R&S®Spectrum Rider FPH Handheld Spectrum Analyzer Getting Started

1321099602
Version 14

ROHDE&SCHWARZ
Make ideas real

This manual describes the following R&S®FPH models with firmware version 2.70 and higher:

- R&S®FPH (1321.1111.02)
- R&S®FPH (1321.1111.06)
- R&S®FPH (1321.1111.13)
- R&S®FPH (1321.1711.23)
- R&S®FPH (1321.1111.26)
- R&S®FPH (1321.1711.36)
- R&S®FPH (1321.1711.44)
- R&S®FPH (1321.1711.54)
- R&S®FPH (1321.1111.52, equivalent to 1321.1111.02)
- R&S®FPH (1321.1111.56, equivalent to 1321.1111.06)
- R&S®FPH (1321.1111.63, equivalent to 1321.1111.13)
- R&S®FPH (1321.1111.76, equivalent to 1321.1111.26)

Muehldorfstr. 15, 81671 Muenchen, Germany
Phone: +49 89 41 29 - 0
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

1321.0996.02 | Version 14 | R&S®Spectrum Rider FPH

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®Spectrum Rider is indicated as R&S Spectrum Rider.

Contents

1 Safety information

The product documentation helps you use the R&S Spectrum Rider safely and efficiently. Follow the instructions provided here and in the printed "Basic Safety Instructions". Keep the product documentation nearby and offer it to other users.

Intended use

The R&S Spectrum Rider is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the R&S Spectrum Rider 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 about the potential dangers and gives instructions how to prevent personal injuries or damage caused by dangerous situations. Safety information is provided as follows:

- The printed "Basic Safety Instructions" provide safety information in many languages and are delivered with the R&S Spectrum Rider.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

2 Korea certification class B

이 기기는 가정용(B급) 전자파 적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

3 Documentation overview

This section provides an overview of the R&S Spectrum Rider user documentation. Unless specified otherwise, you find the documents at:

http://www.rohde-schwarz.com/manual/fph

Further documents are available at:

http://www.rohde-schwarz.com/product/fph

3.1 Getting started manual

Introduces the R&S Spectrum Rider and describes how to set up and start working with the product. A printed version is delivered with the instrument.

3.2 User manuals and help

User 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 and instrument interfaces. Includes the contents of the getting started manual.

The *online version* of the user manual provides the complete contents for immediate display on the internet.

3.3 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

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

3.4 Instrument security procedures

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

3.5 Printed safety instructions

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

3.6 Specifications and product brochures

The specifications document, also known as the data sheet, contains the technical specifications of the R&S Spectrum Rider. 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.

http://www.rohde-schwarz.com/brochure-datasheet/fph

3.7 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.

3.8 Release notes and open-source acknowledgment (OSA)

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

The software uses several valuable open source software packages. An open source acknowledgment document provides verbatim license texts of the used open source software.

http://www.rohde-schwarz.com/firmware/fph

3.9 Application notes, application cards, white papers, etc.

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

www.rohde-schwarz.com/application/fph

3.10 Remote control driver

The instrument drivers enable remote control via the corresponding interfaces. The drivers and installation instructions are available for download on the product page at:

www.rohde-schwarz.com/driver/fph

4 Welcome to the R&S Spectrum Rider

The R&S Spectrum Rider is a new generation Rohde & Schwarz signal and spectrum analyzer developed to meet demanding customer requirements. Offering touchscreen input, the analyzer enhances user experience in making measurements fast and easy.

This user manual contains a description of the functionality that the instrument provides. The latest version is available for download at the product homepage (http://www.rohde-schwarz.com/product/fph.html).

5 Preparing for use

5.1 Putting into operation

This chapter describes the basic steps to be taken when setting up the R&S Spectrum Rider for the first time.

⚠ WARNING

Risk of injury due to disregarding safety information

Observe the information on appropriate operating conditions provided in the data sheet to prevent personal injury or damage to the instrument. Read and observe the basic safety instructions provided with the instrument, in addition to the safety instructions in the following sections. In particular:

- Do not open the instrument casing.

NOTICE

Risk of instrument damage due to inappropriate operating conditions

Specific operating conditions are required to ensure accurate measurements and to avoid damage to the instrument. Observe the information on appropriate operating conditions provided in the basic safety instructions and the instrument's data sheet.

NOTICE

Instrument damage caused by electrostatic discharge

Electrostatic discharge (ESD) can damage the electronic components of the instrument and the device under test (DUT). Electrostatic discharge is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports. To prevent electrostatic discharge, use a wrist strap and cord and connect yourself to the ground, or use a conductive floor mat and heel strap combination.

NOTICE

Risk of instrument damage during operation

An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:

- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

EMI impact on measurement results

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

- Use suitable shielded cables of high quality. For example, use double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Note the EMC classification in the data sheet.

5.1.1 Unpacking and checking the instrument

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

Packing material

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

NOTICE

Risk of damage during transportation and shipment

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

- Always make sure that sufficient mechanical and electrostatic protection is provided.
- When shipping an instrument, the original packaging should be used. If you do not have the original packaging, use sufficient padding to prevent the instrument from moving around inside the box. Pack the instrument in antistatic wrap to protect it from electrostatic charging.
- Secure the instrument to prevent any movement and other mechanical effects during transportation.

5.1.2 Accessory list

The instrument comes with the following accessories:

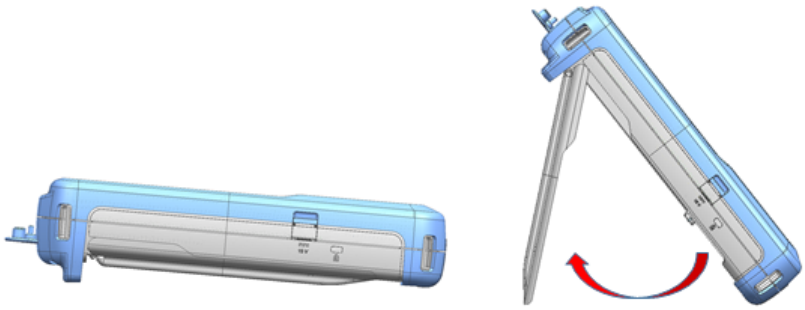
- Power supply cable and adapter set
- Li-ion rechargeable battery
- USB2.0 cable A-Mini
- Side strap
- "Getting Started" printed manual
- Document folder containing safety instructions, KC and CE certificate

Optional accessories and their order numbers are listed in the data sheet.

5.1.3 Setting up the R&S Spectrum Rider

The R&S Spectrum Rider is designed for lab operation as well as for service and maintenance applications on-site.

Depending on the environment, you can adjust the viewing angle of the display and either lay it out horizontally or prop it up using the support on the back of the R&S Spectrum Rider.

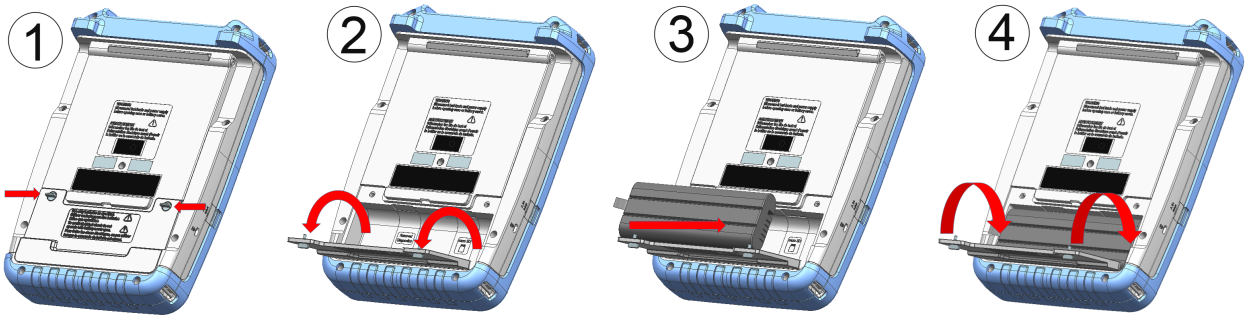


When laid out horizontally for operation from above, the R&S Spectrum Rider is tilted slightly due to the micro-stand at the back. This position provides the optimum viewing angle for the display.

To allow easy operation from the front and still be able to read the display, you can swing out the support on the back of the R&S Spectrum Rider.

Before you turn on the R&S Spectrum Rider, you should insert the lithium ion battery included in the delivery into the battery compartment located at the back of the R&S Spectrum Rider.

Insert battery



1. Unscrew the two thumb screws located on the battery compartment.
2. Open the cover.
3. Insert the battery into the R&S Spectrum Rider.
4. Close the cover and screw back the thumb screws.

You can operate the R&S Spectrum Rider with the AC adapter or the battery. Both are included in the delivery.

5.1.4 Using the AC adapter

NOTICE

Risk of instrument damage

To avoid instrument damage:

- Only use the power supply (R&S HA-Z301, order number 1321.1386.02) included in the delivery.
- Make sure that the AC supply voltage is compatible to the voltage specified on the power supply unit.
- Attach the appropriate adapter to the power supply.

Connect the AC adapter to the DC port on the left side of the R&S Spectrum Rider (item 1 of Figure 5-1). Make sure to fully insert the AC adapter plug into the DC port.

Depending on the system you need, firmly connect the appropriate power cable included in the delivery to the AC adapter (item 2 of Figure 5-1).

Finally, connect the power cable plug to an AC power outlet.

Figure 5-1: AC adapter

1 = AC adapter
2 = Power cable

The voltage range of the AC power supply is 100 V to 240 V AC.

After the R&S Spectrum Rider is connected to the power supply, you can turn it on with the [Power] key on the front panel.

5.1.5 Battery operation

The R&S Spectrum Rider has a smart battery indicator which displays the battery charging status on the [Power] key as well as the battery icon shown at the top right corner of the display screen. See Section 6.6.1, "Title bar", on page 33.

The lithium ion battery has a capacity of 6.4 Ah and it allows operation of up to eight hours when it is fully charged.

The actual operation time depends on the current charged status (see Figure 5-2), the ambient temperature and the operating mode of the R&S Spectrum Rider.

For a summary of the LED indication of the [Power] key, see Table 5-1.

The battery charging and discharging process of the battery icon indicated in the display screen is illustrated below:

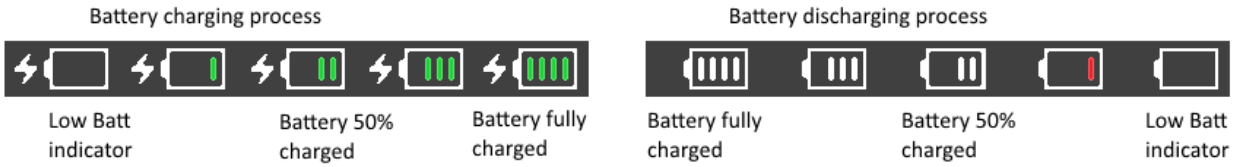


Figure 5-2: Battery charging and discharging process

Charging time is about three hours when the R&S Spectrum Rider is in inactive mode (i.e. R&S Spectrum Rider is switched off). If the instrument is in active mode (i.e. R&S Spectrum Rider is switched on), the charging time is extended to about four hours because the charging current is reduced as the power is partially drained by the usage of the R&S Spectrum Rider.

During operation in the field, you can also charge the battery with the car adapter (R&S HA-Z302, order number 1321.1340.02). You can connect the car adapter to the DC port. With the car adapter, you are able to charge the R&S Spectrum Rider via the car's cigarette lighter socket. A replacement battery (R&S HA-Z306, order number 1321.1334.02) with the same capacity and charging time as the battery included in the standard delivery is also available if necessary.

Battery dispatched during delivery is not fully charged, for battery operation you have to charge it first.

To charge the battery, connect the charger to AC power adapter included in the delivery. For more information, see "Using an external battery charger" on page 19.

Using an external battery charger

You can also use an external battery charger (R&S HA-Z303, order number 1321.1328.02) to charge the battery.

To charge the battery externally, put the battery into the external charger and supply it with power via the AC power adapter.

An amber LED on the charger indicates the charging process. The LED turns to green when the battery is fully charged. A red LED on the charger indicates that the battery is not charging or the charging failed.

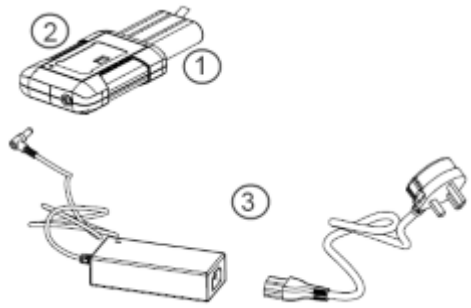


Figure 5-3: External battery charger

1 = Lithium ion battery R&S HA-Z306
2 = External charger R&S HA-Z303
3 = Power supply unit R&S HA-Z301 or car adapter R&S HA-Z302

WARNING

Risk of traffic accidents, physical injury and property damage

- Turn off the R&S Spectrum Rider while driving or while the engine is on.
- Operation of the R&S Spectrum Rider via the cigarette lighter socket while driving or while the engine on is prohibited.

5.1.6 Battery maintenance

The R&S Spectrum Rider comes with a lithium-ion battery. In general, these batteries are easy to handle. When you handle the battery, follow the instruction mentioned in the safety instructions and in the following chapters.

5.1.6.1 Handling

- The battery has been designed for a specific application. Do not use it for any other applications.
- Do not connect batteries in series or parallel as it can cause serious damage.
- Observe correct polarities during installation and charging.
- Do not heat over 70°C. The battery contains thermal fuses that could activate and render the battery inoperable.
- The battery contains an electronic device for protection against deep discharge, overcharge and short-circuiting between the terminals.
  - If you cannot discharge the battery, it may be deep discharged. Charge the battery for 0.5 hours and check again.
  - If you cannot charge the battery, it may be overcharged. Discharge the battery and check again.
  - If the battery has been short-circuited, charge it to reset the electronics.
  - If the battery still does not work, contact the Rohde & Schwarz customer support.
- Do not allow metallic objects to come into contact with the terminals.
- Do not solder directly to the battery.

5.1.6.2 Storage

The battery self-discharges while not in use. When storing the battery for an extended period of time, make sure to

- Handle the battery carefully to avoid short circuits. Make sure that leads and terminals are insulated.
- Keep the battery in the supplied packaging before use. The temperature should be between -20°C to 50°C.
- Store the battery at an initial state of charge between 15% and 50% of its capacity. When calculating the initial state of charge, consider

  - The maximum consumption of electronic devices
  - The self-discharge of the battery - the higher the state of charge, the higher the rate of self-discharge
- Avoid a deep discharge of the battery. A deep discharge occurs when the state of charge falls below 5% of the battery's capacity.
- Recharge the battery at least every six months.

Should the battery voltage be low or even 0 V, the battery protection circuit may have gone into a sleep mode. In that case, reset the battery with an approved charger.

5.1.6.3 Transportation

No special regulations apply for transporting the battery. The battery cells contain no metallic lithium.

5.1.6.4 End of life

The capacity of the battery decreases after it has gone through numerous charge cycles and nearing its end of life. When the battery is dead, do not open the battery. Do not dispose battery in fire.

5.2 Switching the instrument on and off

The instrument can be powered with an AC or DC (battery operated or via car adapter) input. See Section 5.1.4, "Using the AC adapter", on page 17.

► Press [Power] key to switch on the instrument.
During booting, the R&S Spectrum Rider displays a splash screen to indicate the operable frequency range of the instrument. Depending on the frequency upgrade option installed, the respective splash screen is loaded.
After booting, the instrument is ready for operation.
Refer to the instrument brochure for the list of options available.

► Press [Power] key to switch off the instrument.

NOTICE

Risk of losing data

If a running instrument (without battery) is disconnected directly from the power cord, the instrument loses its current settings. Furthermore, program data may be lost.

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

The following shows the [POWER] key behavior in different operation modes.

Table 5-1: Summary of LED indication on POWER key

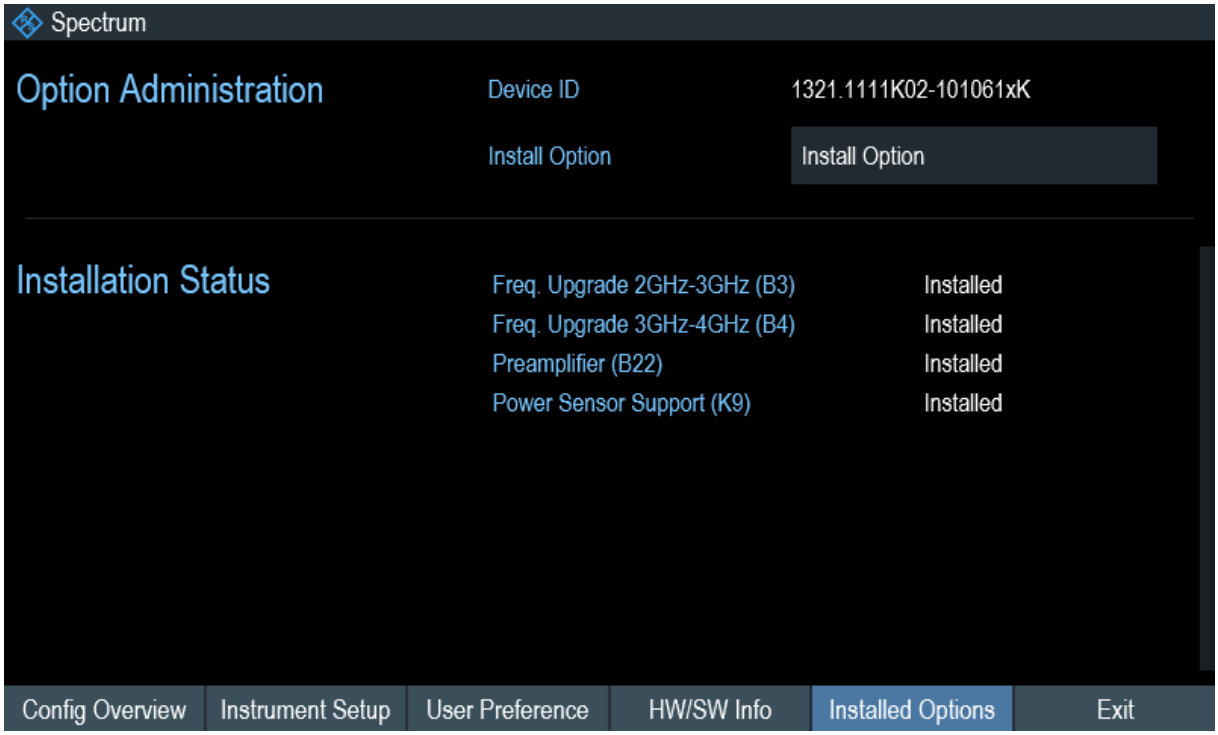
LED indication on [Power] key		Descriptions
Green LED		Instrument is in operation mode.
Blue LED		Instrument is in switch off mode with a fully charged battery. A blinking blue LED indicates that the battery charging is in process.
Amber LED		Instrument is in switch off mode with AC supply and there is no battery in it.
Red LED		There is an error in the battery charging.
LED "OFF"		This is an indication that there is no AC or DC supply to the instrument. The instrument is in a switch off mode.

5.3 Checking the supplied options

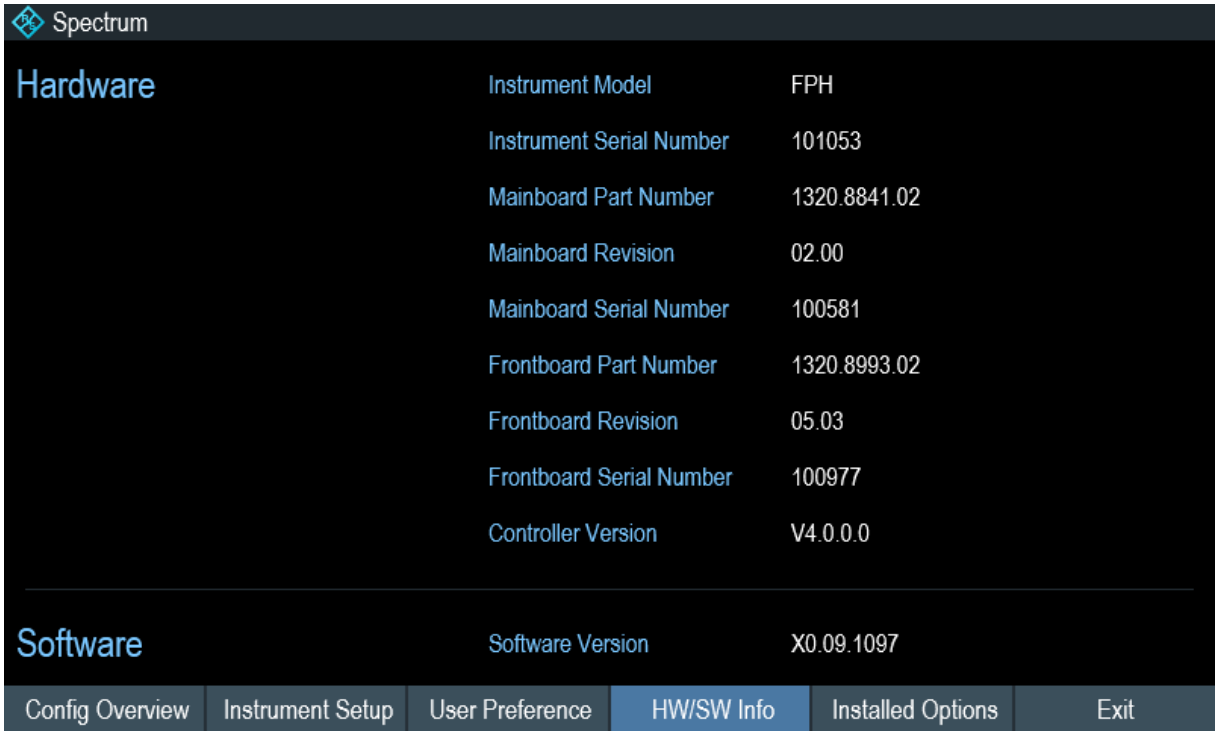
The instrument can be equipped with different hardware and installed options. For a list of R&S Spectrum Rider supported hardware and installed options, refer to the instrument brochure for the list of options available.

In order to check whether the installed options correspond to the options indicated in the delivery note, proceed as follows.

1. Press [SETUP] key.
2. Select "Installed Options" softkey.
   A list of all available options and the current status of the options are displayed.



3. Check the availability of the installed options as indicated in the delivery note.
4. Check the availability of the hardware options as indicated in the delivery note.
5. Press "HW/SW Info" softkey.
   A list with hardware and firmware information is displayed.


Spectrum
Hardware
Instrument Model
FPH
Instrument Serial Number
101053
Mainboard Part Number
1320.8841.02
Mainboard Revision
02.00
Mainboard Serial Number
100581
Frontboard Part Number
1320.8993.02
Frontboard Revision
05.03
Frontboard Serial Number
100977
Controller Version
V4.0.0.0
Software
Software Version
X0.09.1097
Config Overview
Instrument Setup
User Preference
HW/SW Info
Installed Options
Exit

6 Instrument tour

This chapter describes the instrument in different views, including all function keys and connectors.

It also contains general system configuration on the R&S Spectrum Rider as well as the connectivity of the instrument to PC.

6.1 Front view

Figure 6-1: Front panel of R&S Spectrum Rider

1 = RF input (N-type, PC 3.5 mm or PC 2.92 mm connector)
2 = BNC connectors
3 = Headphone jack
4 = USB ports
5 = RF output (N-type, PC 3.5 mm or PC 2.92 mm connector)
6 = Touch-sensitive screen area
7 = Softkey labels (on display)
8 = Softkey
9 = System keys
10 = DC port (behind protective cap)
11 = Kensington lock
12 = Function keys
13 = Power key
14 = Alphanumeric key
15 = Unit keys
16 = Back key
17 = Cancel key
18 = Rotary knob
19 = Screenshot key
20 = LAN and mini USB ports (behind protective cap)
**21 = SD card slot (not visible as it is located behind the battery compartment)

For a detailed description of the front panel keys, see "Front Panel Keys" in the R&S Spectrum Rider user manual.

NOTICE

Instrument damage caused by cleaning agents

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

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

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

6.2 Top view

1 = RF input
2 = BNC connector
3 = Headphone jack
4 = USB type A connector
5 = RF output

RF input

Depending on the instrument models, different RF connector is used.

Table 6-1: Types of RF connectors

Instrument models	Type of RF connector, 50 Ω
Model 02, model 06, model 13 and model 23	N type
Model 26 and model 36	RPC 3.5 mm
Model 44 and model 54	RPC 2.9 mm

Connect a cable or DUT to the RF input. Use a cable to connect the DUT to the R&S Spectrum Rider, if necessary.

Make sure not to overload the R&S Spectrum Rider when a DUT is connected. The maximum power that is permissible at the RF input is 20 dBm (or 100 mW).

The RF input is protected from static discharges and voltage pulses by a limiting circuit.

NOTICE

RF power overload

The R&S Spectrum Rider maybe loaded with up to 30 dBm (or 1 W) for up to three minutes. If you apply 1 W for a longer period, the R&S Spectrum Rider may be destroyed.

⚠ WARNING

Risk of electric shock

To avoid electrical shock the DC input voltage, you must never exceed the value specified on the housing.

NOTICE

Risk of damage of the R&S Spectrum Rider

To avoid damage to the coupling capacitor, input attenuator or the mixer, the DC input voltage must never exceed the value specified in the data sheet.

BNC connector

You can connect the BNC connector for various applications. It supports an external trigger signal or an external reference signal.

When the BNC connector is configured as a trigger input, it controls the start of a measurement. The trigger mode is selected in the "Sweep" menu, see Section 6.8.5, "Function keys", on page 43. The trigger threshold is similar to that of TTL signals.

When the BNC connector is configured as reference input, you can apply a 10 MHz external reference signal to it for frequency synchronization. The external reference label Ext Ref is displayed at the top right corner of the trace window to indi-

cate that the reference signal is supplied via external signal input. The label turns green when the reference signal is detected.

The level of the reference signal must be larger than 0 dBm. If there is no reference signal present at the BNC connector, the R&S Spectrum Rider displays an appropriate message. Thus, measurements without a valid reference can be avoided.

For more information on configuring the BNC connector for the appropriate signal, see "Configuring the BNC connector" on page 49 and Section 6.10.3, "Using the GPS receiver", on page 55.

Headphone jack

The 3.5 mm connector for headphones has an internal impedance of approximately 10 Ω.

USB type A connector

There are two USB ports located on top of the R&S Spectrum Rider.

You can use the USB interface to connect a memory stick and store data sets or screenshots. The USB connector can also be used to control the operation of the external power sensor and GPS receiver.

See Section 7.2, "Using a power sensor", on page 86 and Section 6.10.3, "Using the GPS receiver", on page 55.

RF output

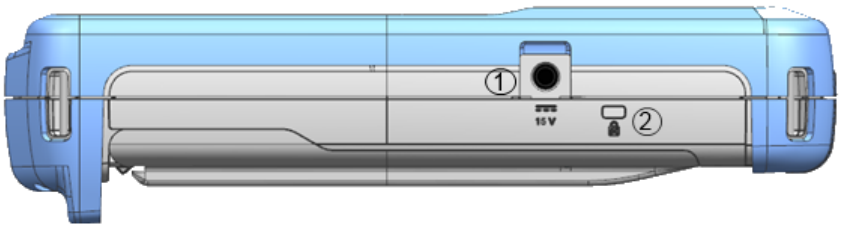
Applicable for model 23, model 36 and model 54, the RF output connector provides the following ways to generate a signal source output power at -10.00 dBm nominal.

- Tracking generator output
- Continuous signal source output
- Coupled continuous signal source output

For types of RF output connectors, see Table 6-1.

For more information on configuring the RF output for signal source, see "Configuring the Tracking Generator" chapter in the R&S Spectrum Rider user manual.

6.3 Left view



1 = DC port
2 = Kensington lock slot

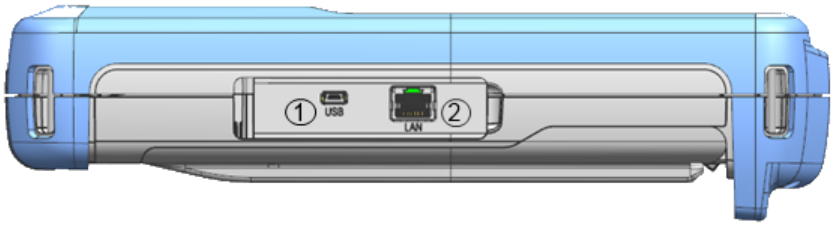
DC port

The R&S Spectrum Rider is supplied with power by the AC/DC transformer power supply via the DC connector. You can also use the DC connector to charge the battery.

Kensington lock slot

A Kensington lock can be anchored to the R&S Spectrum Rider housing to secure it to a workstation mechanically.

6.4 Right view



1 = Mini USB
2 = LAN port

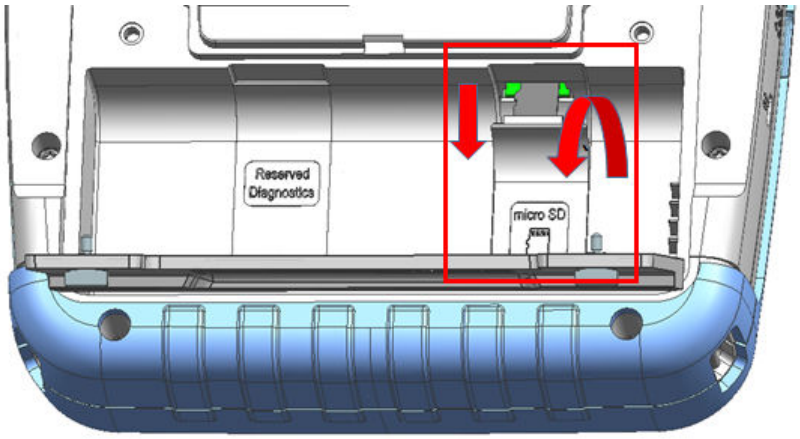
Mini USB

Mini USB connector to connect a computer for remote control of the instrument and transfer data in both directions.

LAN port

RJ-45 connector to connect the instrument to a Local Area Network (LAN) and transfer data in both directions. It supports up to 100 Mbit/s.

6.5 Rear view



SD card slot

The micro-SD card slot is located behind the battery compartment of the R&S Spectrum Rider.

Peel open the SD card protective cap to access to the SD card slot. You can use the SD card to store data sets or screenshots.

6.6 Touchscreen display

For firmware above version 2.70, R&S Spectrum Rider supports up to four measurement traces. See also Section 6.6.3, "Measurement trace window", on page 35.

All measurement results are displayed on the screen. Additionally, the screen display provides status and setting information and you can change the parameters setting with touchscreen gesture.

The touch-sensitive screen offers an alternative means of user interaction for quick and easy handling of the instrument.

NOTICE

Risk of touchscreen damage during operation

The touchscreen may be damaged by inappropriate tools or excessive force.

Observe the following instructions when operating or cleaning the touchscreen:

- Never touch the screen with ball point pens or other pointed objects with sharp edges.
- It is recommended that you operate the touchscreen by finger only. As an alternative, you may use a stylus pen with a smooth soft tip.
- Never apply excessive force to the screen. Touch it gently.
- Never scratch the screen surface, e.g. with a finger nail. Never rub it strongly, for example with a dust cloth.

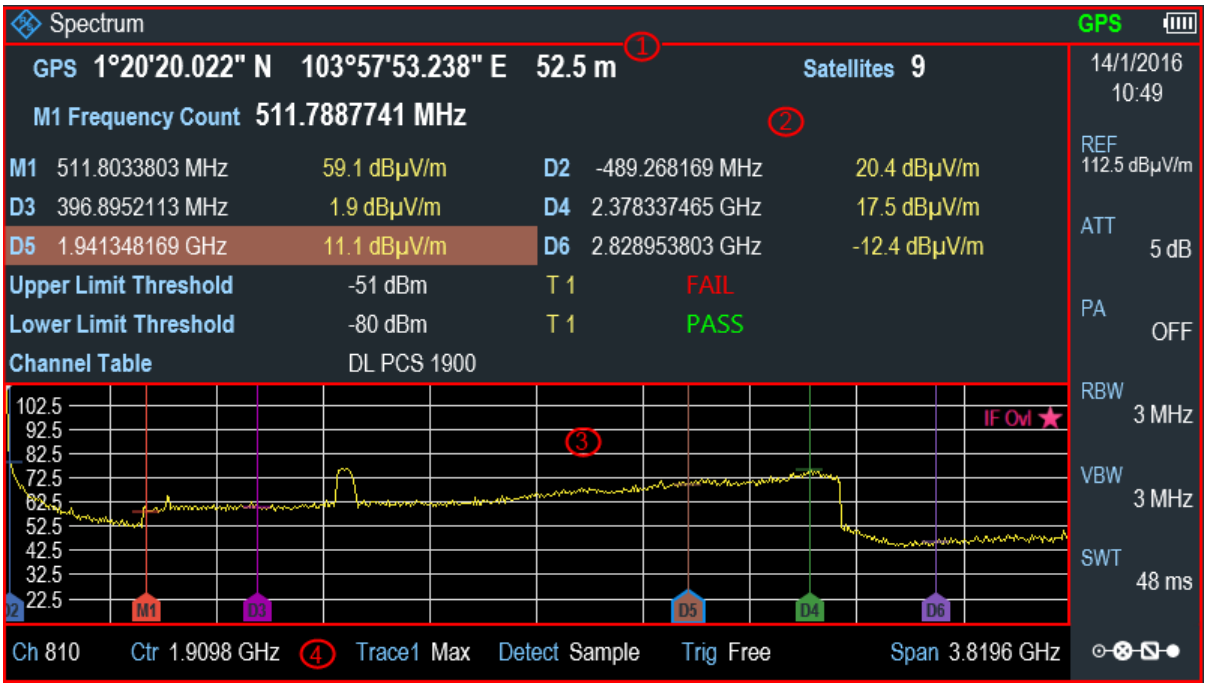


Figure 6-2: R&S Spectrum Rider touchscreen element

The touchscreen display can be divided into several sections:

1. Title bar
2. Measurement result view
3. Measurement trace window
4. Parameter view

A touchscreen is a screen that is touch-sensitive, i.e. it reacts in a specified way when a particular element on the screen is tapped by a finger.

Touchscreen gesture

Special touchscreen features are provided to enhance user experience in using the instrument:

- Swipe horizontally in the trace window, the gesture is used to change the center frequency.
- Swipe vertically in the trace window, the gesture is used to change reference level.
- Pinch and stretch to change the span parameter.
- Double tap on the trace window to add a new marker.
- Tab and drag on the marker icon, the gesture is used to change the marker position.
- Draw a "x" to delete all markers.
- Swipe up or down vertically in the "Measurement Result View" to hide or unhide the measurement result view display.
- In the file manager dialog, swipe horizontally to the left or right direction to preview screenshots.
- In the wizard measurement mode, swipe horizontally to the left direction to skip a wizard measurement.

6.6.1 Title bar

The "Title bar" is located on top of the layout.

It is used to display static content:

- Basic information such as R&S logo, measurement mode name (i.e. "Spectrum", "Power Meter") and battery status.
- Accessories name connected to the instrument, i.e power sensor, GPS receiver.
- Standard information such as measurement standard name and channel table name.

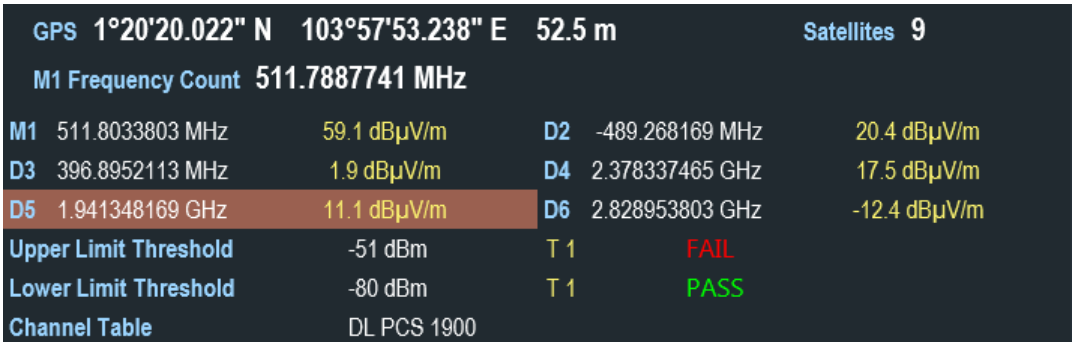
6.6.2 Measurement result view

Special touchscreen gesture

You can swipe vertically up or down in the "Measurement result view" to hide or unhide the measurement result view display.

For more information, see the "Touchscreen Gesture Element" in the R&S Spectrum Rider user manual

The "Measurement result view" is located below the "Title bar".



It displays measurement results of the followings:

- GPS information
- Marker values
  - Including marker function such as marker noise measurement, frequency counter and N dB down bandwidth measurement when activated.
- Display line
- Limit lines
- Channel table

When the marker measurement is enabled and selected in the "Measurement result view", an entry box for marker positioning is displayed. On the selected

marker, you can also see that the function measurement result is displayed in the "Measurement result view", e.g. "Frequency Count".

The selected marker is highlighted in the "Measurement result view", it is also reflected on the marker in the "Measurement trace window".

Table 6-2: Highlighted marker

Highlighted marker in the "Measurement result view"	Highlighted marker in the "Measurement trace window"
	 Note: There is a blue frame on the highlighted "M1" marker.

For more information on marker measurement, see "Using markers" on page 82.

6.6.3 Measurement trace window

For firmware above version 2.70, R&S Spectrum Rider supports up to four measurement traces.

The "Measurement trace window" is the main user interface window in R&S Spectrum Rider. It displays the measurement traces where markers and limit lines are also displayed.

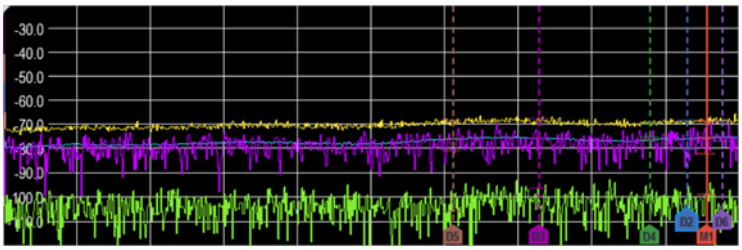


Figure 6-3: An example of the measurement trace window with four traces

Device warning messages (e.g IF Ovl) are displayed at the top right-hand corner of the window.

NOTICE

Device warning message

- IF Ovl: This message indicates that the downconverter of the intermediate frequency (IF) is overloaded in R&S Spectrum Rider.
- In general, a star ★ indicates that the measurement is still in progress.

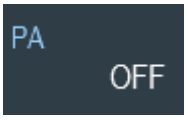
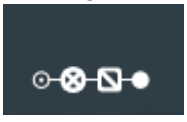
6.6.4 Parameter view

The "Parameter view" contains the important trace setting parameters for the spectrum measurement.

It is located at the right side and bottom section of the layout . See Figure 6-2.

You can select any parameter in the "Parameter view" to adjust the configurations of the spectrum measurement. See details of each of the parameter in the R&S Spectrum Rider user manual.

Parameter settings	Description
"Center", "Start", "Stop" 	This display setting is function-specific depending on the softkey ("Center Freq", "Start Freq", "Stop Freq") indicated in the softkey label. See Section 6.8.3, "Softkey", on page 41. It displays an entry box to configure the center frequency, start or stop frequency for the spectrum measurement.
"Trace" 	Select "Trace" to display the trace menu with a list of settings ("Clear/Write", "Average", "Min Hold", "Max Hold").
"Detect" 	Select "Detect" to display the trace detector menu with a list of settings ("Auto Peak", "Max Peak", "Min Peak", "Sample", "RMS").
"Trig" 	Select "Trig" to display the gate trigger menu with a list of settings ("Free Run", "Ext. Rise", "Ext". "Fall").
"Span" 	Select "Span" to display an entry box to configure the span of the spectrum measurement.

"Time & Date" 	Time and date of the instrument. This field is a read-only field. See Section 6.10.4, "Configuring date and time", on page 58.
"REF" 	Select "REF" to display an entry box to configure the reference level for the spectrum measurement.
"ATT" 	Select "ATT" to display an entry box to configure the attenuation setting for the spectrum measurement.
"PA" 	Depending on the instrument models, optional preamplifier such as R&S FPH-B22 / B23 / B24 / B25 / B26 is available for installation. Select "PA" to toggle between the "ON" and "OFF" status for the optional preamplifier of the spectrum measurement. Note: When the optional preamplifier is absent, this menu is not available.
"RBW" 	Select "RBW" to display an entry box to configure the resolution bandwidth of the spectrum measurement.
"VBW" 	Select "VBW" to display an entry box to configure the video bandwidth of the spectrum measurement.
"SWT" 	Select "SWT" to display an entry box to configure the sweep time of the spectrum measurement.
"Config Overview" 	Select "Config Overview" to display the configuration overview window for more configuration options for the spectrum measurement. See Section 6.6.4.1, "Configuration overview", on page 38.

6.6.4.1 Configuration overview

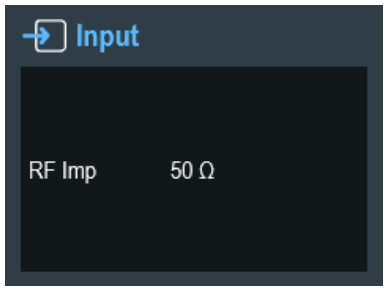
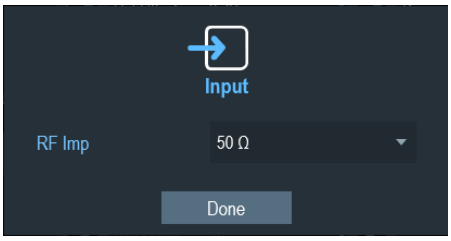
The "Config Overview" is a dedicated button located at the bottom of the "Parameter View", it is operation mode dependent. See Figure 6-2.

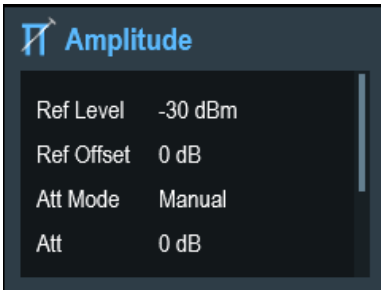
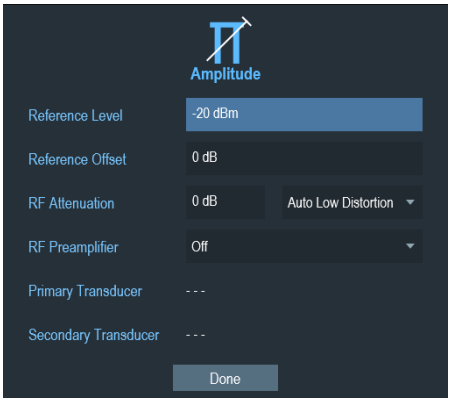
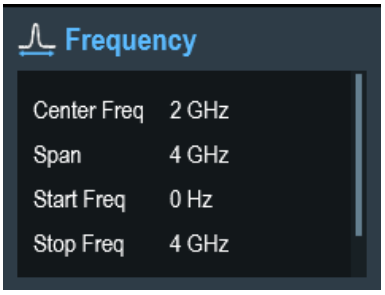
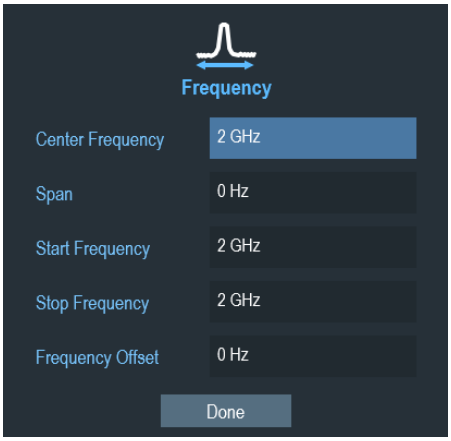
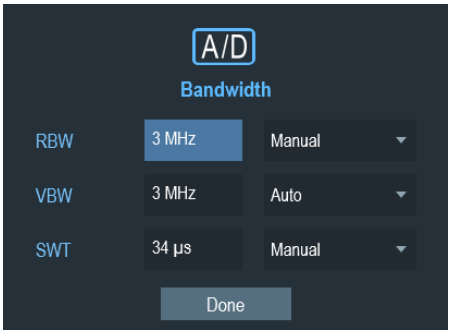
When you select this button, it opens the "Config Overview" window. Accessing it without the touchscreen input is possible via the [SETUP] key. See Section 6.8.4, "System keys", on page 42.

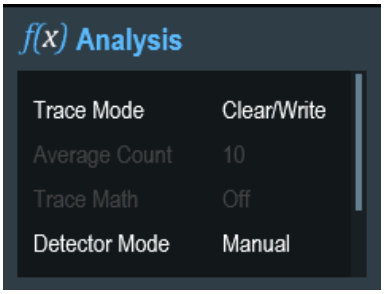
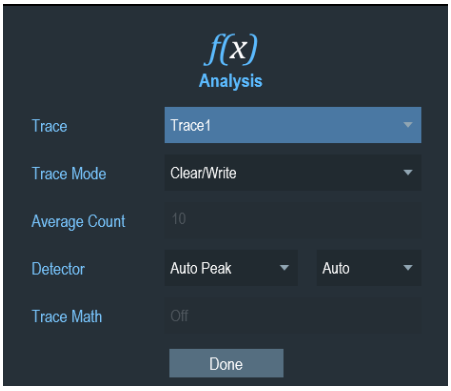
The "Config Overview" illustrates the flow of spectrum measurement at different stages and the relevant parameters which have impact on the measurement at each stage.

The "Config Overview" window is divided into six categories:

Table 6-3: Corresponding dialog box of "Config Overview" window

"Config Overview" block	Corresponding dialog box	Description
		Select "Input" to configure RF impedance.

		Select "Amplitude" to configure reference level, reference offset, optional preamplifier, RF attenuation level and mode. It also provides configuration to set the transducer table used in the signal measurement. Note: When the optional preamplifier is absent, the menu item "RF Preamplifier" is not available.
		Select "Frequency" to configure the center frequency, frequency offset and span of the spectrum measurement.
		Select "Bandwidth" to configure resolution bandwidth, video bandwidth and sweep time for the spectrum measurement.

		Select "Analysis" to configure trace mode, trace detector and the number of count used to average up the measurement for the trace display. It also provides configuration to set the "Trace Math" method used to calculate the differences in the current trace measurement and measurement saved in the memory.
		Select "Trigger" to configure the trigger source, trigger level and the trigger delay setting on the spectrum measurement.

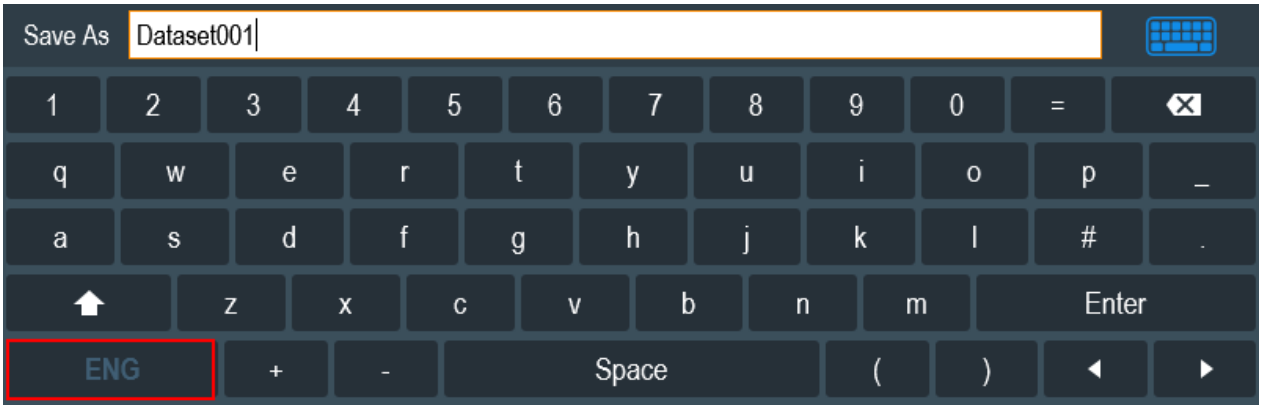
6.7 On-screen keyboard

The on-screen keyboard is an additional means of interacting with the instrument. It provides convenience of usage with the touchscreen input.

Accessing the on-screen keyboard is only available for text-based entry, e.g. save or open a filename.

Touchscreen interface

If the touchscreen interface is not activated, the on-screen keyboard is disabled.



The on-screen keyboard display can be switched on and off using the on-screen keyboard icon highlighted at the top right-hand corner.

6.8 Front panel keys

The following chapters illustrate the function of the front panel keys.

6.8.1 POWER key

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

See Section 5.2, "Switching the instrument on and off", on page 21.

See also Section 6.1, "Front view", on page 26.

6.8.2 Screenshot key

The screenshot key provides a quick way to capture screenshot of the current screen at anytime.

For more information, see "Taking Screenshots" in the R&S Spectrum Rider user manual.

6.8.3 Softkey

The six softkeys on the front panel are used to access the softkey label. See Section 6.1, "Front view", on page 26.

The softkey label is function-specific depending on the key selected on the front panel of the instrument. See Section 6.8.5, "Function keys", on page 43.

6.8.4 System keys

System keys provide settings affecting the general instrument settings, result evaluation settings and save and recall functions.

For more information, see the corresponding functions in the R&S Spectrum Rider user manual.

SYSTEM keys	Descriptions
[PRESET]	Resets the instrument to the default state.
[SETUP]	Provides basic instrument configuration functions: • Reference frequency (external/internal) and hardware selection • Date, time, display, audio and regional configuration • Battery low indicator • LAN interface • Disabling and enabling of options • Information about instrument configuration including firmware version and system error messages • Internal alignment
[MODE]	Provides the selection between applications. • "Spectrum" • "Digital Demo" • "Analog Demo" • "Receiver" • "Power Meter" • "Maps"
[LINES]	Configures display line and limit lines.
[SAVE RECALL]	Provides a file manager function to facilitate the saving and recalling of result and instrument settings.

6.8.5 Function keys

Function keys provide access to the most common measurement settings and functions in the instrument.

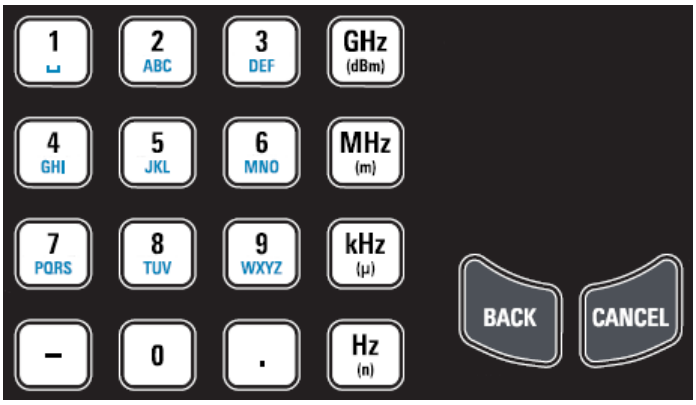
For more information, see the corresponding functions in the R&S Spectrum Rider user manual.

FUNCTION keys	Descriptions
[FREQ]	Sets the center frequency, frequency step size, frequency offset as well as the start and stop frequencies for the frequency range under consideration.
[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. Sets transducer tables to compensate primary and secondary RF path losses.
[WIZARD]	Performs a sequence of standardized and recurring measurements.
[BW]	Sets the resolution bandwidth and the video bandwidth.
[SWEEP]	Sets the sweep time. Sets the trigger mode, trigger threshold and the trigger delay of the external trigger signal. Selects continuous measurement or single measurement.
[TRACE]	Configures the measured data acquisition and the analysis of the measurement data.

FUNCTION keys	Descriptions
[MEAS]	Mode-dependent button. This key provides functionality to select and configure measurements in the available measurement modes. For more information, see the corresponding measurement modes in the R&S Spectrum Rider user manual.
[MARKER]	Mode-dependent button. Sets and positions the absolute and relative measurement markers (markers and delta markers). Marker positioning using peak, next peak, minimum level, reference level and center frequency. Marker search limit function. Enables or disables checkbox for "View List" function. Provides the following marker functions: • Marker mode function which provides capability to measure noise, measure frequency using frequency counter and measure bandwidth using the N dB down setting. • Marker display setting using the frequency or channel table. • AM and FM marker demodulation.

6.8.6 Keypad

The keypad is used to enter alphanumeric parameters, including the corresponding units.



It contains the following keys:

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. In the case of an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (GHz/- dBm MHz/ dBm, kHz/dB and Hz/dB)	These keys add the selected unit to the entered numeric value and complete the entry. In the case of level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they also act like an enter key function.
CANCEL key	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button, it activates that button. For "Edit" dialog boxes the following mechanism is used: • If data entry has been started, it retains the original value and closes the dialog box. • If data entry has not been started or has been completed, it closes the dialog box.
BACK key	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor. Note: If an entry is confirmed with enter key, this key restores the value entered before. This action can be used to toggle, for example, between two frequencies.

6.8.7 Navigation controls

The rotary knob provides navigation controls in the display or within dialog boxes.

The rotary knob has several functions:

- Increments (clockwise direction) or decrements (counter-clockwise direction) the instrument parameters at a defined step width in the case of a numeric entry
- Shifts markers, limit lines and display line on the screen
- Acts like a cursor key in dialog boxes or softkey submenus.
- Moves the scroll bar vertically if the scroll bar is in focused
- Acts as an enter key when pressed

6.9 Managing options

For special measurement tasks, you can equip the R&S Spectrum Rider with various firmware options.

The R&S Spectrum Rider provides options for all required applications, e.g. for power sensor function, you can purchase and activate. Various license types enable you to manage licenses for options as follows:

- Activate an option locally on an instrument
- Activate an option for a certain period of time as needed

An option is ready to operate after it is enabled with a registered license keycode supplied with the option. The registered license key is delivered as a file or on paper. Unregistered licenses must be registered for a particular instrument before the corresponding option can be enabled for operation.

For reliable operation, a software option usually requires the latest firmware version. The required version is specified in the delivery. If your instrument works with a former firmware version, update the firmware before enabling the software option.

The firmware update is described in the release notes provided on the product page of the R&S Spectrum Rider.

6.9.1 Enabling options

To enable options, you have to enter a keycode. The keycode is based on the unique serial number of the R&S Spectrum Rider.

1. Press [SETUP] key.
2. Select "Installed Options" softkey.
   A list of all available options and the current status of the options is displayed.
   See Section 5.3, "Checking the supplied options", on page 22.
3. Select the "Install Option" menu item from the dialog box.
   The R&S Spectrum Rider opens an entry field to enter the option key.
4. Enter in the appropriate option key.
5. Confirm the entry with the rotary knob.
   If you have entered the correct code, the instrument displays a "installation successful" message.
   If incorrect code is entered, the instrument displays a "invalid key code!" message.
6. Enter the correct code again.

6.9.2 Checking options

In the "Setup" menu, the R&S Spectrum Rider shows all options that are currently installed.

1. Press [SETUP] key.
2. Select "Installed Options" softkey.
   The R&S Spectrum Rider shows a list of all available options and the current status of the option:
   - "Installed": This means that the option is installed and working.
   - "Demo": This means that the option is for demo purposes and it has an expiry date.
   - "Removed:<option key>": This indicates that a portable license has been removed and is ready to be transferred to another R&S Spectrum Rider.

6.10 Configuring the R&S Spectrum Rider

In the "Instrument Setup" dialog box, the R&S Spectrum Rider provides various general settings that are independent of the operating mode of the R&S Spectrum Rider.

1. Press [SETUP] key.
2. Select "Instrument Setup" softkey.
   A corresponding dialog box to configure the instrument opens.
3. Select the item that you want to modify.

6.10.1 Configuring the hardware

The hardware settings provide settings that control internal and connected hardware.

Using auto accessory detection

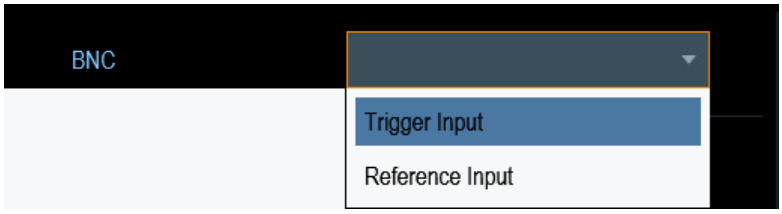
If you are using any accessories while working with the R&S Spectrum Rider, the instrument is able to identify the connected hardware. To enable this setting:

1. In the "Instrument Setup" dialog box, select the "Auto Accessory Detection" item.
   A drop-down menu to select the accessory detection opens.
2. Set "Auto Accessory Detection" to "On".
   When this feature is on, the name of the connected accessory is displayed in the "Detected Accessory" field.

Configuring the BNC connector

You can use the BNC connectors for various applications. For more information on the supported applications, see "BNC connector" on page 28.

1. In the "Instrument Setup" dialog box, select the "BNC" item.
   A drop-down menu to select the BNC connector application opens.



2. Select the required application.

6.10.2 Configuring antennas

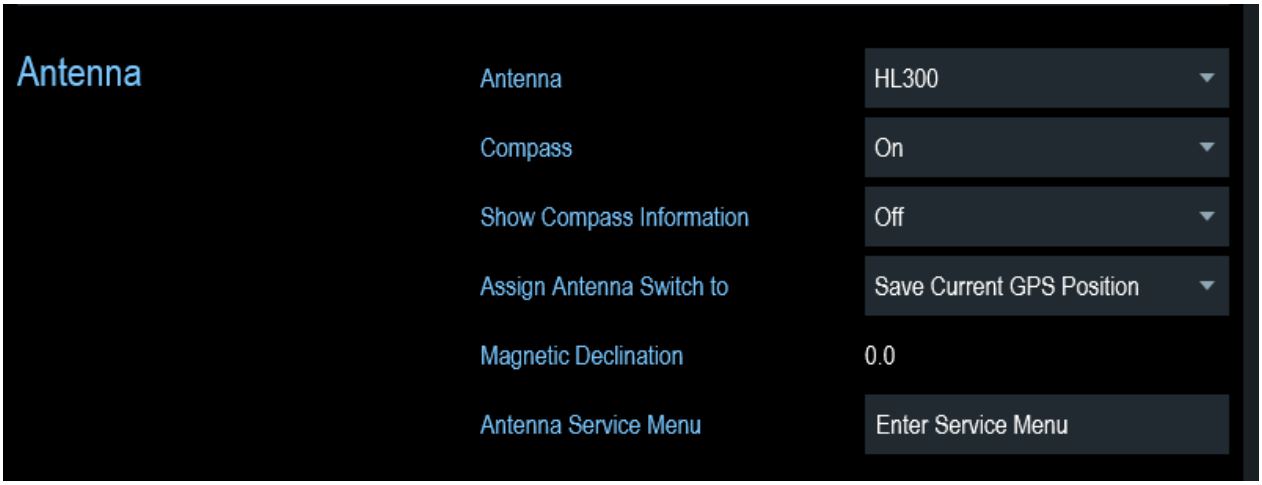
You can use the log-periodic antenna (R&S HL300, order number 4097.3005.02), active directional antenna (R&S HE300, order number 4067.5900.02) or the directional antenna (R&S HE400, order number 4104.6000.02, R&S HE400MW, order number 4104.6000.02) with the R&S Spectrum Rider to locate potential interfering sources. For a list of other antennas supported by the instrument, see the data sheet for details.

For comprehensive description of the antennas and their functionality, see the respective user manuals delivered with the product.

For antennas embedded with a GPS receiver and electronic compass, you can control the GPS receiver of the antennas as described in Section 6.10.3, "Using the GPS receiver", on page 55.

If necessary, you may need a USB adapter (R&S HE300USB, order number 4080.9440.02) to connect the antenna control cable to the USB interface of the R&S Spectrum Rider.

The "Instrument Setup" dialog box provides all settings necessary to control the antenna.



Enabling the antenna

1. In the "Instrument Setup" dialog box, select the "Antenna" menu item.
   A drop-down menu to select the antenna opens.

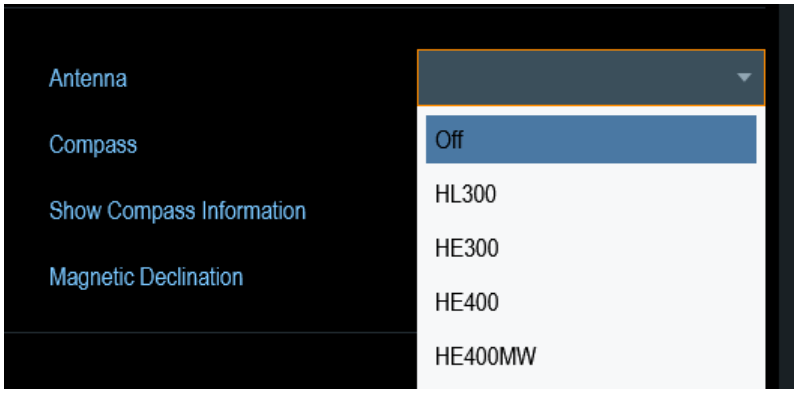


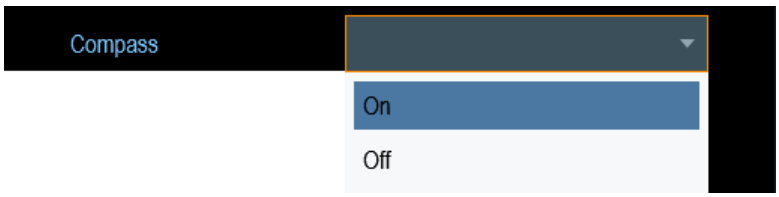
Figure 6-4: Selected antenna for calibration setup

2. Select the required antenna.
   The R&S Spectrum Rider enables the selected antenna.
   Note: The "Auto Accessory Detection" menu item in the "Hardware" section turns off when an antenna is selected.

Enabling the compass

The antennas feature an electronic compass to determine directions precisely.

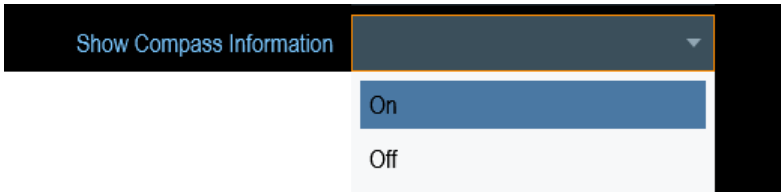
1. In the "Instrument Setup" dialog box, select the "Compass" item.
   A drop-down menu to enable or disable the compass opens.



2. Select "On" to enable the compass.
   The R&S Spectrum Rider shows the magnetic declination of your current position in the "Magnetic Declination" menu item when you turn on the compass.

Showing compass information

1. In the "Instrument Setup" dialog box, select the "Showing Compass Information" menu item.
   A drop-down menu to enable or disable the display of compass information opens.

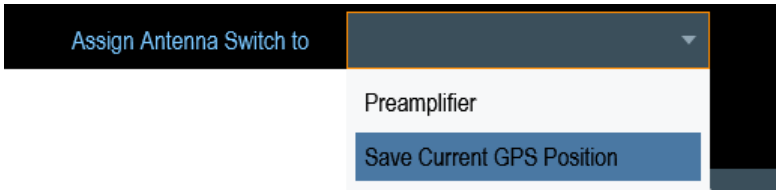


2. Select "On" to enable the display of compass information.
   The R&S Spectrum Rider displays the compass information at the top of the map display.

Assigning functions to the toggle switch

Some antennas (e.g. R&S HL300 and R&S HE400) are equipped with a toggle switch on its handle that you can assign to one of the following functions:

1. In the "Instrument Setup" dialog box, select the "Assign Antenna Switch" menu item.
   A drop-down menu to select the function of the antenna toggle switch opens.



   a) "Preamplifier"
      Using the toggle switch turns the preamplifier on and off.

b) "Save current GPS position"
Using the toggle switch tags your current position in the map material.

2. Select the required function.

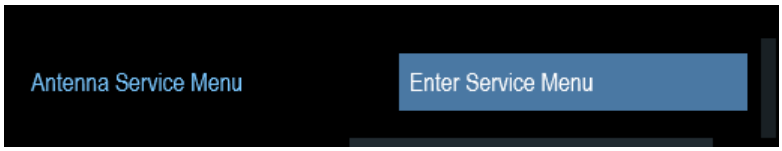
Calibrating the antenna

If you need to know technical specification about the antenna, for example for service or support, you can get the necessary information from the "Antenna Service Menu" provided in the R&S Spectrum Rider.

The "Antenna Service Menu" contains functionality to calibrate the antenna.

The antenna calibration routine varies for different selected antenna, it is necessary to move the antenna according to the direction as instructed on the display. The following illustrates the steps based on the R&S HL300 antenna.

1. In the "Instrument Setup" dialog box, select the "Antenna Service Menu" item to activate the antenna service menu.



The R&S Spectrum Rider informs you that the selected antenna is disabled to determine the antenna information. See selected antenna information in Figure 6-4.

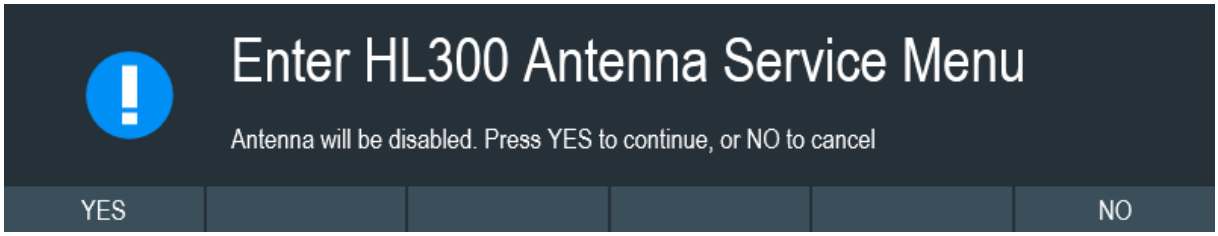


Figure 6-5: HL300 antenna service menu

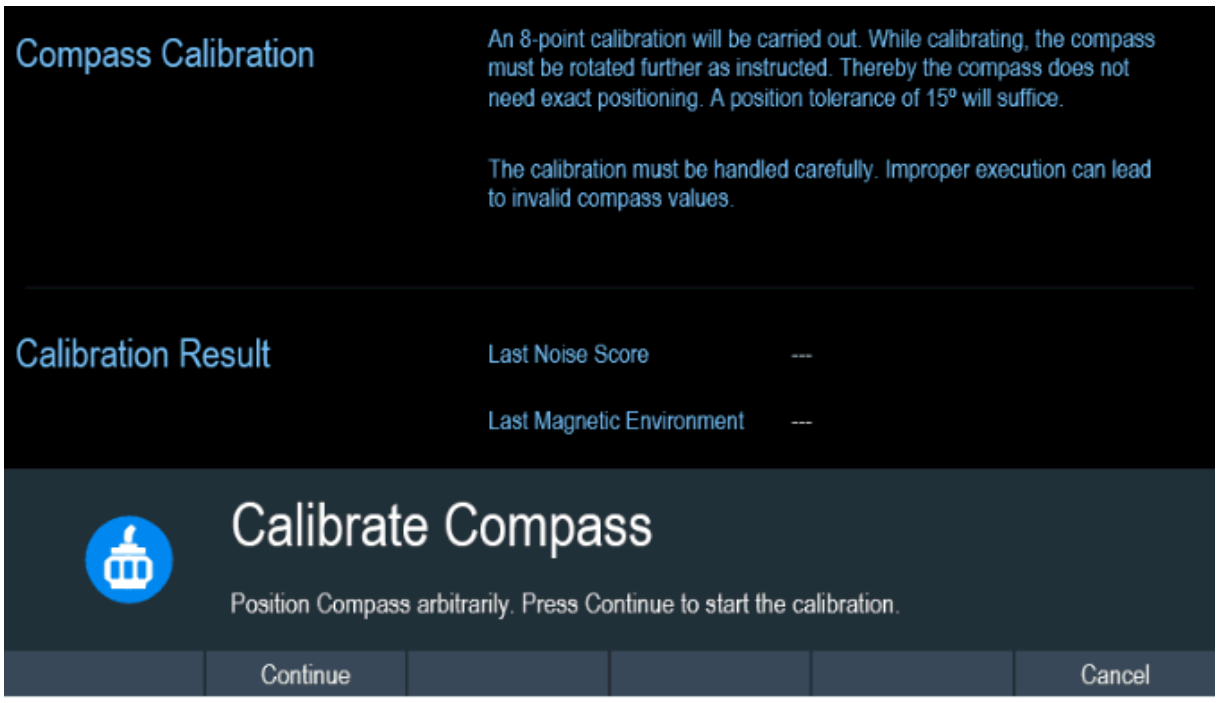
2. Select "YES" softkey.
The R&S Spectrum Rider tries to determine the antenna characteristics. It shows the results in a dialog box.

Figure 6-6: Selected antenna characteristics

3. Select the "Calibrate" softkey.
   The R&S Spectrum Rider displays the compass calibration instruction, it is necessary to move the antenna according to the direction as instructed on the display.

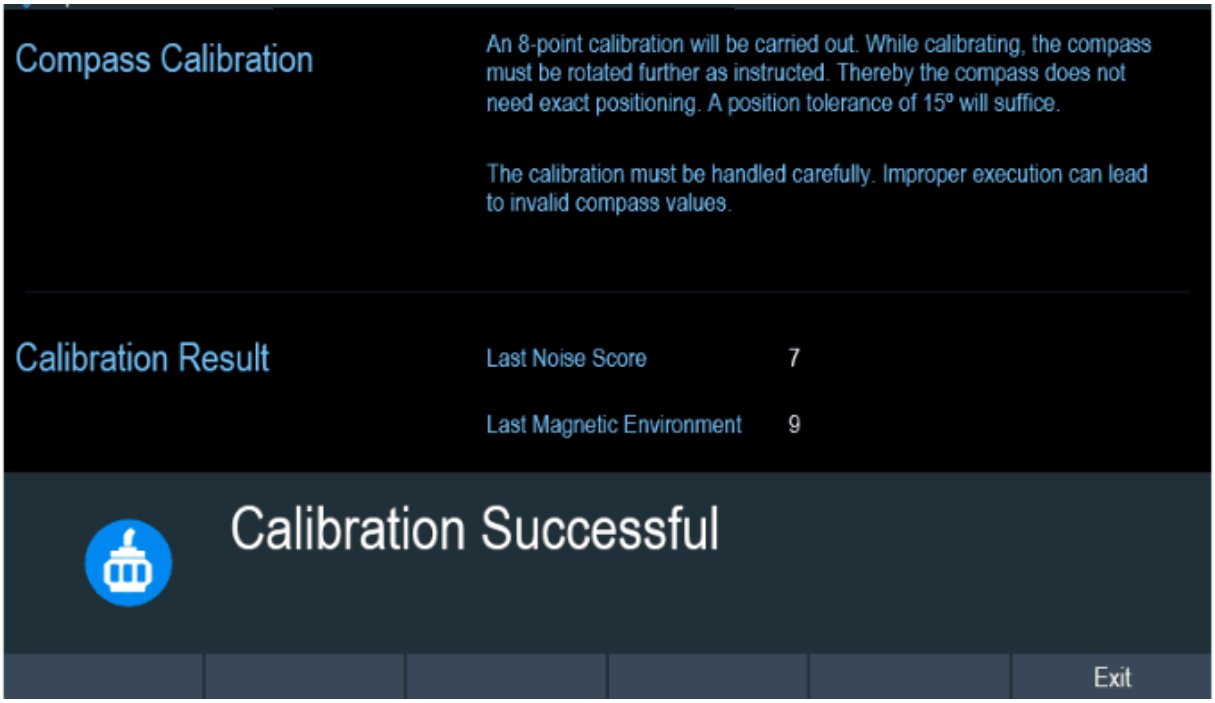
Figure 6-7: Display of compass calibration instruction and last calibrated result

4. Select the "Calibrate" softkey.
   The R&S Spectrum Rider starts the calibration routine based on the selected antenna.



5. Select "Continue" to start the calibration.

When the calibration completes, the R&S Spectrum Rider displays a "Calibration Successful" message with the calibration result.



6. Select "Exit" to exit the antenna calibration routine.

6.10.3 Using the GPS receiver

The R&S Spectrum Rider can locate your exact position if you connect the GPS receiver (R&S HA-Z340, order number 1321.1392.02) to the USB connector.

Location to secure GPS receiver (R&S HA-Z340)

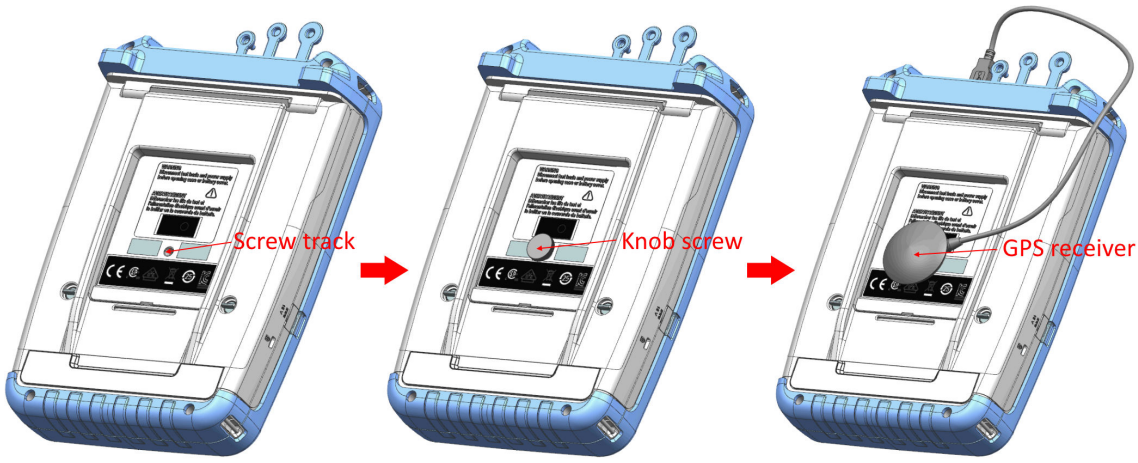
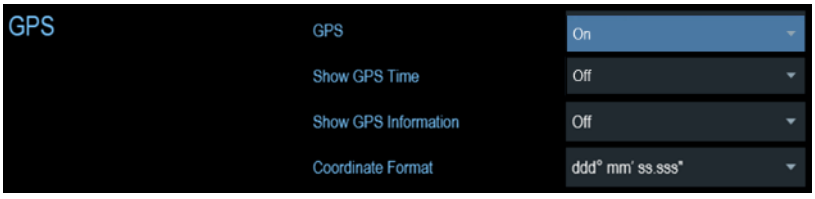


Figure 6-8: Location of GPS receiver

- Tighten the knob screw supplied with the GPS receiver to the screw track at the back of R&S Spectrum Rider.
- The GPS receiver can be conveniently attached to the knob screw as shown in Figure 6-8.

The "Instrument Setup" dialog box provides all settings necessary to configure the GPS receiver.



Enabling the GPS receiver

1. In the "Instrument Setup" dialog box, select the "GPS" item.
   A drop-down menu opens to turn the GPS receiver on or off.
2. Turn the GPS receiver on or off as required.

When "GPS" item is turned on, the R&S Spectrum Rider is ready to receive GPS data.

Showing the GPS time

1. In the "Instrument Setup" dialog box, select the "Show GPS Time" item.
   A drop-down menu opens to turn the display of the GPS time on or off.
2. Turn the display of the GPS time on or off as required.

When "Show GPS Time" item is turned on, the UTC time from the GPS receiver is displayed below the system date.

Displaying GPS information

1. In the "Instrument Setup" dialog box, select the "Show GPS Information" item.
   A drop-down menu opens to turn the display of the GPS information on and off.
2. Turn the display of GPS information on or off as required.

When the "Show GPS Information" item is set on, the R&S Spectrum Rider displays the GPS coordinates and number of satellites in the Measurement result view when sufficient connection is established to the GPS satellites.

When the satellite connection is lost, the GPS coordinates and number of satellites are displayed with a white bar.

When the GPS receiver is not connected or enabled, a message "GPS Not Connected" is displayed in the measurement result view.

State of GPS receiver

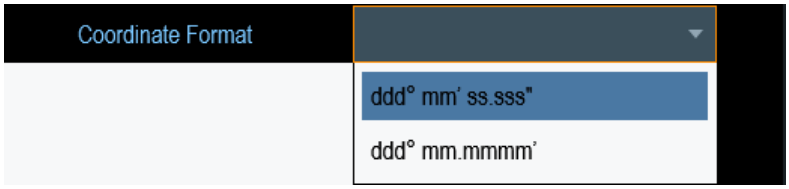
The state of the GPS receiver locking to satellite is shown in the title bar is illustrated as follows.

- GPS Indicates that the GPS receiver is enabled and that there is a fix connection with enough satellites for the GPS receiver to provide the coordinates.

- GPS Indicates that the GPS receiver is enabled but that there is no fix connection to a satellite.
- GPS Indicates that the GPS receiver is enabled but that there is no GPS receiver connection.
- The title bar shows no symbol if the GPS receiver is not enabled

Selecting the coordinate format

1. In the "Instrument Setup" dialog box, select the "Coordinate Format" item.
   A drop-down menu opens to select the coordinate format.



2. Select the coordinate format from the drop-down menu.

6.10.4 Configuring date and time

The R&S Spectrum Rider has an internal clock that can apply a date and time-stamp. In the "Instrument Setup" dialog box, you can set both date and time.

Setting the date

1. In the "Instrument Setup" dialog box, select the "Set Date" item.
2. Enter the date that you want with the numeric keys. The sequence depends on the selected date format. See "Setting the date format" on page 60.

3. Confirm the entry with the rotary knob.

Setting the time

1. In the "Instrument Setup" dialog box, select the "Set Time" item.
2. Enter the time that you want with the numeric keys.

3. Confirm the entry with the rotary knob.
   After you have entered the time, the R&S Spectrum Rider verifies the validity of the time. If it is not a valid time, it sets to the next valid time.

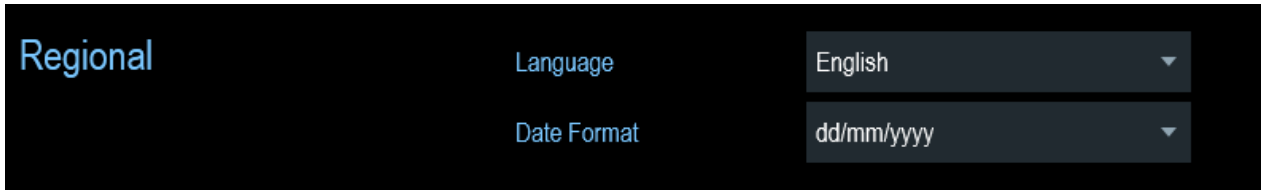
Selecting the time zone

1. In the "Instrument Setup" dialog box, select the "Time Zone" item.
2. Enter a positive or negative time offset relative to the system time with the numeric keys.

3. Confirm the entry with the rotary knob.
   After you have confirmed the time zone, the R&S Spectrum Rider adjusts the displayed time accordingly without changing the system time.

6.10.5 Selecting regional settings

The regional setting allows you to select a different language and date format.



Setting the language

The R&S Spectrum Rider supports several languages for the user interface.

The following is a list of languages that the instrument supports:

English	Spanish	Japanese	Russian
French	Italian	Chinese	Hungarian
German	Portuguese	Korean	Traditional Chinese

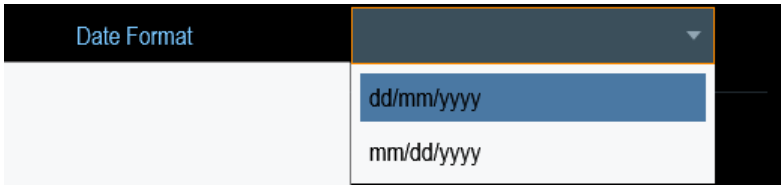
1. In the "Instrument Setup" dialog box, select the "Language" item.
   A drop-down menu opens to select the language.

2. Select the desired language from the drop-down menu.
3. Reboot the device to activate the choice of selected language.

Setting the date format

The R&S Spectrum Rider provides two different formats to display the date.

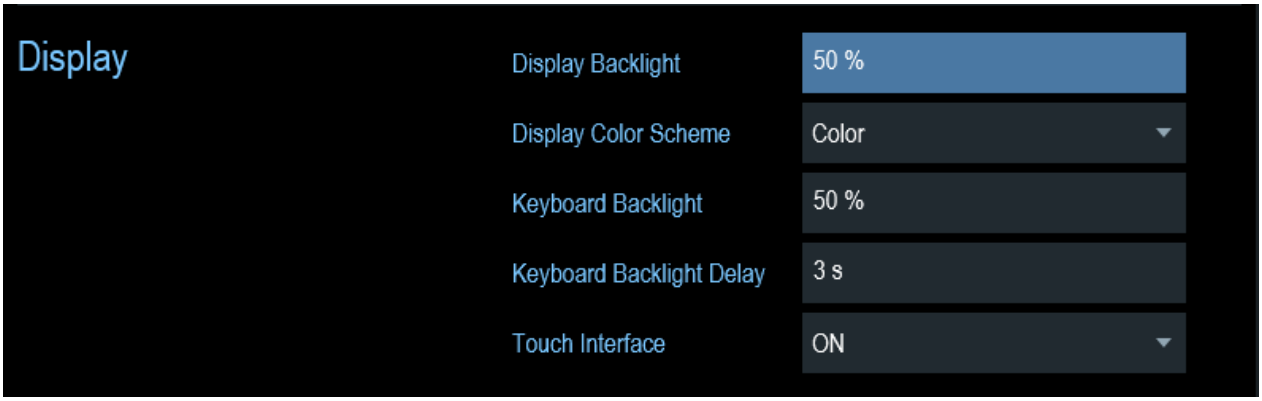
1. In the "Instrument Setup" dialog box, select the "Date Format" item.
   A drop- down menu opens to select the date format.



2. Select the required date format from the drop-down menu.

6.10.6 Configuring the display

The display setting configures the display characteristics and the touch interface.



The display of the R&S Spectrum Rider is a TFT color LCD display.

The ideal brightness of the display depends on the intensity of the backlight. To strike a balance between battery operating time and screen display quality, set the backlight intensity to the minimum brightness needed.

To optimize the viewing angle, adjust the display color scheme settings. To achieve the maximum contrast, the screen can be switched from color display to black-and-white display.

The intensity of the keyboard backlight is adjustable with a time delay setting to turn off the backlight. The keyboard backlight remains on until the time specified by the "Keyboard Backlight Delay" or a subsequent key is pressed.

Adjusting the display backlight

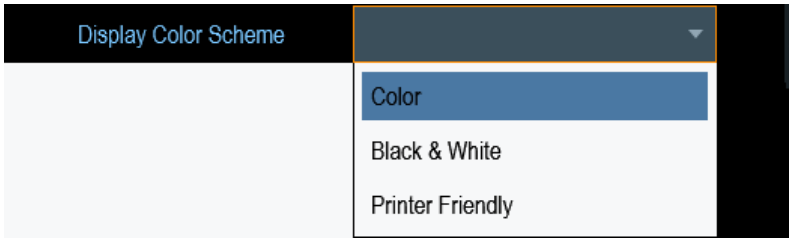
1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the backlight intensity that you want with the numeric keys.

   The backlight intensity is a percentage from 0% to 100% with 100% being the brightest.
3. Confirm the entry with the rotary knob.

Adjusting the display color scheme

1. In the "Instrument Setup" dialog box, select the "Display Color Scheme" item. A drop-down menu opens to select the display color scheme.



2. Select the color scheme from the drop-down menu.
   a) "Color" selects a color display with color scheme as follows:
      - Trace 1: Yellow
      - Trace 2: Green
      - Trace 3: Blue
      - Trace 4: Purple
   b) "Black & White" selects monochrome display.
   c) "Printer Friendly" converts the background to white and selects a trace color with color scheme as follows:
      - Trace 1: Orange
      - Trace 2: Green
      - Trace 3: Dark Blue
      - Trace 4: Purple

Adjusting the keyboard backlight

1. In the "Instrument Setup" dialog box, select the "Keyboard Backlight" item.
2. Enter the backlight intensity that you want with the numeric keys.

   The backlight intensity is a percentage from 0% to 100% with 100% being the brightest.
3. Confirm the entry with the rotary knob.

Adjusting the keyboard backlight delay

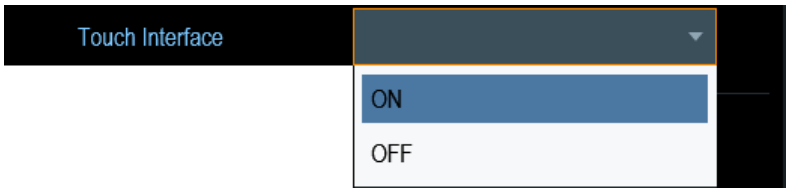
1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the time that you want to turn off the keyboard backlight with the numeric keys.

The time delay has a range of 1s to 10s.

3. Confirm the entry with the rotary knob.

Activating the touchscreen interface

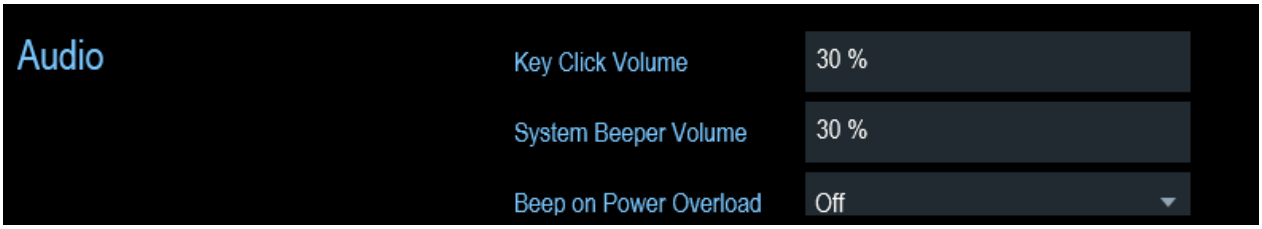
1. In the "Instrument Setup" dialog box, select the "Touch Interface" item.
2. Select "ON" to activate the touchscreen interface with R&S Spectrum Rider.



3. Select "OFF" to deactivate the touchscreen interface.
   Note: If the touch interface is not activated, the On-screen keyboard is disabled.

6.10.7 Configuring the audio output

The audio settings control the audio output of the system.



Setting the key click volume

The key click volume sets the volume of the sound that the R&S Spectrum Rider produces when you press a key or select a softkey.

1. In the "Instrument Setup" dialog box, select the "Key Click Volume" item.
2. Enter the volume that you want with the numeric keys.

The key click volume is a percentage from 0% to 100% with 100% being the loudest.

3. Confirm the entry with the rotary knob.

Setting the system beeper volume

The system beeper volume sets the volume of the system beeper of the R&S Spectrum Rider used, i.e. if a message box pops up.

1. In the "Instrument Setup" dialog box, select the "System Beeper Volume" item.
2. Enter the volume that you want with the numeric keys.

The system beeper volume is a percentage from 0% to 100% with 100% being the loudest.

3. Confirm the entry with the rotary knob.

Activating / Deactivating audio alert for power overload

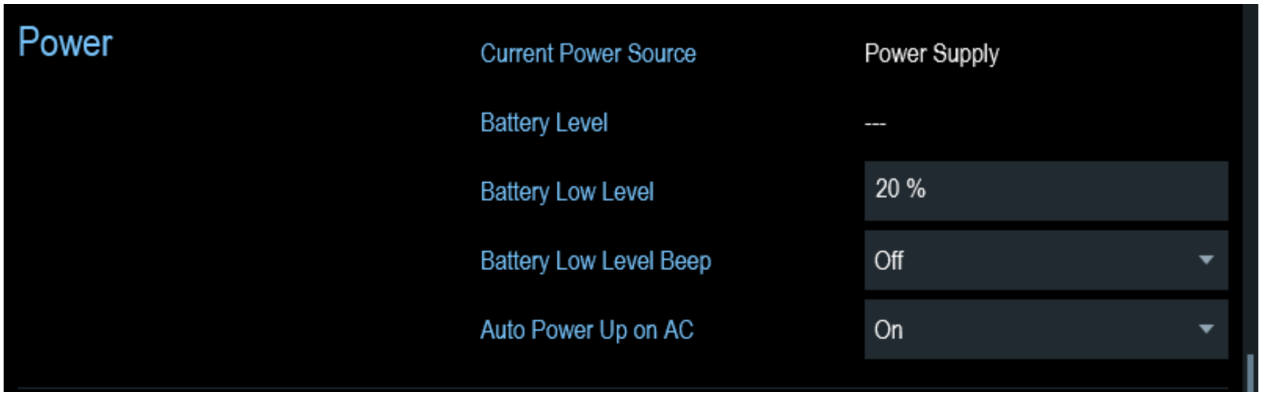
In case the R&S Spectrum Rider detects an overload at one of its inputs, you can configure the alert audible.

1. In the "Instrument Setup" dialog box, select the "Beep on Power Overload" item.
2. Select "Beep on Power Overload" to "On".
   When this beeper turns on, the R&S Spectrum Rider makes a sound every time it detects an overload.

6.10.8 Configuring power supply

The "Current Power Source" shows the source that the R&S Spectrum Rider is powered by.

When you are using the battery to power up the R&S Spectrum Rider, the remaining "Battery Level" is displayed as a percentage with 100 % representing a full charge.



Setting the battery low level

The battery low level is a reminder that the remaining battery charge might be used up soon.

When the battery low level is reached, the battery symbol in the title bar turns red and starts blinking. See Section 5.1.5, "Battery operation", on page 18.

1. In the "Instrument Setup" dialog box, select the "Battery Low Level" item.
2. Enter the charge level in percent of a fully charged battery with the numeric keys.

3. Confirm the entry with the rotary knob.

Activating / Deactivating audio alert for battery low-level state

The R&S Spectrum Rider also allows you to turn on an audio signal that indicates that the battery has reached its low-level state.

1. In the "Instrument Setup" dialog box, select the "Battery Low Level Beep" item.

2. Select either "Repetitive" or "Once" to turn on the audio signal.

If you have selected "Once", the R&S Spectrum Rider beeps once if the battery runs out of power. For a continuous beep, select "Repetitive".

3. Select "Off" to turn off the beeper.

Auto power up

The R&S Spectrum Rider allows you to auto power up the instrument when supplying with an AC power, without pressing the [POWER] key button.

1. In the "Instrument Setup" dialog box, select the "Auto Power Up on AC" menu item.

2. Select "On" to turn on the auto power up mode.
On the next power up cycle, the R&S Spectrum Rider goes into the auto power up mode when supplying with an AC power.

6.10.9 Internal alignment

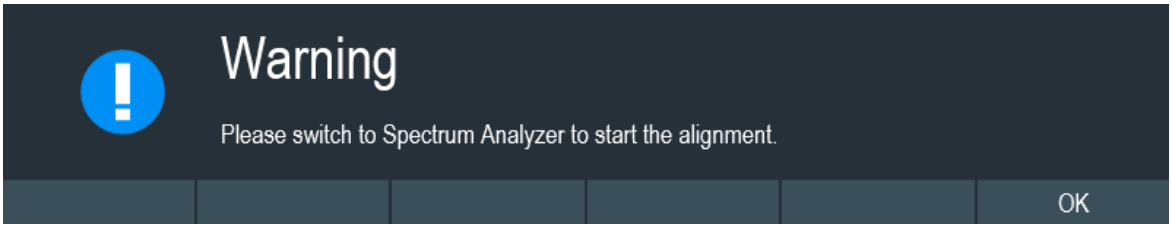
R&S Spectrum Rider option

R&S FPH-K35 (order number: 1321.1563.02) option is required to operate the R&S Spectrum Rider internal frequency clock and reference level adjustment.

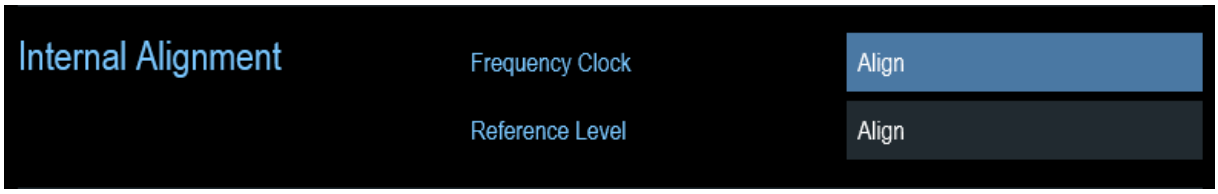
Operating mode

The frequency clock and reference level alignment can only be performed in "Spectrum" mode. If the wrong operating mode is detected, a warning message is displayed before alignment is performed.

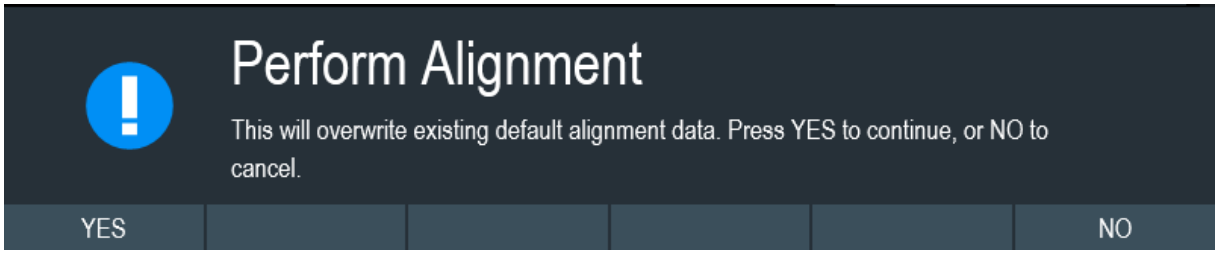
For more information on the operating mode of the R&S Spectrum Rider, see Section 6.8.4, "System keys", on page 42.



1. In the "Instrument Setup" dialog box, select frequency clock or reference level "Align" item to perform alignment.



2. The R&S Spectrum Rider displays the "Perform Alignment" dialog.



3. Select "Yes" to overwrite existing default alignment data and proceed to perform alignment. The R&S Spectrum Rider displays the "Alignment" dialog. Depending on the selected alignment item, different input signal is required. See Figure 6-9 and Figure 6-10.

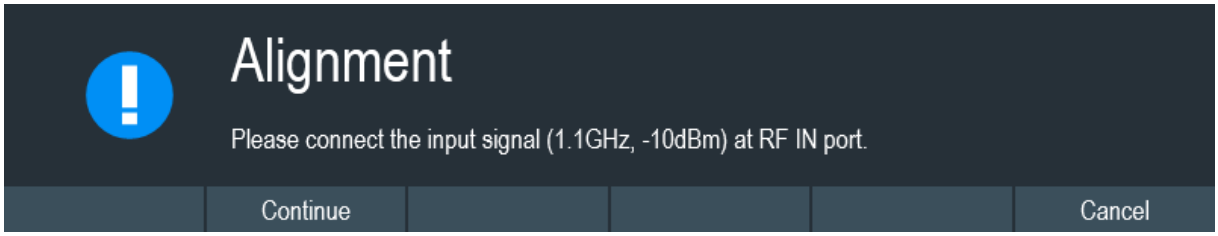


Figure 6-9: Input signal for frequency clock alignment

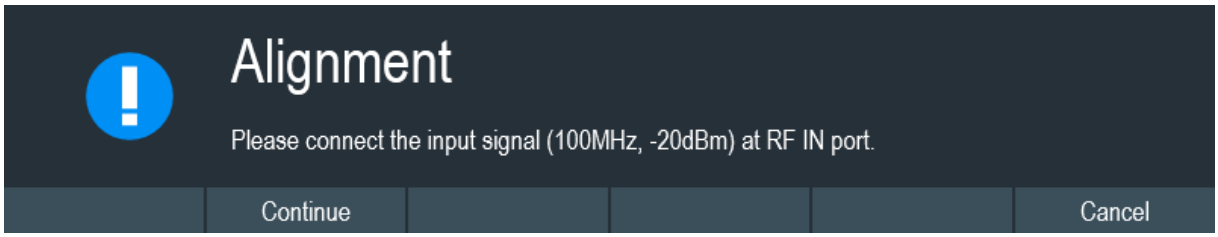
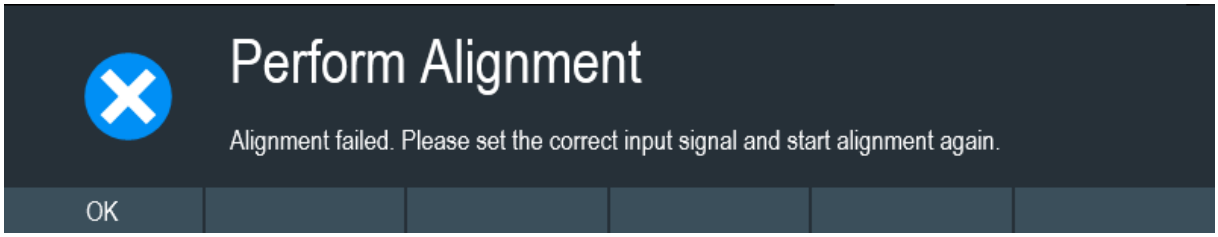


Figure 6-10: Input signal for reference level alignment

4. Connect an input signal of 1.1 GHz, -10dBm at the "RF IN" port for frequency alignment or 100 MHz, -20 dBm at the "RF IN" port for reference level alignment.
5. Select "Continue" to start the internal alignment on the instrument.

The R&S Spectrum Rider overwrites existing adjustment data and performs the internal alignment.
If the wrong input signal is detected, the R&S Spectrum Rider displays a message of a failed alignment dialog.



6.10.10 Resetting the R&S Spectrum Rider

You can either preset the R&S Spectrum Rider or reset it to factory settings.

Presetting the R&S Spectrum Rider

The [PRESET] key resets the R&S Spectrum Rider to the default setup of the currently active operating mode.

This default setup allows you to define the instrument with a new configuration based on a defined measurement parameter without using parameters from a previous measurement unintentionally still being active.

► Press the [PRESET] key.

Resetting the R&S Spectrum Rider

A "Reset to Factory Settings" resets the R&S Spectrum Rider to the factory defaults.

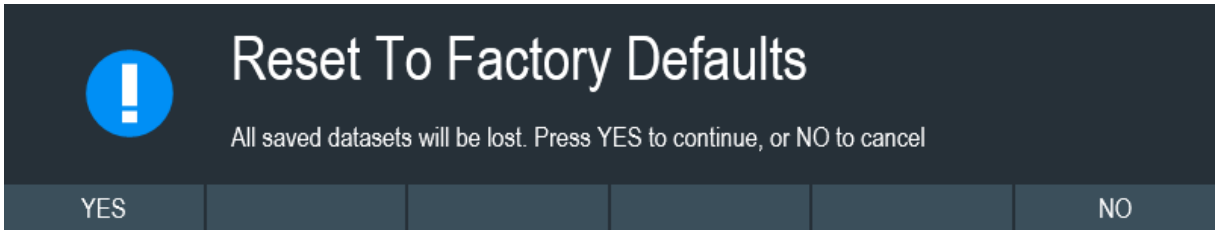
During a reset, the R&S Spectrum Rider restores the original configuration. It also deletes all customized datasets (limit lines, standards, channel tables, transducer tables etc.). Instead, it will reinstall all the datasets that have been available after delivery.

Risk of data loss
All datasets you have saved are deleted during a factory reset.

1. In the "Instrument Setup" dialog box, select the "Reset to Factory Settings" item.

2. Confirm the entry with the rotary knob.

The R&S Spectrum Rider initiates the reset procedure and shows a warning message box.



3. A corresponding dialog box opens for selection.
   - Select "Yes" to perform the reset. During the reboot, it shows a corresponding message.
   - Select "No" to cancel the reset.

6.11 Connecting the R&S Spectrum Rider to a PC

The R&S Spectrum Rider is supported on the R&S InstrumentView software package. This software package features several tools that allow you to document measurement results, create and edit the different datasets necessary for the instrument. For more information, see the R&S InstrumentView software manual.

The .NET Framework 2.0 (or higher) is required to run the software properly.

You can set up a connection between the R&S Spectrum Rider and R&S InstrumentView either via its LAN port or its mini USB port.

You have to install the R&S InstrumentView software on the PC before you are able to establish a connection.

Download the latest R&S InstrumentView from https://www.rohde-schwarz.com/software/fph/.

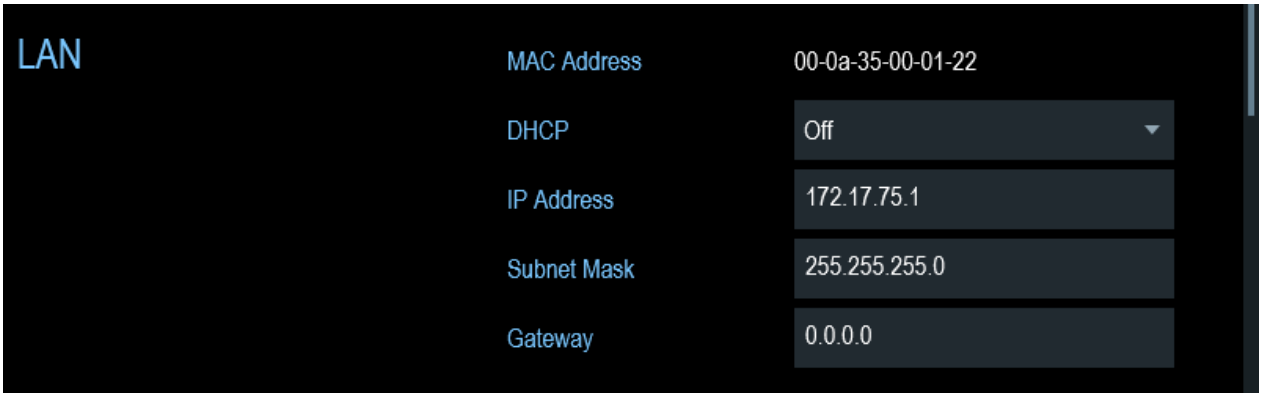
Firewall settings

If no connection can be established between the software and the R&S Spectrum Rider after successful configuration, check the firewall settings on your PC.

6.11.1 LAN connection

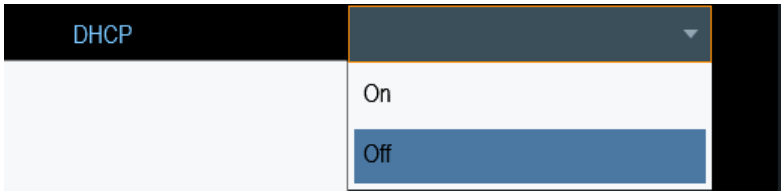
You can connect the R&S Spectrum Rider directly to the PC with a LAN cable. The LAN port is located behind a protective cap on the right side of the R&S Spectrum Rider.

You can set up the LAN connection in the "Instrument Settings" dialog box.



For a direct connection between the PC and R&S Spectrum Rider, the DHCP (Dynamic Host Configuration Protocol) of the R&S Spectrum Rider has to be turned off (which is the default state).

1. In the "Instrument Settings" dialog box, select the "DHCP" item.
   A drop-down menu opens to select the DHCP state.
2. Select "DHCP" to "On" or "Off" as required.

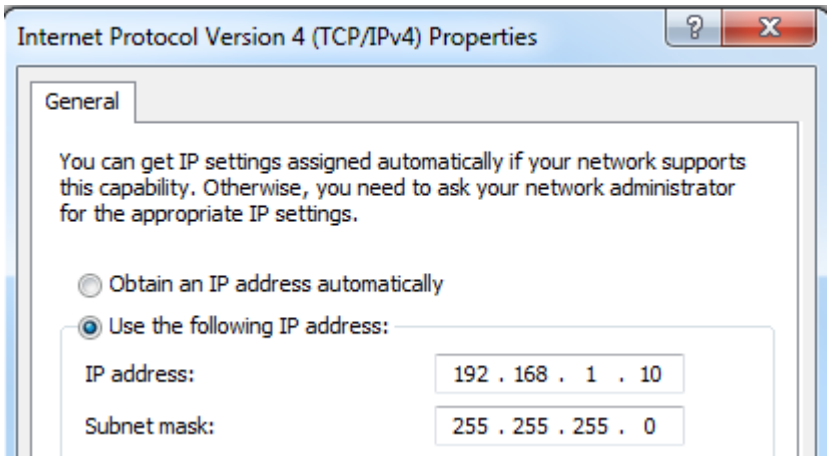


Setting an IP address and subnet mask

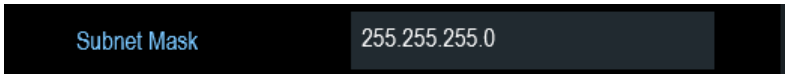
To establish a connection, the PC and R&S Spectrum Rider have to be in the same subnet.

Subnet mask

1. Identify the subnet mask of your PC, i.e. in the Microsoft Windows "TCP/IP Properties".



2. In the "Instrument Settings" dialog box, select the "Subnet Mask" item.
3. Enter the subnet mask of the PC with the numeric keys.



After you have matched the subnet mask, you can define the IP address. When both devices are in the same subnet, the first three digits of the IP address are usually the same. See example below:

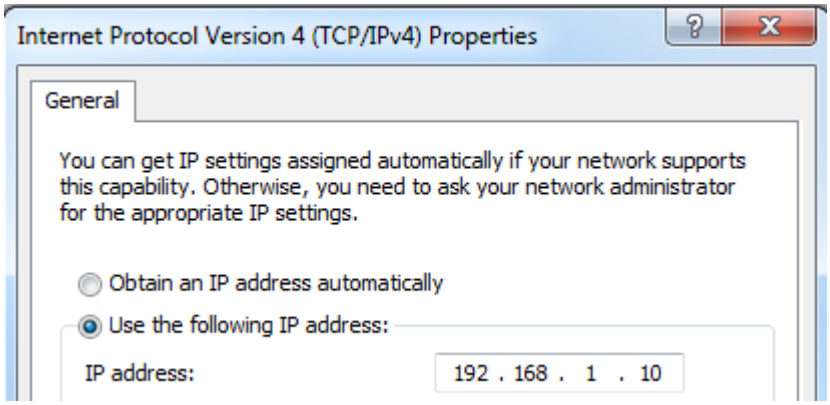
Example:

IP address for PC: 192.168.1.10

IP address for R&S Spectrum Rider: 192.168.1.20

IP address

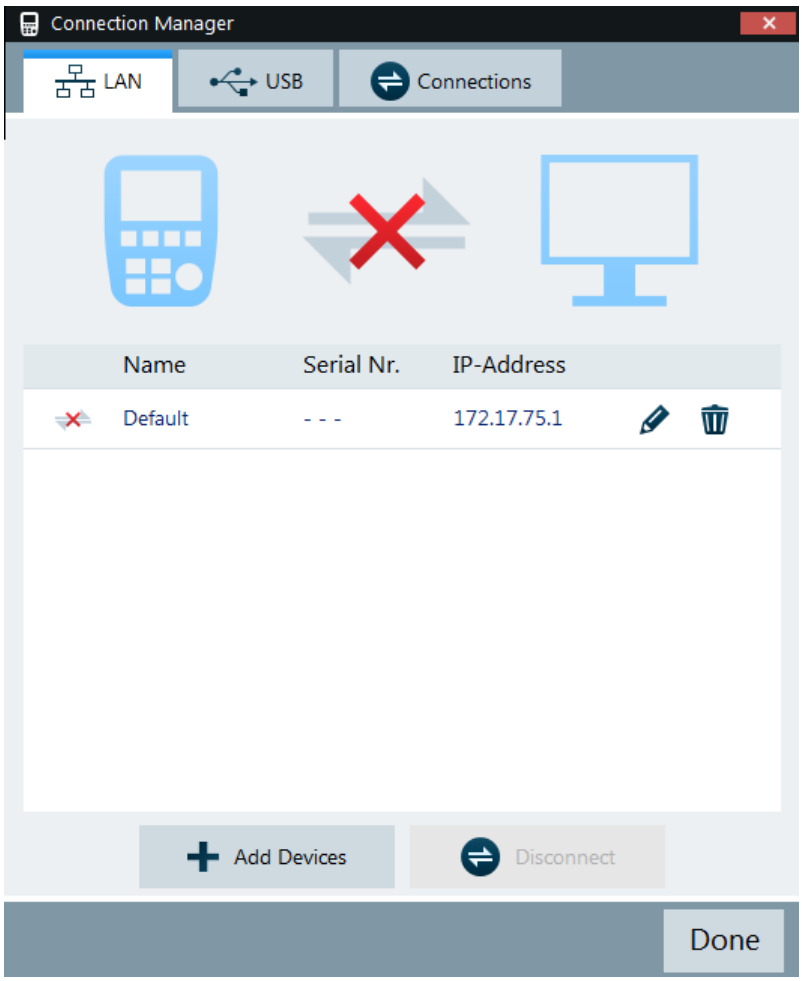
1. Identify the IP address of your PC, i.e. in the Microsoft Windows "TCP/IP Properties".



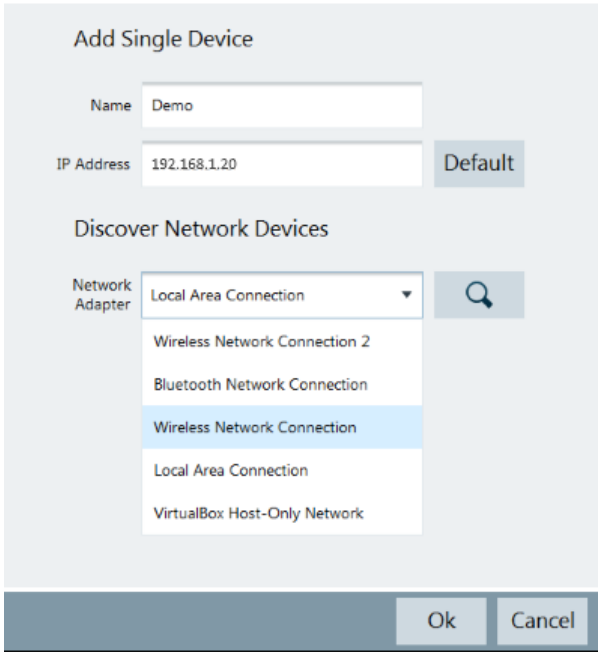
2. In the "Instrument Settings" dialog box, select the "IP Address" item.
3. Confirm the entry with the rotary knob.
4. Enter the IP address of the PC with the numeric keys.

Configuring the R&S InstrumentView software package

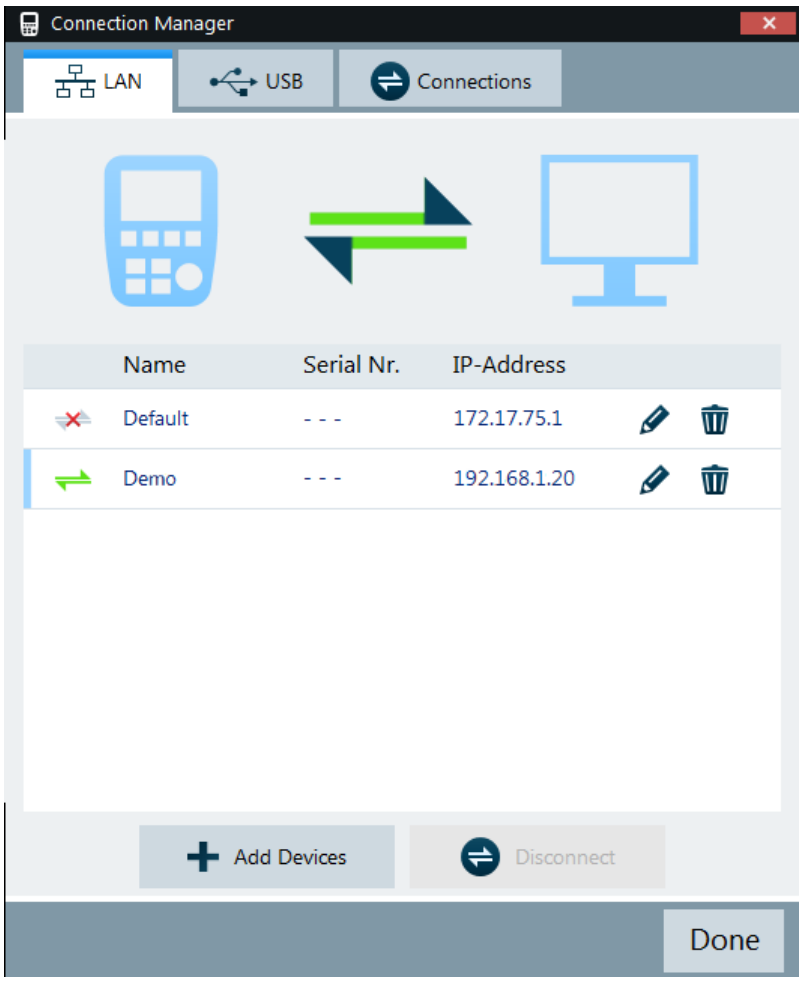
1. Start the R&S InstrumentView software.
2. Select the "LAN" tab in the screen layout.



3. During the initial startup, the "IP-Address" field is set to default "172.17.75.1". You can edit the IP address using the icons
4. Select the "Add Devices" button to create a new network connection.



5. Specify a name and the IP address for the new network connection.
6. Select "Local Area Connection" for the "Network Adapter".
7. Confirm the entry with the "OK" button to add the new instrument to the connection manager list.
8. Depending on the connection status icon, you can connect or disconnect an instrument from the connection manager list



Connecting the R&S Spectrum Rider in an existing LAN

You can either get the R&S Spectrum Rider IP address automatically from the DHCP server or manually assign a fixed address.

With manual allocation, a fixed IP address and subnet mask must be assigned to the R&S Spectrum Rider as described in Section 6.11.1, "LAN connection", on page 70. After setting up the R&S Spectrum Rider, configure the R&S InstrumentView software with the assigned IP address as described in "Configuring the R&S InstrumentView software package" on page 72.

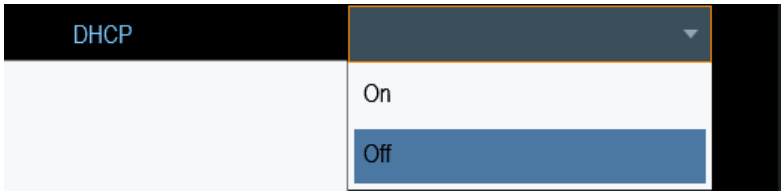
Free IP address

Contact your IT system administrator to get a free IP address.

In networks with a DHCP server, the DHCP permits automatic allocation of the network configuration to the R&S Spectrum Rider connected via LAN cable. For this purpose, the DHCP has to be active on the R&S Spectrum Rider.

The DHCP is off by default. Turn it on like this:

1. In the "Instrument Setup" dialog box, select the "DHCP" item.
2. Select "DHCP" to "On" to activate the DHCP.



The R&S Spectrum Rider is now allocated an IP address and the subnet mask by the DHCP server. This can take several seconds.

The IP address and subnet mask are automatically set in the corresponding input fields and are no longer available for editing.

Configure the R&S InstrumentView software with the IP address and subnet mask as defined by the DHCP server. For more information, see Section 6.11.1, "LAN connection", on page 70.

6.11.2 USB connection

Alternatively, you can connect the R&S Spectrum Rider to the PC with a USB cable. The mini USB interface is located behind a protective cap on the right side of the R&S Spectrum Rider.

When you connect the R&S Spectrum Rider to a computer for the first time, Windows tries to install the new hardware automatically. The required drivers are installed along with the R&S InstrumentView software package.

When the drivers have been found on your system and the hardware has been successfully installed, Windows shows a corresponding message.

1. Connect the R&S Spectrum Rider via the mini USB port to your computer.
2. Start the R&S InstrumentView on the PC.
3. There is only one USB instance in the connection manager list. See Figure 6-11.
   Depending on the connection status icon, ⇌ ✕ you can connect or disconnect an instrument from the connection manager list

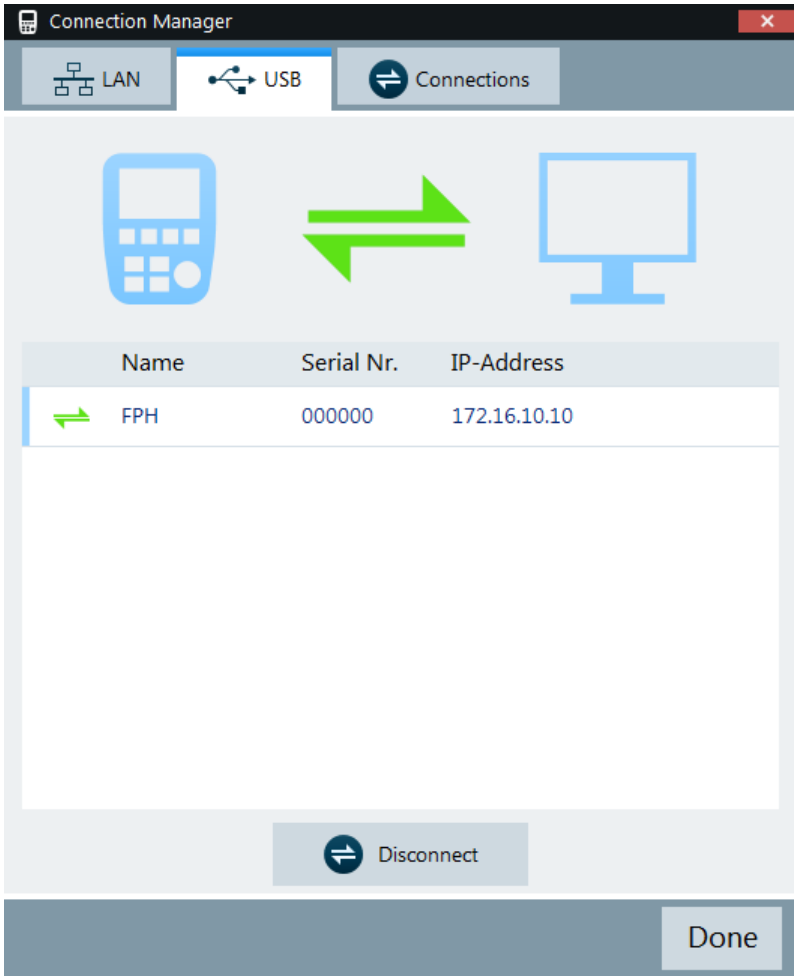


Figure 6-11: USB connection

7 Trying out the instrument

This chapter provides a short overview of the first steps of the measurements you can perform with the R&S Spectrum Rider.

7.1 Using the spectrum analyzer

This chapter provides a short overview of the first steps of the measurements you can perform with the R&S Spectrum Rider.

7.1.1 Attenuating the signal

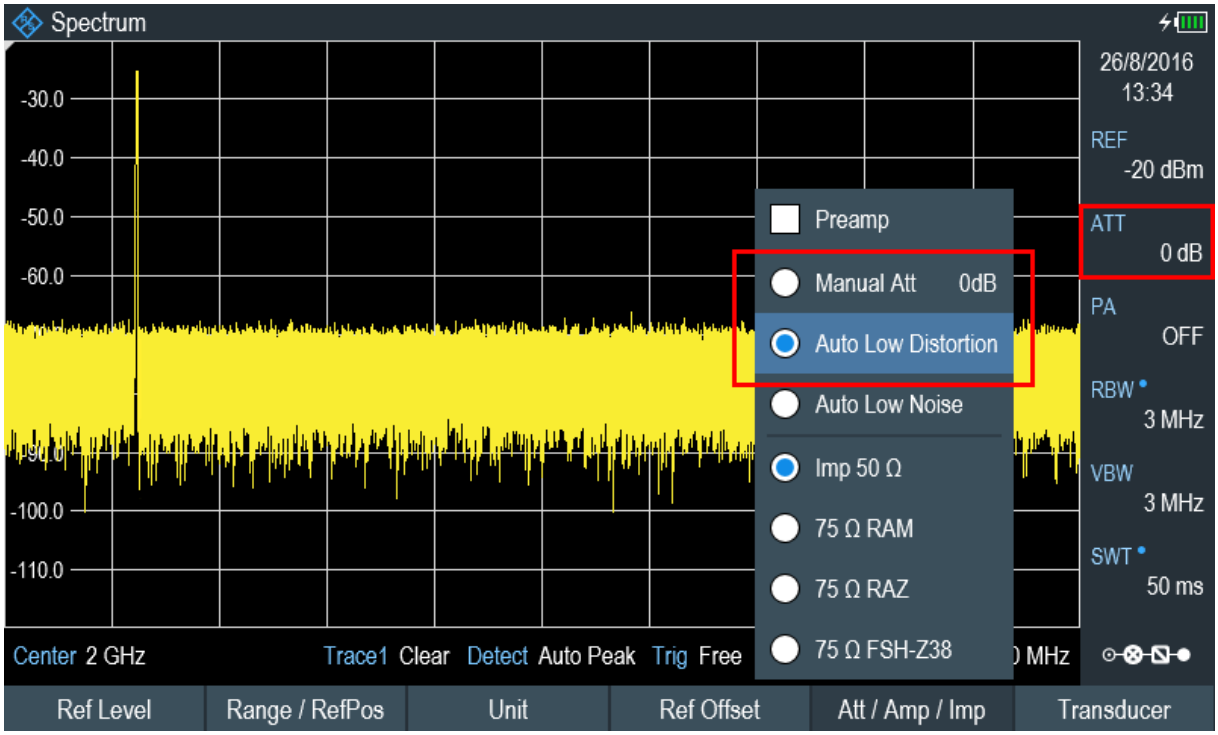
You can attenuate the signal to a suitable level either manually or automatically.

In case of automatic attenuation, the level of attenuation at the RF input depends on the current reference level. The R&S Spectrum Rider provides two ways of automatic attenuation.

For the highest possible sensitivity, it provides the "Auto Low Noise" attenuation mode. For the lowest possible intermodulation, it provides the "Auto Low Distortion" mode.

The main difference between the two modes is that the attenuation level is 5 dB to 10 dB higher in case of "Auto Low Distortion" than it is for "Auto Low Noise". In the default state, "Auto Low Distortion" is active.

1. Press [AMPT] key.
2. Select "Att/Amp/Imp" softkey.
3. Select either the "Auto Low Noise" or "Auto Low Distortion" menu item.
   The R&S Spectrum Rider shows the current attenuation level in the "Parameter view". The currently active menu item has a blue background and the selected parameters is indicated with a blue dot in the menu item.



You can also set the attenuation manually. TheR&S Spectrum Rider provides attenuation in the range from 0 dB to 40 dB in 5 dB steps.

4. Press [AMPT] key.
5. Select "Att/Amp/Imp" softkey.
6. Select the "Manual Att" menu item.
   The R&S Spectrum Rider opens an entry box to define the attenuation. Two methods are provided to fill in the input fields:
   - Directly with the number keys
   - Using rotary knob

   While you can enter any number you want with the number keys, using the rotary knob is coupled to a certain step size in most cases.
   If you use the rotary knob to change the attenuation, i.e. the step size is 5 dB.
7. Enter the attenuation you need.
   The R&S Spectrum Rider shows the current attenuation level in the "Parameter View".

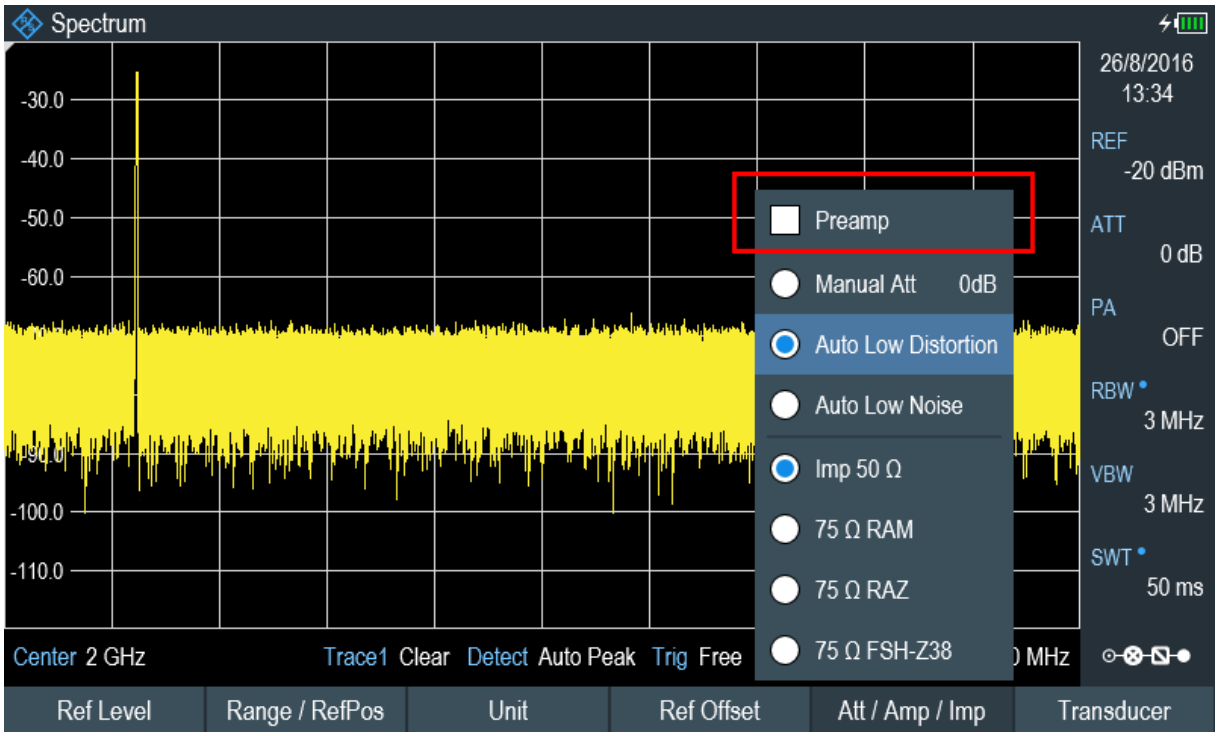
7.1.2 Using the preamplifier

The R&S Spectrum Rider has an optional preamplifier (R&S FPH-B22, order number 1321.0680.02) to increase sensitivity. Depending on the frequency, the

gain of the amplifier is in the range from 15 dB to 20 dB and increases the sensitivity by 10 dB to 15 dB.

In the signal path, the preamplifier comes after the input protection circuit and before the RF attenuator of the R&S Spectrum Rider to provide excellent sensitivity when the preamplifier is switched on.

1. Press [AMPT] key.
2. Select "Att/Amp/Imp" softkey.
3. Enable or disable the "Preamp" checkbox to turn on or off the preamplifier of the R&S Spectrum Rider.



The magnitude of amplification depends on the reference level. This coupling to the reference level makes sure that the dynamic range is at an optimum.

7.1.3 Measuring CW signals

A basic task for spectrum analyzers is to measure the level and frequency of sinewave signals. The following examples illustrate an effective way of performing these measurements.

A signal generator, e.g. R&S SMBV provides the signal source.

Test setup

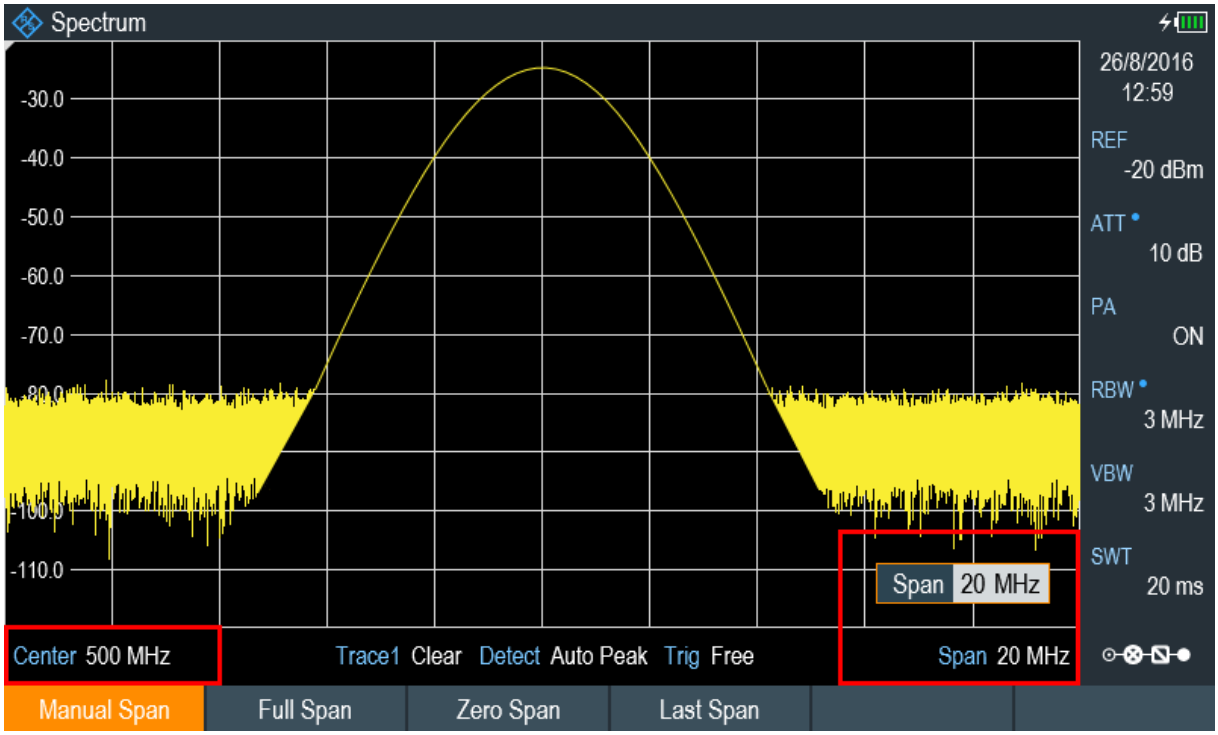
Connect the RF output of the signal generator to the RF input of the R&S Spectrum Rider.

Signal generator settings:

- Frequency: 500 MHz
- Level: -25 dBm

Measuring the level

1. Press [PRESET] key.
   The R&S Spectrum Rider is reset to its default state.
   After the preset, the R&S Spectrum Rider displays the frequency spectrum over its full frequency span.
   At 500 MHz, the generator signal is displayed as a vertical line. To analyze the generator signal at 500 MHz in more detail, reduce the frequency span.
2. Select the "Center" softkey at the "Parameter view".
   The R&S Spectrum Rider opens an entry box to define the center frequency.
3. Enter a center frequency of 500 MHz.
   The signal is now in the center of the display.
4. Select the "Span" softkey at the "Parameter view".
   The R&S Spectrum Rider opens an entry box to specify the span.
5. Enter a span of 20 MHz.
   The R&S Spectrum Rider now displays the generator signal with a higher resolution.



Setting the reference level

The level at the top of the measurement diagram is called the reference level. To obtain the best dynamic range from the R&S Spectrum Rider, you should use its full level range. That means that the maximum level value should be at or close to the top of the measurement diagram (= reference level).

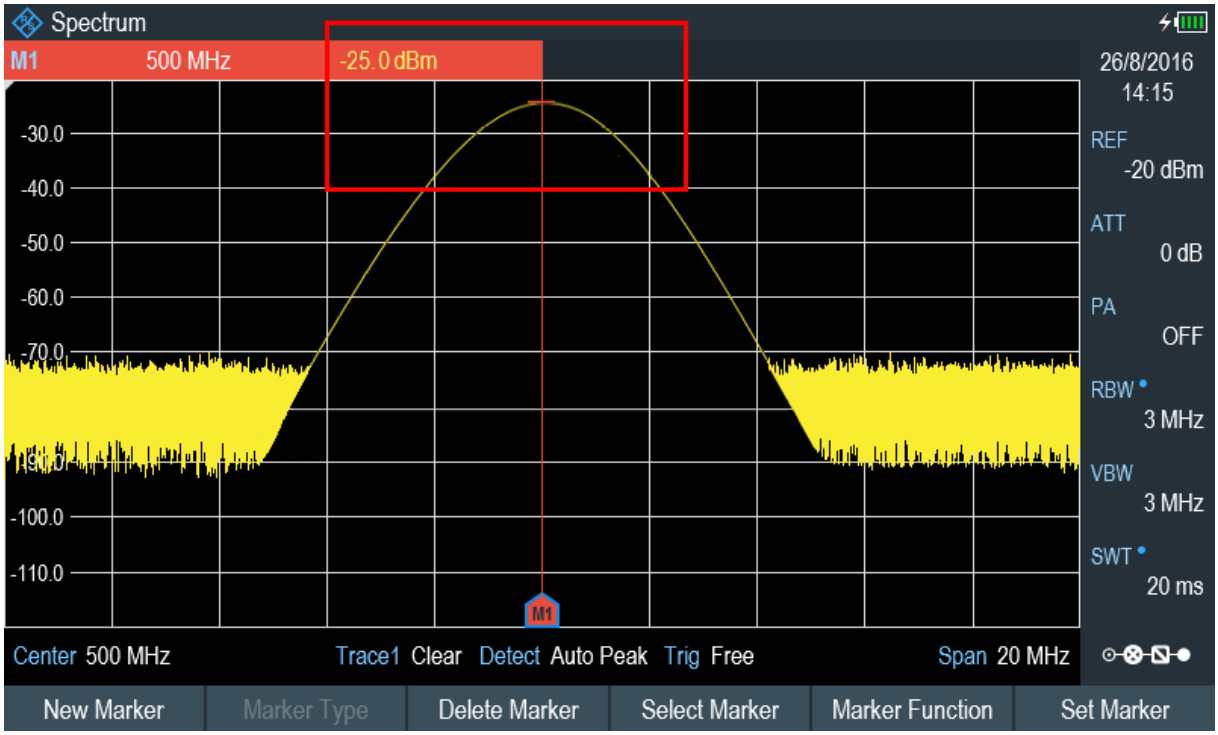
1. Press "REF" softkey at the "Parameter view".
   The R&S Spectrum Rider opens an entry box to enter the reference level.
2. Enter a reference level of -25 dBm.
   The R&S Spectrum Rider reduces the reference level by 5 dB.

The maximum trace value is close to the maximum scale value of the measurement diagram. The increase in the displayed noise floor is minimal. The difference between the signal maximum and the displayed noise (i.e. the dynamic range) has, however, been increased.

Using markers

The R&S Spectrum Rider has markers to read out signal levels and frequencies. Markers are always positioned on the trace. Both the level and frequency at their current positions are displayed on the screen.

► Press [MARKER] key.
The R&S Spectrum Rider activates a marker and puts it on the maximum value on the trace. The coordinates of the marker are shown in a table above the measurement diagram.
A red vertical line represents the position of the marker on the horizontal axis (i.e. the frequency). A small red horizontal dash represents the marker position on the vertical axis (i.e. the level).



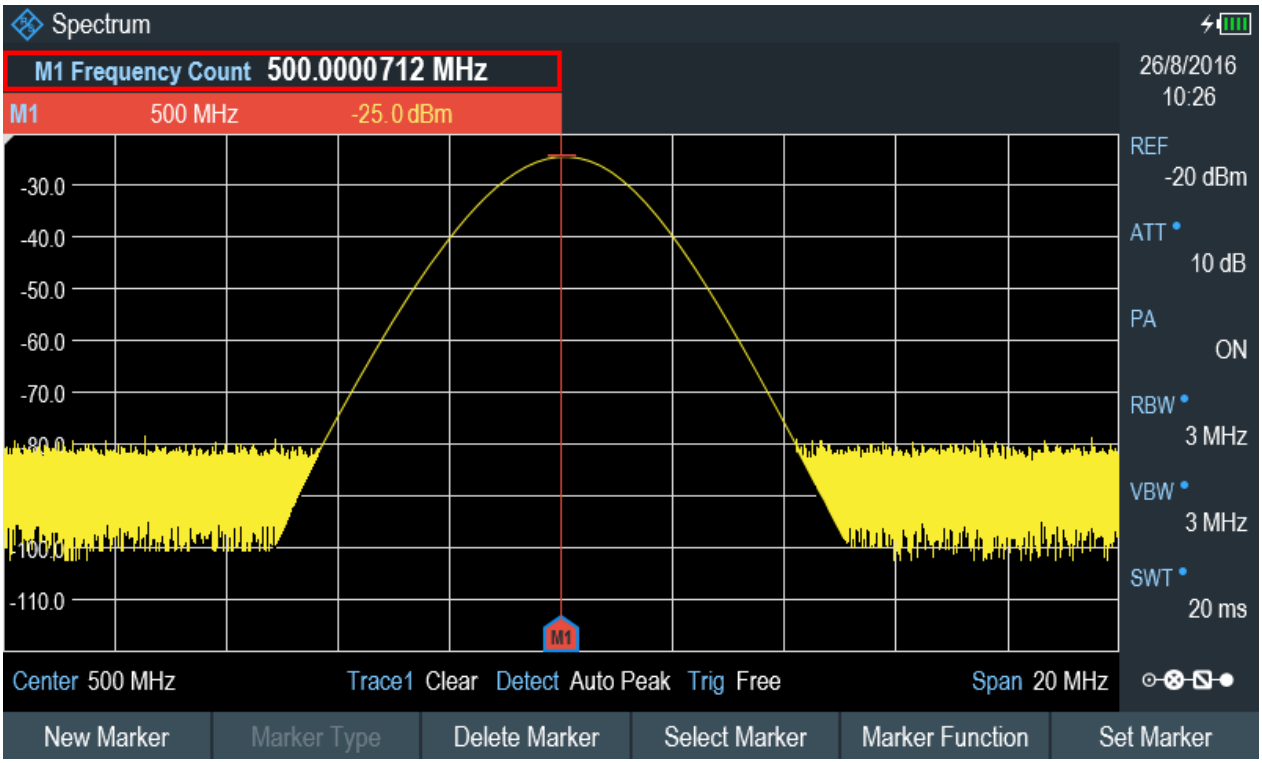
Measuring the frequency

The trace consists of 711 measurement points (frequency points). The marker is always positioned on one of these measurement points. The R&S Spectrum Rider calculates the marker frequency from the frequency of the measurement point, the center frequency and the frequency span that have been set. The measurement-point resolution, and consequently the accuracy of the marker frequency readout, therefore depend on the frequency span that has been selected.

The R&S Spectrum Rider has a frequency counter to increase the accuracy of the marker-frequency readout. It completes the sweep, then counts the frequency at the marker position.

1. Press the "Marker Function" softkey at the "Parameter view".
2. Select the "Frequency Count" from the menu item.

The measurement result of the frequency counter is displayed at the "Measurement result view". When the frequency counter is active, the highest resolution of the frequency readout that can be achieve is 0.0001 Hz. The accuracy is determined by the internal reference frequency which is far more exact than the pixel-oriented marker readout.



7.1.4 Measuring harmonics

A spectrum analyzer is ideal to measure harmonic levels or harmonic ratios, because it can resolve different signals in the frequency domain.

With marker functions, you can speed up the measurement tasks.

A signal generator, e.g. R&S SMBV provides the signal source.

Test setup

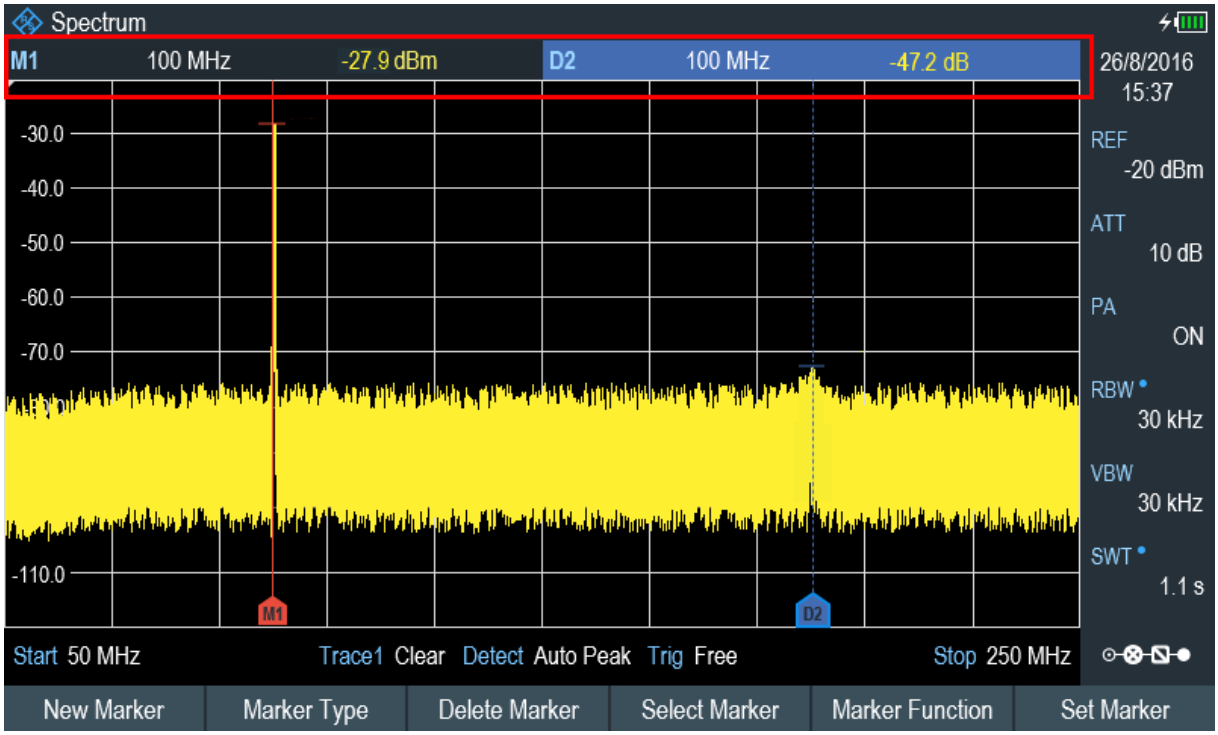
Connect the RF output of the signal generator to the RF input of the R&S Spectrum Rider.

Signal generator settings:

- Frequency: 100 MHz
- Level: -20 dBm

Detecting harmonics

1. Press [PRESET] key.
   The R&S Spectrum Rider is reset to its default state.
   After the preset, the R&S Spectrum Rider displays the frequency spectrum over its full frequency span.
   At 100 MHz, the generator signal is displayed as a vertical line. In addition, you can see the harmonics as smaller vertical lines at frequencies that are multiples of 100 MHz. To measure the second harmonic ratio, decrease the span.
2. Press [FREQ] key.
3. Select the "Start" softkey at the "Measurement footer bar".
   The R&S Spectrum Rider opens an entry box to enter the start frequency.
4. Enter a start frequency of 50 MHz.
5. Confirm the entry with one of the unit keys.
6. Select the "Stop" softkey at the "Measurement footer bar".
   The R&S Spectrum Rider opens an entry box to enter the stop frequency.
7. Enter a stop frequency of 250 MHz.
8. Confirm the entry with one of the unit keys.
   The R&S Spectrum Rider displays the frequency spectrum in the range from 50 MHz to 250 MHz. This frequency range visualizes the signal itself at 100 MHz and the second harmonic at 200 MHz.



To measure the harmonic ratio, set the marker on the signal and a delta marker on the second harmonic.

9. Press [MARKER] key.
   The R&S Spectrum Rider sets a marker on the trace maximum. The trace maximum corresponds to the signal.

10. Select the "New Marker" softkey at the "Measurement footer bar".
    The R&S Spectrum Rider activates a delta marker and places it on the next trace maximum. This corresponds to the second harmonic.
    The harmonic ratio is the vertical distance of the marker and the delta marker.
    The R&S Spectrum Rider displays this value in the "Measurement result view".

7.2 Using a power sensor

R&S Spectrum Rider option

R&S FPH-K9 (order number: 1321.0709.02) option is required to operate the R&S Spectrum Rider in the power sensor mode.

For highly accurate power measurements, you can connect one of the power sensors that are supported by the R&S Spectrum Rider.

For a list of R&S Spectrum Rider supported power sensors, see the datasheet of the R&S Spectrum Rider.

You can connect the list of supported power sensors to the USB port of the R&S Spectrum Rider. This connector allows you to control the power sensor and supplies it with power. For more information, see "Mini USB" on page 30.

7.2.1 Measuring the power with a power sensor

For more information about the characteristics of the supported power sensors, refers to their datasheet.

NOTICE

Risk of damaging the power sensor

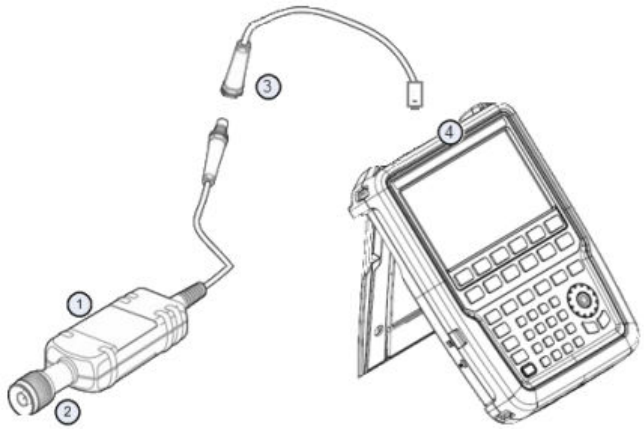
Because of high input power,

- The continuous power applied to the power sensor's input must not exceed 400 mW (26 dBm).
- Use an attenuator for measurements on high-power transmitters.

However, brief power peaks ≤ 10 µs up to 1 W (30 dBm) are permissible.

Test setup

Connect the power sensor cable to the USB port of R&S Spectrum Rider. If the power sensor is having the binder connector (i.e R&S FSH-Z1, R&S FSH-Z18), the FSH-Z101 adaptor cable is needed.



1 = Supported power sensor (e.g R&S FSH-Z1, R&S NRP-Z11)
2 = Power sensor connector (DUT)
3 = USB binder adaptor (R&S FSH-Z101)
4 = USB port connector

Measuring the power

1. Press [MODE] key.
2. Select "Power Meter" softkey.
   The R&S Spectrum Rider switches its operating mode.

If the R&S Spectrum Rider recognizes a power sensor, it sets up a connection via the USB interface. After a few seconds, the R&S Spectrum Rider shows the measured power.

If no power sensor has been connected or is not connected appropriately, the R&S Spectrum Rider shows nothing.

If there are communication problems between the R&S Spectrum Rider and the power sensor, the R&S Spectrum Rider displays an error message that indicates a possible cause.

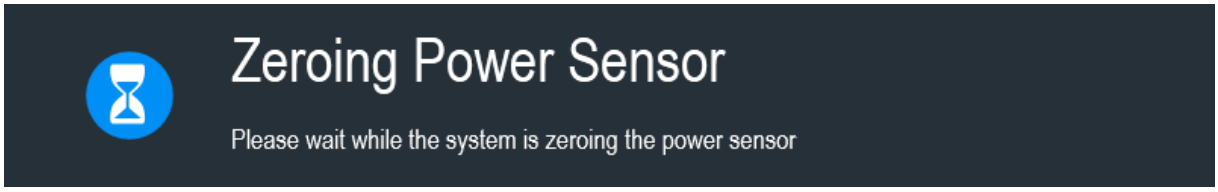
For more information on the error messages, see the "Power Meter" in the R&S Spectrum Rider user manual.

Zeroing the power sensor

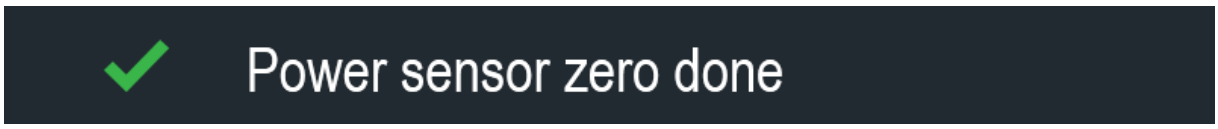
To compensate internal offsets of the power meter, a zeroing for the power sensor is required before starting the measurement.

1. Select "Zero" softkey.
   Do not to apply any signals to the power sensor while zeroing is active.
   A popup message box is displayed to provide instructions during the zeroing of the power sensor.

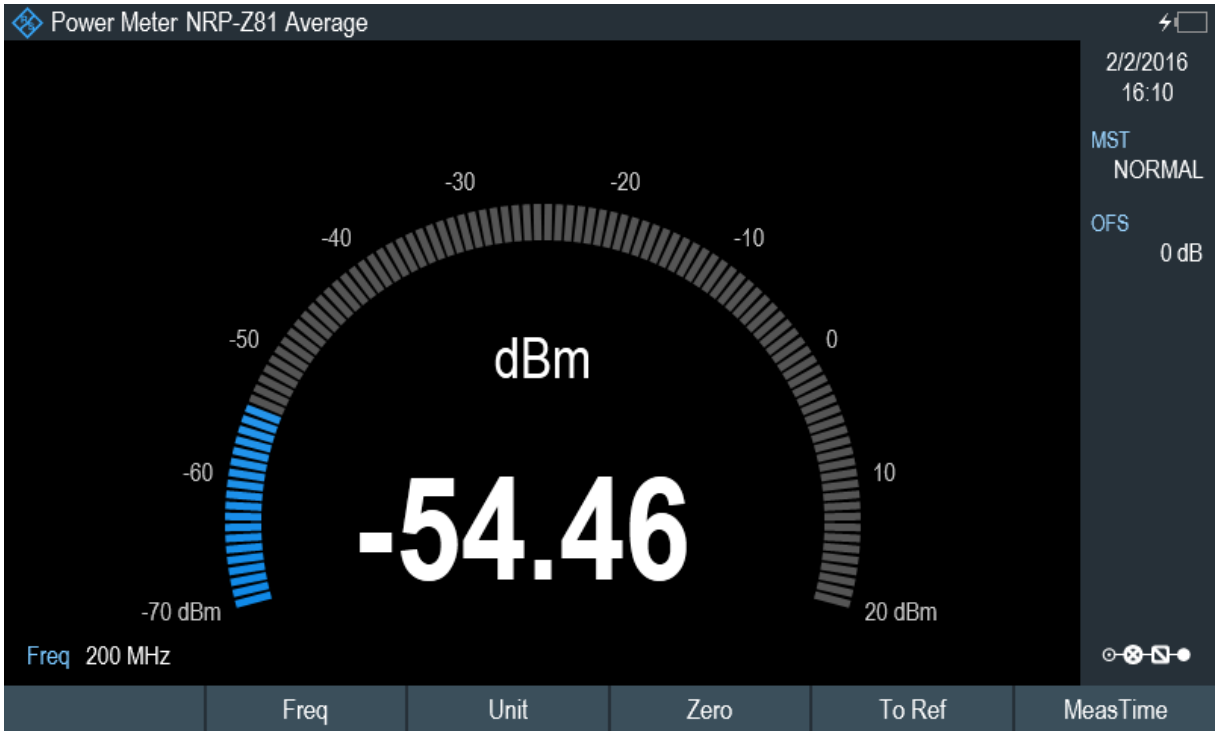
2. Disconnect the power sensor from any signal sources.
3. Select "Continue" softkey to start zeroing.
   The R&S Spectrum Rider starts the zeroing process.



4. Wait for the zeroing process to finish.
   After zeroing, the R&S Spectrum Rider displays the message "Power sensor zero done" and again shows the power sensor softkey menu.



5. Connect the DUT to the power sensor.
   The R&S Spectrum Rider shows the measured power level in dBm. For more information on the power meter measurement, see "Power Meter" in the R&S Spectrum Rider user manual.



Set the frequency

To get the best results, enter the frequency of the signal under test.

1. Select "Freq" softkey.
   The R&S Spectrum Rider opens an entry box to enter the frequency.

2. Enter the frequency of the signal.
3. Confirm the entry with one of the unit keys.

The R&S Spectrum Rider transfers the new frequency to the power sensor which then corrects the measured power readings.

7.2.2 Measuring power and return loss

With the directional power sensors R&S FSH-Z14 and R&S FSH-Z44, you can measure the power in both directions.

When you connect the directional power sensor between the source and the load, the R&S Spectrum Rider measures the power from the source to load (forward power) and from the load to source (reverse power).

The ratio between the forward and reverse power is a measure of the load matching. The R&S Spectrum Rider displays it as the return loss or standing wave ratio.

The power sensors for the R&S Spectrum Rider have an asymmetrical design. Therefore, they have to be inserted into the test setup in such a way that the "Forward" arrow on the sensor points toward the load (in the direction of the power flux).

When measuring high powers, pay strict attention to the following instructions to avoid personal injury and to prevent the power sensor from being destroyed.

⚠ CAUTION

Danger of skin burns and damage to the instrument

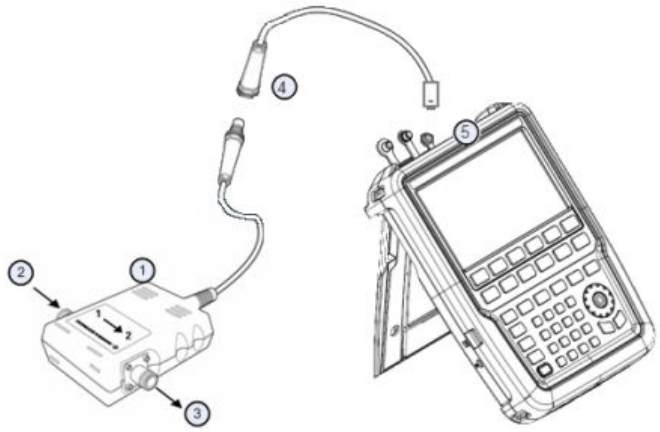
- Never exceed the permissible continuous power.
- See diagram on the rear of the sensor for the permissible continuous power.
- Turn off the RF power to connect the sensor.
- Screw the RF connectors tightly.

Test setup

Connect the power sensor cable to the USB port of R&S Spectrum Rider. If the power sensor is having the binder connector (i.e R&S FSH-Z14, R&S FSH-Z44),

the FSH-Z144 adaptor cable is needed. Insert the directional power sensor between the source and the load.

The power sensors for the R&S Spectrum Rider have an asymmetrical design. Hence, you have to insert them into the test setup in such a way that the "Forward" arrow (1➞2) on the sensor points toward the load (= in the direction of the power flux).



1 = Directional power sensor R&S FSH-Z14 or Z44
2 = Source
3 = Load
4 = USB binder adaptor (R&S FSH-Z144)
5 = USB port connector

Measuring the power

1. Press [MODE] key.
2. Select "Power Meter" softkey.

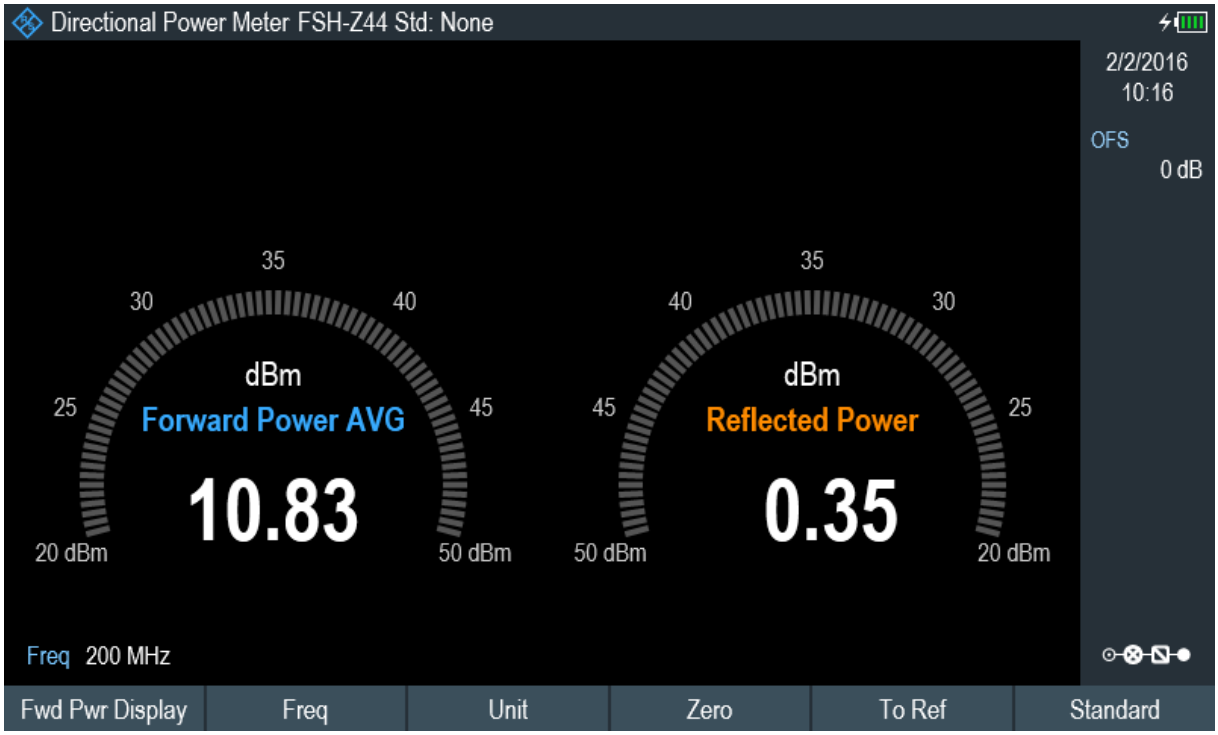
As soon as the R&S Spectrum Rider recognizes the power sensor, it displays the type of the directional power sensor that is connected in the "Title bar" (see Figure 6-2). After a few seconds, it also shows the forward power and return loss currently measured at the load.

Zeroing the power sensor

Before performing the power measurement, you should zeroing the power sensor.

After zeroing is done, the R&S Spectrum Rider displays the message "Power sensor zero done" and again shows the power sensor softkey menu.

► Connect the R&S FSH-Z14 or R&S FSH-Z44 between the source and the load. The R&S Spectrum Rider displays the measured forward power in dBm and the SWR of the load. For more information on using the directional power sensor, see "Power Meter" in the R&S Spectrum Rider user documentation.



To get the best results, you should also define the frequency of the signal. For more information on the measuring power and return loss, see "Power Meter" in the R&S Spectrum Rider user manual.

7.3 Saving and recalling results and settings

Storage device

If both USB flash drive and micro-SD card are connected to the instrument, the USB flash drive takes precedent over SD card as a storage device.

If both storage devices are not connected, the internal memory of the instrument is used for storage.

The R&S Spectrum Rider can store measurement results and settings in the internal memory, removable micro-SD card or on a USB flash drive via the USB interface.

Results and settings are always stored together, allowing them to be interpreted in context when recalled. The R&S Spectrum Rider can store at least 100 data records in the internal memory which are differentiated by their names.

The R&S Spectrum Rider provides two USB ports and one micro-SD card slot.

For more information on saving measurement results and settings, see "Saving Datasets" in the R&S Spectrum Rider user manual.

For more information on recalling measurement results and settings, see "Restoring Datasets" in the R&S Spectrum Rider user manual.

8 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 8-1: QR code to the Rohde & Schwarz support page

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