on the tool bar in the touchscreen
- Displayed setting on the touchscreen

7.2.1   Toolbar Functions

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

You can hide the toolbar display, e.g. when using remote control, to enlarge the display area for the measurement results ("Setup" > "Display" > "Displayed Items").

See the R&S FPL1000 User Manual.

Print immediately
Prints the current display (screenshot) as configured.

Open
Opens a file from the instrument ("Save/Recall" menu).

Save
Stores data on the instrument ("Save/Recall" menu).

Report Generator
Displays the "Report" menu to configure a report.

Undo
Reverts last operation, 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 select a different measurement. In this case, many settings would be lost. However, if you press [UNDO] immediately afterwards, the previous status is retrieved, i.e. the zero span measurement and all settings.

Note: The [UNDO] function is not available after a [PRESET] or "Recall" operation. When these functions are used, the history of previous actions is deleted.

Redo
Repeats previously reverted operation

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.

Gen On/Off
Enables/disables the internal generator.

Gen Config

Opens the dialog box to configure the internal generator.

Help (+ Select)

Allows you to select an object for which context-specific help is displayed

See Chapter 7.5, "Getting Help", on page 91

Help

Displays context-sensitive help topic for the most recently selected element

See Chapter 7.5, "Getting Help", on page 91

Windows

Displays the Windows "Start" menu and task bar.

See "To access the "Start" menu" on page 31.

7.2.2 Softkeys

Softkeys are virtual keys provided by the software. Thus, more functions can be provided than those that can be accessed directly via the function keys on the instrument. 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 pressed, it displays the next set of softkeys.

Recognizing the softkey status by color
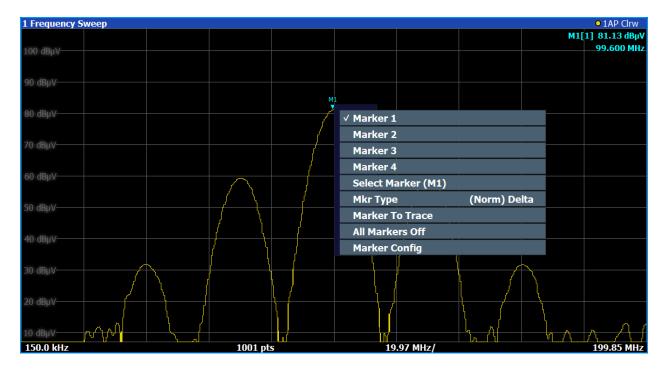
Color	Meaning
Orange	Associated dialog box is open
Blue	Associated function is active; for toggle keys: currently active state
Gray	Instrument function is temporarily not available due to a specific setting or missing option

💡 You can hide the softkey display, e.g. when using remote control, to enlarge the display area for the measurement results ("Setup" > "Display" > "Displayed Items"). See the User Manual for details.

7.2.3 Context Menus

Several items in the diagram area have context menus (for example markers, traces or the channel bar). If you right-click on one of these items (or tap it for about 1 second), a menu is displayed which contains the same functions as the corresponding softkey. This is useful, for example, when the softkey display is hidden.

7.2.4 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.

7.3   Entering Data

Data can be entered in dialog boxes using one of the following methods:

- Using the touchscreen, via the online keyboard
- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or navigation keys
  The rotary knob acts like the [ENTER] key when it is pressed.
- Using a connected external keyboard
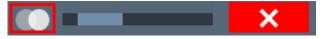
> 💡 **Transparent dialog boxes**
>
> You can change the transparency of the dialog boxes to see the results in the windows behind the dialog box. Thus, you can see the effects that the changes you make to the settings have on the results immediately.
>
> To change the transparency, select the transparency icon at the top of the dialog box. A slider is displayed. To hide the slider, select the transparency icon again.
>
>
>
> (The title bar of the dialog box is always slightly transparent and is not affected by the slider.)

> ℹ️ **Particularities in Windows dialog boxes**
>
> In some cases, e.g. if you want to install a printer, original Windows dialog boxes are used. In these dialog boxes, the rotary knob and function keys do not work. Use the touchscreen instead.

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).

2. After entering the numeric value via keypad, press 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 pressing the [ENTER] key or any of the unit keys.
   The editing line is highlighted to confirm the entry.

Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see Chapter 7.2.4, "On-screen Keyboard", on page 85).

Correcting an entry

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

2. Press the [Backspace] key.

   The entry to the left of the cursor is deleted.

3. Enter your correction.

Completing the entry

► Press the [ENTER] key or the rotary knob.

Aborting the entry

► Press the [ESC] key.
   The dialog box is closed without changing the settings.

7.4   Touchscreen Gestures

A touchscreen allows you to interact with the software using various finger gestures on the screen. The basic gestures supported by the software and most applications are described here. Further actions using the same gestures may be possible.

Note: Inappropriate tools or excessive force can damage the touchscreen.

For instructions on cleaning the screen, see "Cleaning the product" on page 9.

Tapping

Touch the screen quickly, usually on a specific element.

You can tap most elements on the screen; in particular, any elements you can also click on with a mouse pointer.
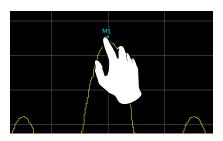
Figure 7-1: Tapping

Double-tapping

Tap the screen twice, in quick succession.

Double-tap a diagram or the window title bar to maximize a window in the display, or to restore the original size.
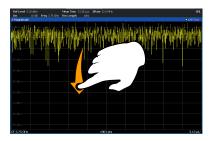
 Dragging

Move your finger from one position to another on the display, keeping your finger on the display the whole time.

By dragging your finger over a table or diagram you can pan the displayed area of the table or diagram to show results that were previously out of view.
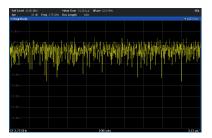
Figure 7-2: Dragging

 Pinching and spreading two fingers
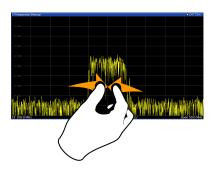
Move two fingers together on the display (pinch) or move two fingers apart on the display (spread).

When you pinch two fingers in the display, you decrease the size of the currently displayed area, showing the surrounding areas previously out of view.

When you spread two fingers in the display, you increase the size of the currently displayed area, showing more details.

You can pinch or spread your fingers vertically, horizontally, or diagonally. The direction in which you move your fingers determines which dimension of the display is changed.
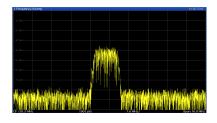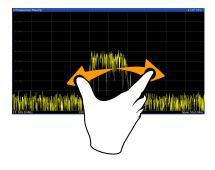
Figure 7-3: Pinching
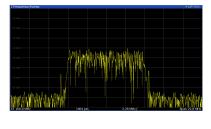
Figure 7-4: Spreading

ⓘ **Touch gestures in diagrams change measurement settings**

When you change the display using touch gestures, the corresponding measurement settings are adapted. This is different to selecting an area on the screen in zoom mode, where merely the resolution of the displayed trace points is changed temporarily (graphical zoom).

Mouse vs. touch actions

Any user interface elements that react to actions by a mouse pointer also react to finger gestures on the screen, and vice versa. The following touch actions correspond to mouse actions:

Table 7-4: Correlation of mouse and touch actions

Mouse operation	Touch operation
Click	Tap
Double-click	Double-tap
Click and hold	Touch and hold
Right-click	Touch, hold for 1 second and release
Drag-&-drop (= click and hold, then drag and release)	Touch, then drag and release
n.a. (Change hardware settings)	Spread and pinch two fingers
Mouse wheel to scroll up or down	Swipe
Dragging scrollbars to scroll up or down, left or right	Swipe

In (graphical) Zoom mode only: dragging the borders of the displayed rectangle to change its size	Touch, then drag and release

Example:

You can scroll through a long table in conventional mouse operation by clicking in the table's scrollbar repeatedly. In touch operation, you would scroll through the table by dragging the table up and down with your finger.

7.5 Getting Help

If any questions or problems concerning the R&S FPL1000 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.

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

To call 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 "Content" 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

1. Select the "Help pointer" icon on the toolbar.

   The pointer changes its shape to a "?" and an arrow.

2. Select the screen element to change the focus.

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

8　Customer Support

8.1　Collecting Information for 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 FPL1000. We will find solutions more quickly and efficiently if you provide us with the information listed below.

- **Windows Event Log Files**
  Windows records important actions of applications and the operating system in event logs. You can create event log files to summarize and save the existing event logs (see "To create Windows event log files" on page 94).

- **System Configuration:** The "System Configuration" dialog box (in the "Setup" menu) provides information on:
  System Configuration: The "System Configuration" dialog box (in the "System Configuration" 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 94).

- **Error Log:** The `RSError.log` file (in the `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\log` directory) contains a chronological record of errors.

- **Support file:** a *.zip file with important support information can be created automatically (in the `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\user` directory). 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. Press the [Setup] key.

2. Select "Service" > "R&S Support" and then "Create R&S Support Informa-
   tion" .

   The file is stored as
   `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\user\`
   `<inst_model>_<serial-no>_<date_and_time>.zip`
   For example
   `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\user\FPL1003__20160803_145113`

To create Windows event log files

1. Select the "Windows Start Button" in the bottom left corner.

2. Enter *Event Viewer* and select "Enter".

3. Select and expand "Windows Logs" in the "Console Tree".

4. Right-click on each subsection and select "Save All Events As...".

Figure 8-1: Event Viewer

5. Enter a file name and select "Save"

Collect the error information and attach it to an email in which you describe the problem. Send the email to the customer support address for your region as listed in

8.2   Contacting Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:

Figure 8-2: QR code to the Rohde & Schwarz support page

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