R&S®Spectrum Rider FPH Handheld Spectrum Analyzer

Getting Started

1321.0996.02 ─ 02.00

ROHDE&SCHWARZ

Test & Measurement

Getting Started

This manual describes the following R&S®FPH model and options:

- R&S® FPH (1321.1111.02)
- R&S ®FPH-B3 (1321.0667.02)
- R&S ®FPH-B4 (1321.0673.02)
- R&S ®FPH-B22 (1321.0680.02)
- R&S ® FPH-K7 (1321.0696.02)
- R&S ® FPH-K9 (1321.0709.02)
- R&S ® FPH-K19 (1321.0721.02)
- R&S ® FPH-K29 (1321.0738.02)

The contents of this manual correspond to firmware version 1.00 or higher.

The firmware of the R&S Spectrum Rider makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgment" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual: R&S®Spectrum Rider is abbreviated as R&S Spectrum Rider, R&S®FPH is abbreviated as R&S FPH, R&S®InstrumentView is abbreviated as R&S InstrumentView.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any purpose other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

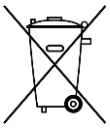
The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories. For product-specific information, see the data sheet and the product documentation.

Safety labels on products

The following safety labels are used on products to warn against risks and dangers.

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF Power
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Symbol	Meaning	Symbol	Meaning
	Caution ! Hot surface		Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth		Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.

DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.
In the product documentation, the word ATTENTION is used synonymously.

These signal words are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the signal words described here are always used only in connection with the related product documentation and the related product. The use of signal words in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of ±10 % shall apply to the nominal voltage and ±5 % to the nominal frequency, overvoltage category 2, pollution degree 2.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

If the information on electrical safety is not observed either at all or to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the mains-supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC 60950-1 / EN 60950-1 or IEC 61010-1 / EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.

2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
   - Class A equipment:
     Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings
     Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
   - Class B equipment:
     Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.

2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
5. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.
6. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
7. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal/Environmental protection

1. Specially marked equipment has a battery or accumulator that must not be disposed of with unsorted municipal waste, but must be collected separately. It may only be disposed of at a suitable collection point or via a Rohde & Schwarz customer service center.
2. Waste electrical and electronic equipment must not be disposed of with unsorted municipal waste, but must be collected separately.
   Rohde & Schwarz GmbH & Co. KG has developed a disposal concept and takes full responsibility for take-back obligations and disposal obligations for manufacturers within the EU. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.
3. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
4. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

For additional information about environmental protection, visit the Rohde & Schwarz website.

Instrucciones de seguridad elementales

¡Es imprescindible leer y cumplir las siguientes instrucciones e informaciones de seguridad!

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

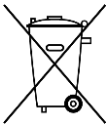
Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios. Los datos específicos del producto figuran en la hoja de datos y en la documentación del producto.

Señalización de seguridad de los productos

Las siguientes señales de seguridad se utilizan en los productos para advertir sobre riesgos y peligros.

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.

Símbolo	Significado	Símbolo	Significado
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.

⚠ PELIGRO	Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.
⚠ ADVERTENCIA	Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.
⚠ ATENCIÓN	Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.
AVISO	Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales. En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de ±10 % sobre el voltaje nominal y de ±5 % sobre la frecuencia nominal. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, se pueden causar lesiones o, en determinadas circunstancias, incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión.
   El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m).
   Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.

6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión U_{eff} > 30 V se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.
12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados —los llamados alérgenos (p. ej. el níquel)—. Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalizar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
   - Aparato de clase A:
     Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.
     Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.
   - Aparato de clase B:
     Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.
5. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
6. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
7. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.

2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación/protección del medio ambiente

1. Los dispositivos marcados contienen una batería o un acumulador que no se debe desechar con los residuos domésticos sin clasificar, sino que debe ser recogido por separado. La eliminación se debe efectuar exclusivamente a través de un punto de recogida apropiado o del servicio de atención al cliente de Rohde & Schwarz.
2. Los dispositivos eléctricos usados no se deben desechar con los residuos domésticos sin clasificar, sino que deben ser recogidos por separado.
   Rohde & Schwarz GmbH & Co.KG ha elaborado un concepto de eliminación de residuos y asume plenamente los deberes de recogida y eliminación para los fabricantes dentro de la UE. Para desechar el producto de manera respetuosa con el medio ambiente, diríjase a su servicio de atención al cliente de Rohde & Schwarz.
3. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Safety instructions for rechargeable lithium ion batteries

⚠ WARNING

Risk of serious personal injury or even death.

You must fully observe the following instructions in order to avoid serious personal injury – or even death – due to an explosion and/or fire.

1. Do not dismantle, open or crush the batteries or drop them from a great height. If mechanical damage occurs, there is a risk that chemicals may be released. Gases that are released can cause breathing difficulties. Immediately ventilate the area and in serious cases consult a doctor.
   Irritation can occur if the chemicals that are released come in contact with the skin or eyes. If this happens, immediately and thoroughly rinse the skin or eyes with water and consult a doctor.
2. Do not expose cells or batteries to heat or fire. Do not store them in direct sunlight. If overheating occurs, there is the risk of an explosion or a fire, which can lead to serious personal injuries.
3. Keep the batteries clean and dry. If the terminals become soiled, clean them with a dry, clean cloth.
4. Charge the batteries prior to using them.
   Only use the appropriate Rohde & Schwarz charger to charge the batteries. See the device manual or data sheet for the exact designation of the charger.
   If the batteries are improperly charged, there is a risk of explosion, which can cause serious personal injury.
5. The charging temperature must be between 0 °C and 45 °C
   (see manual for information on possible restrictions).
6. Discharging may take place only at temperatures between 0 °C and 50 °C
   (see manual for information on possible restrictions).
7. Only charge batteries until they are fully charged. Frequent overcharging can reduce the battery lifetime.
8. Remove the battery from the device when the battery is not being used. Following a longer period of storage, it may be necessary to charge and discharge the battery several times in order to obtain the full capacity.
9. Only use the battery with designated Rohde & Schwarz devices. See the device manual for details.
10. Do not dispose of the batteries with unsorted municipal waste. The batteries must be collected separately. After the end of their life, dispose of the batteries at a suitable collection point or via a Rohde & Schwarz customer service center.

EU labeling for batteries and secondary cells

11. Keep this safety information for future reference.

Instrucciones de seguridad para baterías recargables de ión litio

⚠ ADVERTENCIA Posibilidad de lesiones graves que en determinadas circunstancias puede causar la muerte.

Tenga en cuenta los siguientes avisos en caso de explosión y/o incendio para impedir lesiones graves en personas que, en determinadas circunstancias, podrían incluso causar la muerte.

1. No desarme las baterías, no las abra, no las triture ni las deje caer desde una gran altura.
   En caso de daños mecánicos existe el riesgo de salida de sustancias químicas. En caso de salida de gases pueden producirse dificultades respiratorias. Ventile inmediatamente la habitación y acuda a un médico en casos graves.
   Si sustancias químicas provenientes de la batería entran en contacto con la piel o los ojos pueden producirse irritaciones. Enjuague en estos casos la piel y los ojos inmediatamente con abundante agua y acuda a un médico.
2. No exponga las celdas o baterías al calor ni al fuego. No las almacene bajo la luz solar directa. En caso de sobrecalentamiento existe peligro de explosión o de incendio, lo que puede provocar lesiones graves en personas.
3. Mantenga las baterías limpias y secas. Si los conectores están sucios, límpielos con un paño seco y limpio.
4. Cargue las baterías antes de su uso.
   Solamente está permitido cargar la batería con el correspondiente cargador de Rohde & Schwarz. Consulte en el manual o en las especificaciones técnicas del equipo la denominación exacta del cargador.
   Si las baterías se cargan de forma incorrecta existe peligro de explosión, lo que podría causar lesiones graves en personas.
5. La temperatura de carga debe encontrarse entre 0 °C y 45 °C (consulte el manual para posibles restricciones).
6. La descarga solamente puede efectuarse entre 0 °C y 50°C (consulte el manual para posibles restricciones).
7. Cargue las baterías solamente el tiempo necesario hasta que se hayan cargado por completo. La sobrecarga frecuente reduce la vida útil de la batería.
8. Extraiga la batería del equipo si no se va a utilizar. Después de un periodo de almacenamiento prolongado puede ser necesario cargar y descargar varias veces la batería para recuperar su capacidad completa.
9. Utilice la batería exclusivamente con los equipos Rohde & Schwarz correspondientes. Consulte para ello el manual del equipo.
10. No elimine las baterías junto con los residuos urbanos sin clasificar, sino por separado. Para eliminar la batería una vez finalizada su vida útil, diríjase a un punto de recogida de residuos adecuado o a una oficina de representación de Rohde & Schwarz.

Etiquetado de la UE para baterías y acumuladores

11. Conserve estas instrucciones de seguridad para fines de información y consulta posterior.

Sicherheitshinweise
für wiederaufladbare Li-Ion-Batterien

⚠ WARNUNG Mögliche schwere Verletzungen, unter Umständen mit Todesfolge.

Beachten Sie die folgenden Hinweise vollständig, um schwere Verletzungen von Personen - unter Umständen mit Todesfolge - durch Explosion und/oder Brand zu verhindern.

1. Batterien nicht zerlegen, öffnen, zerkleinern oder aus großer Höhe fallen lassen. Bei mechanischer Beschädigung besteht die Gefahr des Austritts von Chemikalien. Austretende Gase können zu Atembeschwerden führen. Sofort lüften, in schweren Fällen einen Arzt konsultieren.
   Bei Haut- oder Augenkontakt mit austretenden Chemikalien können Hautirritationen und Reizungen auftreten. In diesen Fällen die Haut oder Augen sofort gründlich mit Wasser ausspülen und einen Arzt konsultieren.
2. Zellen oder Batterien weder Hitze noch Feuer aussetzen. Nicht im direkten Sonnenlicht lagern. Bei Überhitzung besteht die Gefahr einer Explosion oder eines Brandes, was zu schweren Verletzungen bei Personen führen kann.
3. Batterien sauber und trocken halten. Falls die Anschlüsse verschmutzt sind, mit einem trockenen, sauberen Tuch reinigen.
4. Batterien vor dem Gebrauch laden.
   Die Batterie darf ausschließlich mit dem entsprechenden Rohde &Schwarz Ladegerät geladen werden. Siehe Handbuch oder Datenblatt des Gerätes für die genaue Bezeichnung des Ladegerätes.
   Wenn Batterien unsachgemäß geladen werden, besteht Explosionsgefahr, was zu schweren Verletzungen bei Personen führen kann.
5. Die Ladetemperatur muss zwischen 0 °C und 45 °C betragen
   (für mögliche Einschränkungen siehe Handbuch).
6. Ein Entladen darf nur zwischen 0 °C und 50 °C erfolgen
   (für mögliche Einschränkungen siehe Handbuch).
7. Batterien nur so lange laden, bis sie vollständig aufgeladen sind. Ein häufiges Überladen führt zu einer geringeren Lebensdauer der Batterie.
8. Die Batterie aus dem Gerät entfernen, wenn sie nicht benutzt wird. Nach längerer Lagerzeit kann es erforderlich sein, die Batterie mehrmals zu laden und zu entladen, um die volle Leistungsfähigkeit zu erlangen.
9. Die Batterie nur mit dafür vorgesehenen Rohde & Schwarz-Geräten betreiben. Siehe dazu das Handbuch des Gerätes.
10. Die Batterien nicht über unsortierten Siedlungsabfall entsorgen, sondern getrennt sammeln. Nach Ende der Lebensdauer über eine geeignete Sammelstelle oder eine Rohde&Schwarz-Kundendienststelle entsorgen.

EU - Kennzeichnung für Batterien und Akkumulatoren

11. Diese Sicherheitsinformationen für zukünftige Informations- und Nachschlagezwecke aufbewahren.

Consignes de sécurité pour batteries rechargeables lithium-ion

⚠ AVERTISSEMENT Risque de blessures graves pouvant entraîner la mort.

Respecter intégralement les consignes ci-dessous afin d'éliminer tout risque de blessures graves voire mortelles par suite d'explosion et/ou d'incendie.

1. Ne pas démonter, ouvrir ou découper les batteries ni les faire tomber d'une hauteur importante. Des produits chimiques peuvent s'écouler en cas de détérioration mécanique et les gaz libérés peuvent provoquer des difficultés respiratoires. Aérer immédiatement les locaux. Dans les cas graves, consulter un médecin. Si la peau ou les yeux entrent en contact avec les produits chimiques libérés, des irritations peuvent se produire. Rincer immédiatement et abondamment la peau ou les yeux à l'eau claire et consulter un médecin.
2. Ne pas exposer les cellules ou les batteries à la chaleur ou au feu. Ne pas les stocker dans un endroit exposé à la lumière directe du soleil. Toute surchauffe risque de provoquer une explosion ou un incendie, ce qui peut entraîner des blessures graves.
3. Conserver les batteries dans un lieu sec et propre. Nettoyer les points de contact sales à l'aide d'un chiffon sec et propre.
4. Charger les batteries avant utilisation. Utiliser seulement le chargeur Rohde & Schwarz approprié pour recharger les batteries. Les références exactes du chargeur sont indiquées dans le manuel ou la fiche technique de l'appareil. Une recharge incorrecte des batteries peut entraîner des explosions susceptibles de causer des blessures graves.
5. Recharger impérativement à des températures comprises entre 0 °C et 45 °C (restrictions éventuelles : voir le manuel).
6. Décharger impérativement à des températures comprises entre 0 °C et 50 °C (restrictions éventuelles : voir le manuel).
7. Terminer la charge dès que les batteries sont complètement rechargées. Une surcharge répétée diminue la longévité des batteries.
8. Retirer les batteries de l'appareil lorsqu'elles ne sont pas utilisées. Après un stockage prolongé, plusieurs cycles de recharge et de décharge peuvent s'avérer nécessaires pour rétablir la pleine capacité des batteries.
9. Utiliser les batteries exclusivement dans les appareils Rohde & Schwarz auxquels elles sont destinées. Voir le manuel fourni avec chaque appareil.
10. Ne pas éliminer les batteries avec les déchets municipaux non triés mais s'assurer qu'elles soient collectées séparément. Recycler les batteries en fin de vie en les confiant à un point de collecte compétent ou à un point de service après-vente Rohde & Schwarz.

Marquage UE pour batteries et accumulateurs

11. Conserver ces consignes de sécurité de sorte à pouvoir vous y reporter ou vérifier ultérieurement certains points.

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

Europe, Africa, Middle East

Phone +49 89 4129 12345
customersupport@rohde-schwarz.com

North America

Phone 1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

Latin America

Phone +1-410-910-7988
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ROHDE&SCHWARZ

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Quality management and environmental management

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,
Sie haben sich für den Kauf eines Rohde&Schwarz Produktes entschieden. Sie erhalten damit ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unserer Qualitäts- und Umweltmanagementsysteme entwickelt, gefertigt und geprüft. Rohde&Schwarz ist unter anderem nach den Managementsystemen ISO 9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet
- Energie-effiziente, RoHS-konforme Produkte
- Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ISO 14001-zertifiziertes Umweltmanagementsystem

Dear customer,
You have decided to buy a Rohde&Schwarz product. This product has been manufactured using the most advanced methods. It was developed, manufactured and tested in compliance with our quality management and environmental management systems. Rohde&Schwarz has been certified, for example, according to the ISO 9001 and ISO 14001 management systems.

Environmental commitment
- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Cher client,
Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests de ce produit ont été effectués selon nos systèmes de management de qualité et de management environnemental. La société Rohde&Schwarz a été homologuée, entre autres, conformément aux systèmes de management ISO 9001 et ISO 14001.

Engagement écologique
- Produits à efficience énergétique
- Amélioration continue de la durabilité environnementale
- Système de management environnemental certifié selon ISO 14001

ROHDE&SCHWARZ

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Contents

1 Preface

1.1 Documentation Overview

The user documentation for the R&S Spectrum Rider is divided as follows:

- **Getting Started**
- **User Manual**
- **Service Manual**
- **Release Notes**
- **Internet Site**

Getting Started

The Getting Started provides basic information on the instrument's functions.

It covers the following topics:

- Overview of all elements of the front and rear panels.
- Basic information on how to set up the R&S Spectrum Rider.
- Information on how to operate the R&S Spectrum Rider in a network.
- Instructions on how to perform measurements.

User Manual

The User Manual provides a detailed description on the instrument's functions.

In this manual, a detailed description on the instrument's functions are provided. Furthermore, it provides a detailed description of the instrument's remote control commands and information on the instrument's status reporting system.

It covers the following topics:

- Instructions on how to set up and operate the R&S Spectrum Rider in its various operating modes.
- Instructions on how to perform measurements with the R&S Spectrum Rider.
- Instructions on how to work with the available software options and applications.

Service Manual

The Service Manual provides information on maintenance.

It covers the following topics:

- Instructions on how to perform a performance test.
- Instructions on how to repair the R&S Spectrum Rider including a spare parts list.
- Mechanical drawings.

Release Notes

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

Internet Site

The internet site at: http://www.rohde-schwarz.com/product/fph.html provides the most up to date information on the R&S Spectrum Rider. The most recent manuals are available as printable PDF files in the download area.

Also provided for download are firmware updates including the corresponding release notes, instrument drivers, current data sheets, application notes and image versions.

1.2 Conventions Used in the Documentation

The following conventions are used throughout the R&S Spectrum Rider manual.

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in underline blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen or a key on the instrument or on a keyboard.

1.2.3 Other Conventions

Remote commands may include abbreviations to simplify input. In the description of such commands, all parts that have to be entered are written in capital letters. Additional text in lower-case characters is for information only.

2 Preparing for Use

2.1 Putting into Operation

This chapter assists you in using the R&S Spectrum Rider for the first time. It describes the basic steps to be taken when setting up the instrument for the first time.

⚠ WARNING

Risk of injury and instrument damage

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

- Do not open the instrument casing.
- Read and observe the "Basic Safety Instructions" delivered as a printed brochure with the instrument or in electronic format on the documentation CD-ROM.
  In addition, read and observe the safety instructions in the following sections. Notice that the data sheet may specify additional operating conditions.

NOTICE

Risk of instrument damage

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

NOTICE

Risk of electrostatic discharge (ESD)

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

For details, refer to the safety instructions delivered in electronic format on the documentation CD-ROM.

NOTICE

Risk of instrument damage during operation

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

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

EMI impact on measurement results

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

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

2.1.1 Unpacking and Checking the Instrument

Check the equipment for completeness using the delivery note and the accessory lists for the various items. Check the instrument for any damage. If there is damage, immediately contact the carrier who delivered the instrument.

Packing Material

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

NOTICE

Risk of damage during transportation and shipment

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

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

2.1.2 Accessory List

The instrument comes with the following accessories:

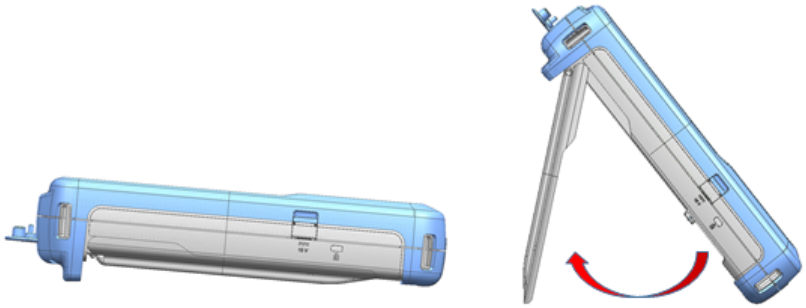
- Power supply cable and adapter set

- Li-ion rechargeable battery
- USB2.0 cable A-Mini
- Side strap
- Printed Getting Started manual
- Document folder containing safety instructions and calibration certificate
- R&S Spectrum Rider CD-Rom

2.1.3 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.



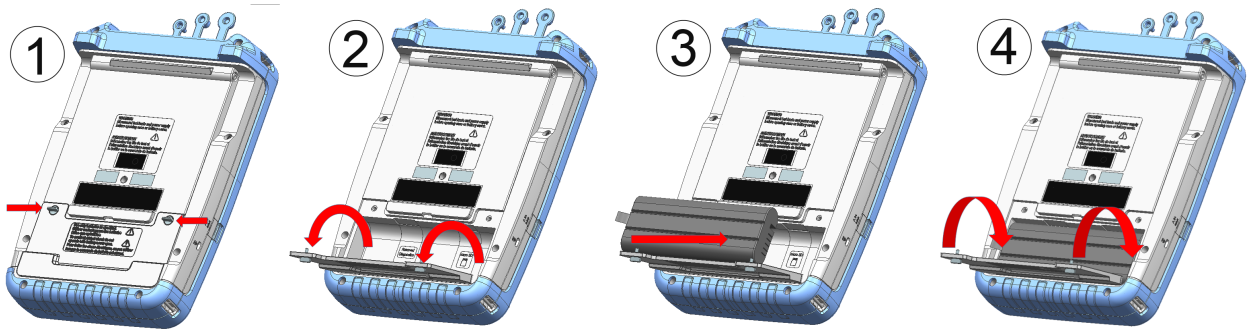
When laid out horizontally for operation from above, the R&S Spectrum Rider is tilted slightly due to the micro-stand at the back. This position provides the optimum viewing angle for the display.

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.

For use on site or service measurements, it is best to hold the instrument in both hands. All the controls are easy to reach. It is also recommended to use the shoulder strap (R&S HA-Z323, order number 1321.1363.00) while working on the device under test (DUT) as it provides the ease of work during transport.

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.

2.1.4 Using the AC Adapter

NOTICE

Risk of instrument damage

To avoid instrument damage,

- Only use the power supply included in the delivery (R&S HA-Z301) only.
- 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 (R&S HA-Z301, order number 1321.1386.00) to the DC port on the left side of the R&S Spectrum Rider (item 1 of Figure 2-1). Make sure to fully insert the plug into the 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 2-1).

Finally, connect the plug to an AC power outlet.

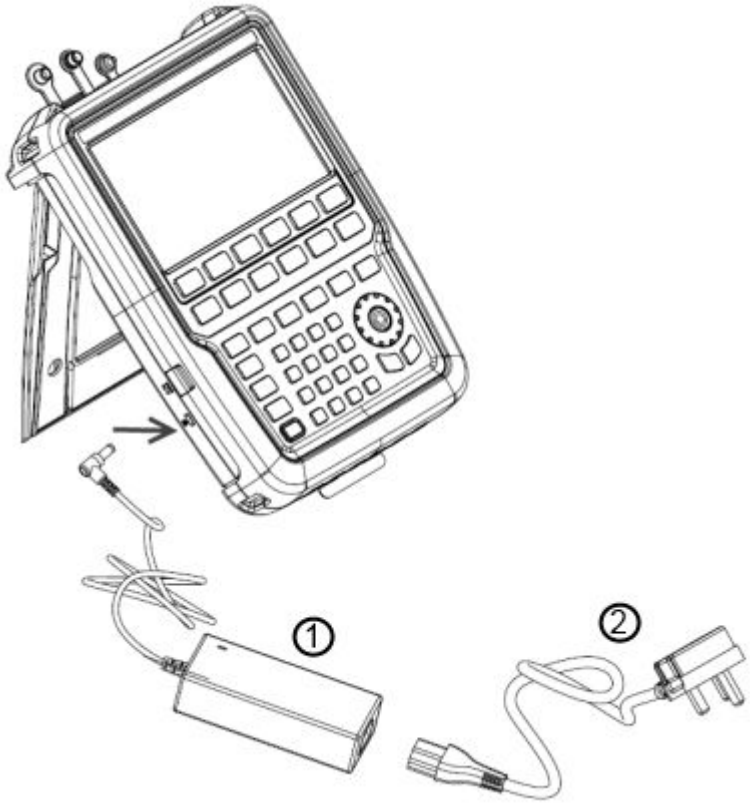


Figure 2-1: AC adapter

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.

2.1.5 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 in . See Chapter 3.3.1, "Title Bar", on page 34.

The lithium ion battery has a capacity of approximately 6.4 Ah and it allows operation of up to 8 hours when it is fully charged.

The actual operation time depends on the current charge status, the ambient temperature and the operating mode of the R&S Spectrum Rider.

When the R&S Spectrum Rider is in operation, the power's LED displays green on the button, the battery charging status can also be viewed on the "Title Bar". See Chapter 3.3.1, "Title Bar", on page 34.

When the R&S Spectrum Rider is not in operation, the power's LED displays blue for a fully charged battery and it blinks in blue to indicate a battery charging process.

The battery charging and discharging process of the battery icon shown on the "Measurement Title" is illustrated below:

Figure 2-2: Battery charging process

Figure 2-3: Battery discharging process

While charging, the green slot on the battery icon is added from the right to left to indicate that the battery is charging while connected to the power supply.

When battery is fully charged, there will be four green slots in the battery icon. Every single slot is approximately 25% of the battery capacity. See Figure 2-2.

During the discharging process, the white slot in the battery icon is reduced until it turns to a single red slot. This shows that the battery has reached low level. See Figure 2-3.

Charging time is about 3 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 4 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 delivered battery included in the standard delivery is also available if required.

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 18.

Using an external battery charger

You can also use an external battery charger (R&S HA-Z303, order no. 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.

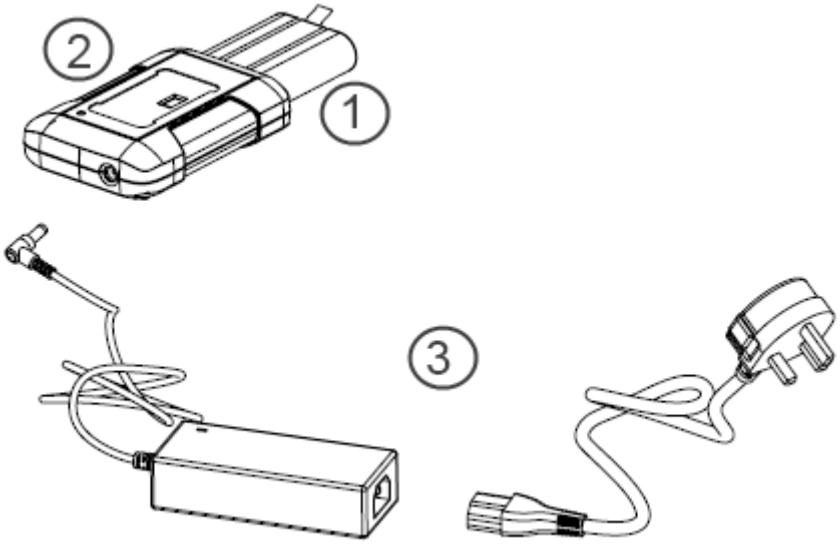


Figure 2-4: External battery charger

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

Prohibition of operating R&S Spectrum Rider

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 is on is prohibited.

2.1.6 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.

2.1.6.1 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.

2.1.6.2 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 prior to use. The temperature should not exceed 30°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.

2.1.6.3 Transportation

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

2.1.6.4 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 it in fire.

2.2 Switching the Instrument On and Off

Switching the instrument on

The instrument can be powered with an AC or DC (battery operated or via car adapter) input. See Chapter 2.1.4, "Using the AC Adapter", on page 15.

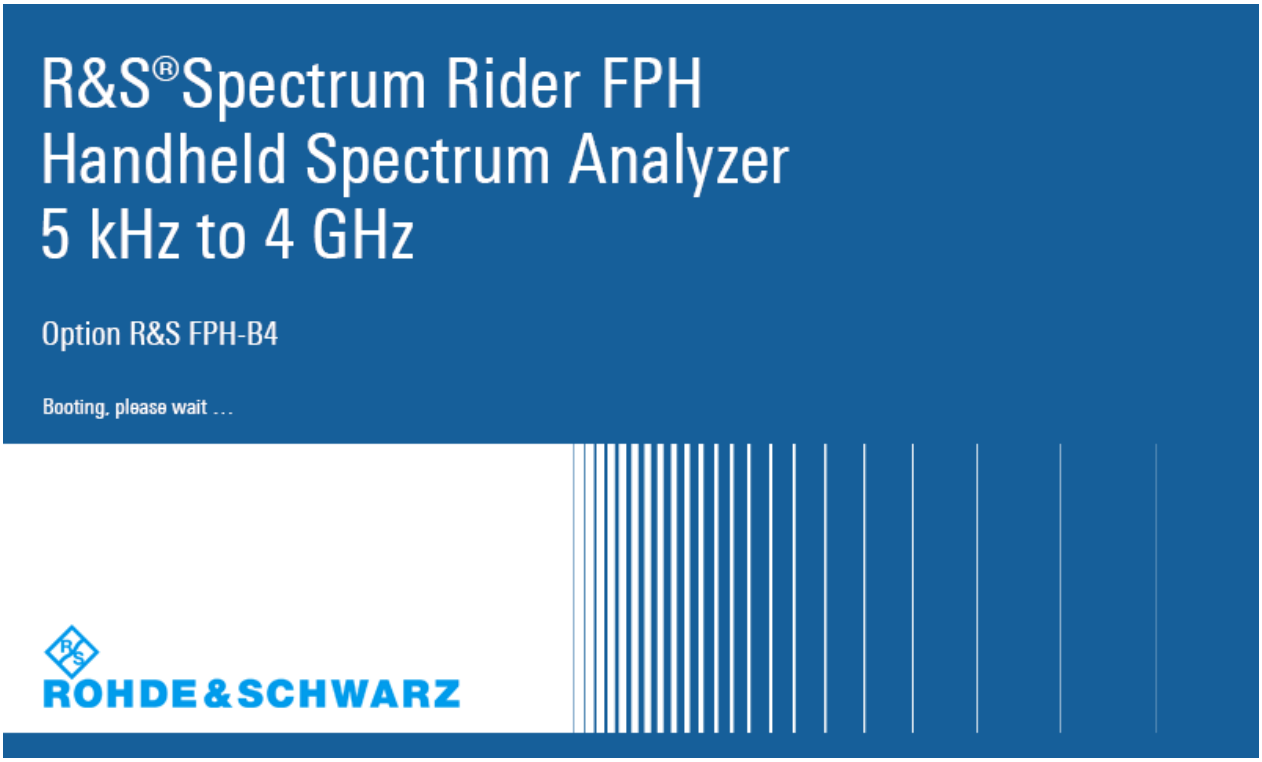
Press the POWER key to switch on the instrument. A green LED shows that the instrument is in operation mode.

See details in Chapter 2.1.5, "Battery Operation", on page 16.

During booting, the R&S Spectrum Rider displays a splash screen to indicate the operable frequency range of the instrument. If frequency upgrade option has been installed, the splash screen will show "5 kHz to 3 GHz" for R&S FPH-B3 option or "5 kHz to 4 GHz" for R&S FPH-B4 option. The spalsh screen shows "5kHz to 2 GHz" by default.

Depending on the frequency upgrade option installed, the respective splash screen is loaded. Refer to the instrument brochure for the list of options available.

After booting, the instrument is ready for operation.



Switching the instrument off

Press the POWER key to switch off the instrument. A blue LED button indicates that the battery is fully charged, a blinking blue LED shows that the battery charging is in process. See Chapter 2.1.5, "Battery Operation", on page 16.

In case the battery is not inserted into R&S Spectrum Rider, the amber LED is displayed.

In general, a red LED indicates that there is a battery charging error.

Table 2-1: 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 charge 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.

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.

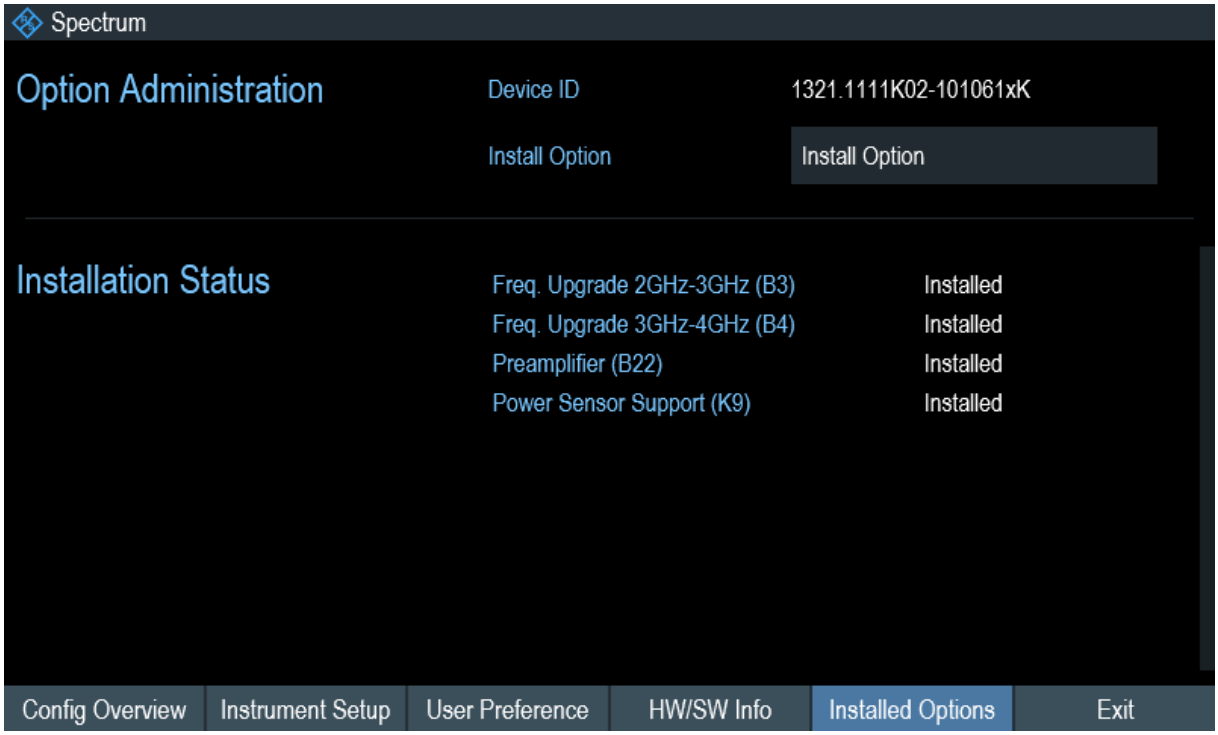
Press the POWER key first to shut down the application properly.

2.3 Checking the Supplied Options

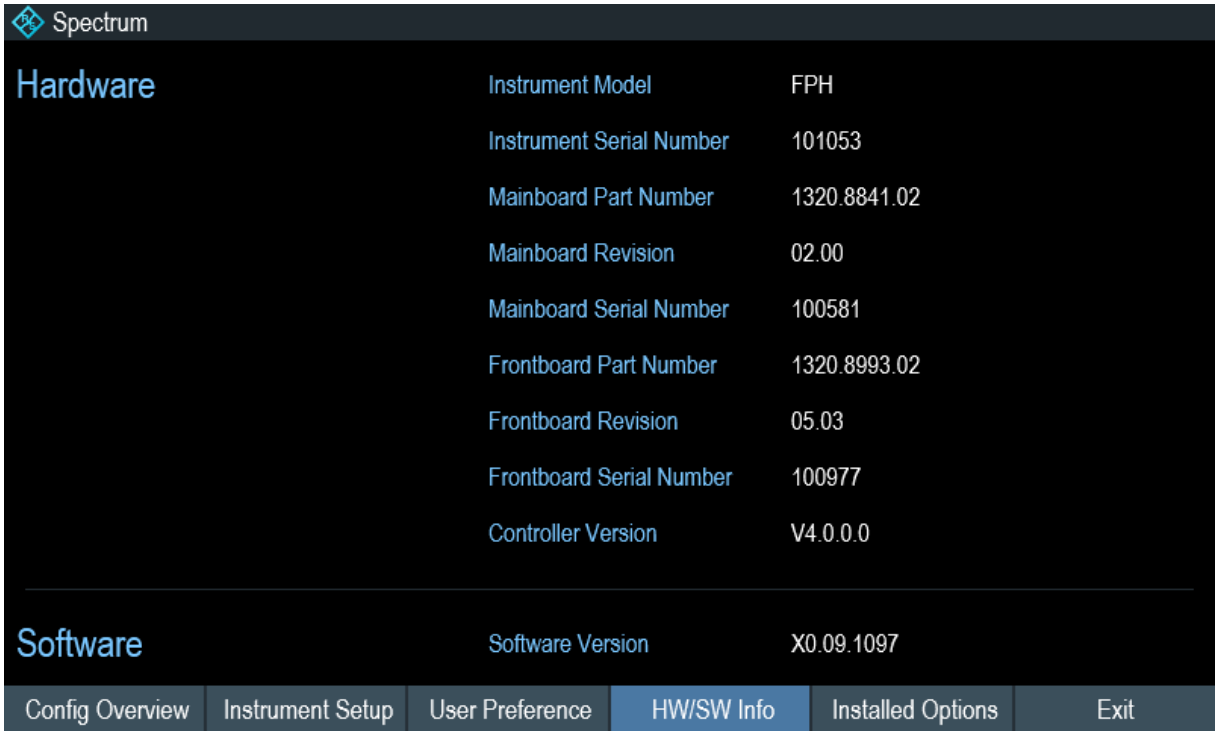
The instrument can be equipped with different hardware and installed options. For a list of R&S Spectrum Rider supported hardware and installed options, refer to the instrument brochure for the list of options available.

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

1. Press the SETUP key.
2. Select the "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 the "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

3 Instrument Tour

This chapter describes the front panel, 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.

3.1 Overview Control

Figure 3-1: Front Panel of R&S Spectrum Rider

1 = RF Input (N-connector)
2 = BNC connectors
3 = Headphone jack
4 = USB ports

5 = Touch-sensitive screen area
6 = Softkey labels (on display)
7 = Softkey
8 = System Keys
9 = DC port (behind protective cap)
10 = Kensington lock
11 = Function Keys
12 = Power key
13 = Alphanumeric key
14 = Unit keys
15 = Back key
16 = Cancel key
17 = Rotary knob
18 = Screenshot key
19 = LAN and Mini USB ports (behind protective cap)
**20 = SD Card Slot (not visible as it is located behind the battery compartment)

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.

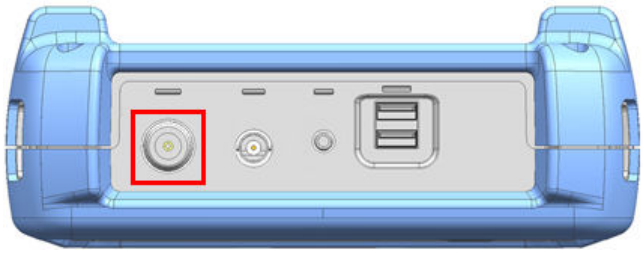
The outside of the instrument can be cleaned sufficiently using a soft, lint-free dust cloth.

3.2 Connectors of the R&S Spectrum Rider

The R&S Spectrum Rider has several connectors. The connectors are either on the upper, left or right side of the instrument.

3.2.1 RF Input

The RF input 50Ω is located on the top of the R&S Spectrum Rider.



Connect a cable or DUT to the RF input with an N connector. 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

In order to avoid electrical shock the DC input voltage you must never exceed the value specified on the housing.

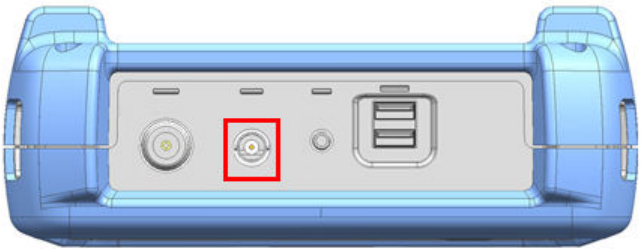
NOTICE

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.

3.2.2 BNC Connector

The BNC connector is located on the top of the R&S Spectrum Rider.



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 Chapter 3.5.5, "Function Keys", on page 43. The trigger threshold is similar to that of TTL signals.

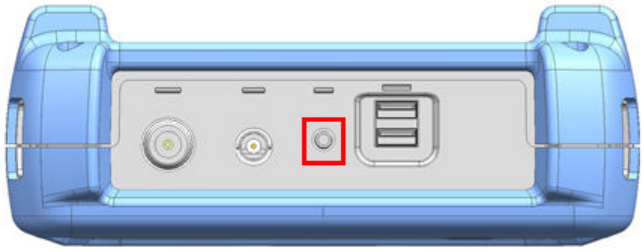
When the BNC connector is configure as reference input, you can apply a 10 MHz external reference signal to it for frequency synchronization. The external reference label Ext Ref is displayed at the top right corner of the trace window to indicate that the reference signal is supplied via external signal 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 50 and Chapter 3.7.2, "Using the GPS receiver", on page 50.

3.2.3 Headphone Jack

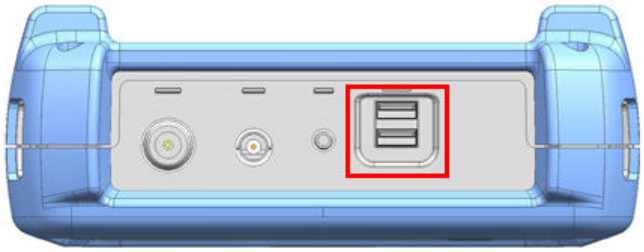
The 3.5 mm connector for headphones is located on the top of the R&S Spectrum Rider.



The internal impedance of the connector is approximately 10 Ohm.

3.2.4 USB Port

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

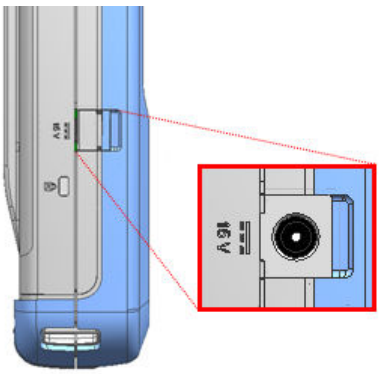


You can use the USB interface to connect a memory stick and store data sets or screenshots.

The USB connector can also be used to control the operation of the power sensor and GPS receiver. See Chapter 4.2, "Using a Power Sensor", on page 77 and Chapter 3.7.2, "Using the GPS receiver", on page 50.

3.2.5 DC Port

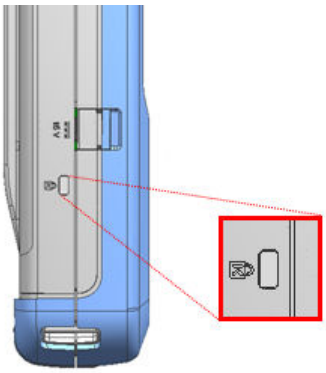
The DC port is located on the left side of the R&S Spectrum Rider behind a protective cap.



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.

3.2.6 Mechanical Locking Device

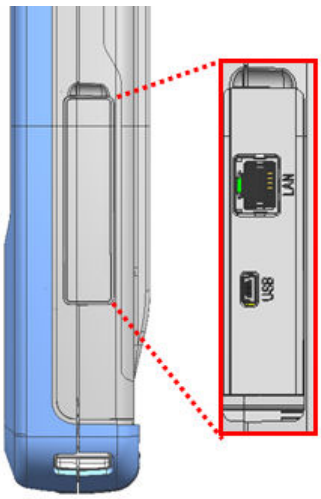
The Kensington lock is located on the left side of the R&S Spectrum Rider behind a protective cap.



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

3.2.7 Mini USB and LAN Port

The mini USB and LAN ports are located on the right side of the R&S Spectrum Rider behind a protective cap.

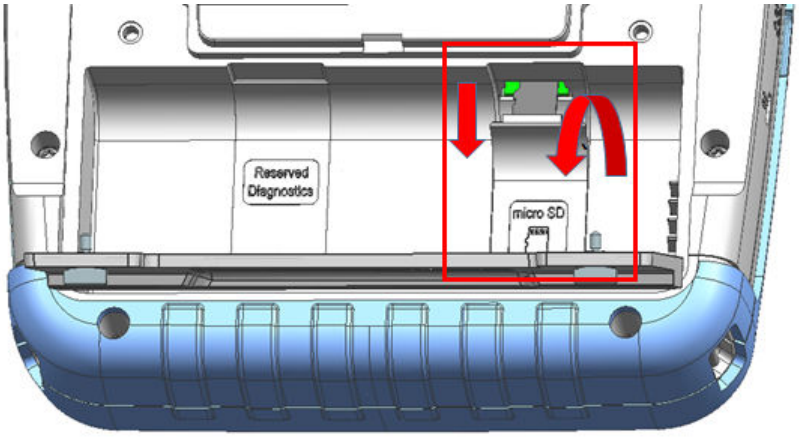


You can connect the R&S Spectrum Rider to a PC via USB or LAN and transfer data in both directions.

Configure the USB and LAN connection via the "Instrument Setup" menu. For more information, see Chapter 3.7.1, "Configuring the Hardware", on page 49.

3.2.8 SD Card Slot

The 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.

3.3 Touchscreen Display

All measurement results are displayed on the screen. Additionally, the screen display provides status and setting information and it allows you to 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.

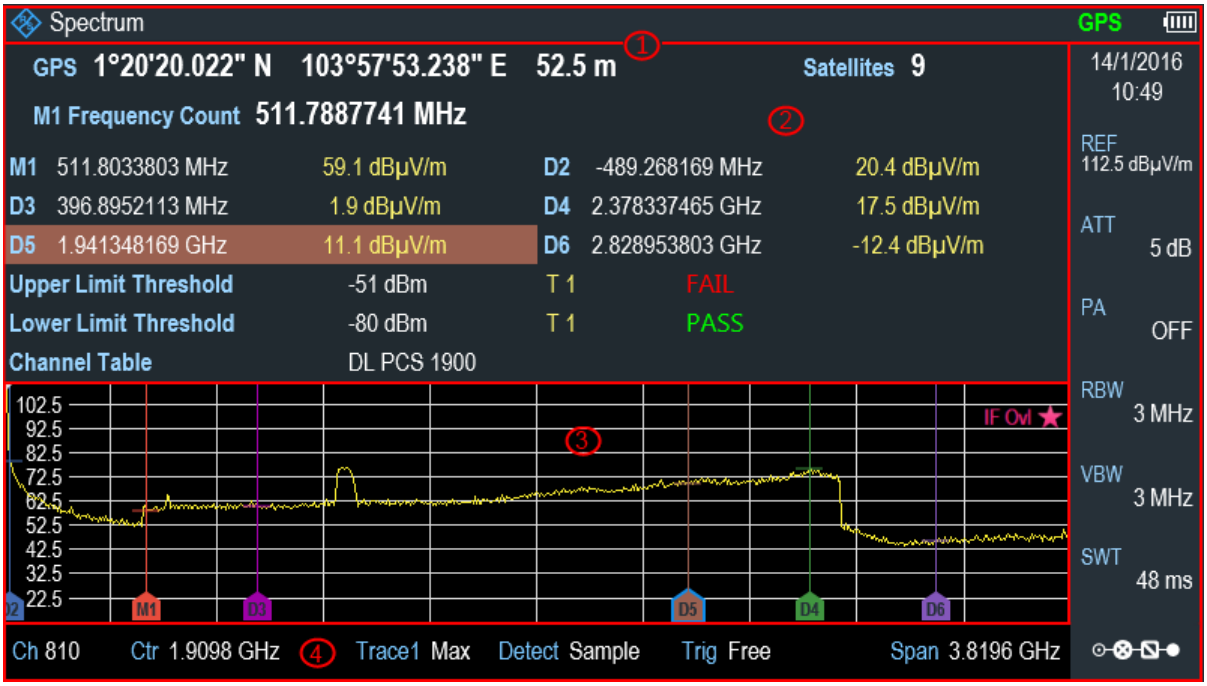


Figure 3-2: R&S Spectrum Rider touchscreen element

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.

3.3.1 Title Bar

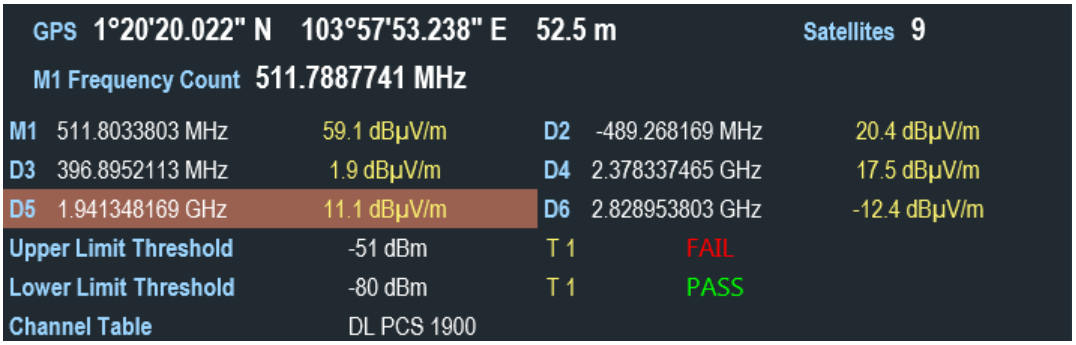
The "Title bar" is located on top of the layout.

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, channel table name etc.

3.3.2 Measurement Result View

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.
- 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 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".

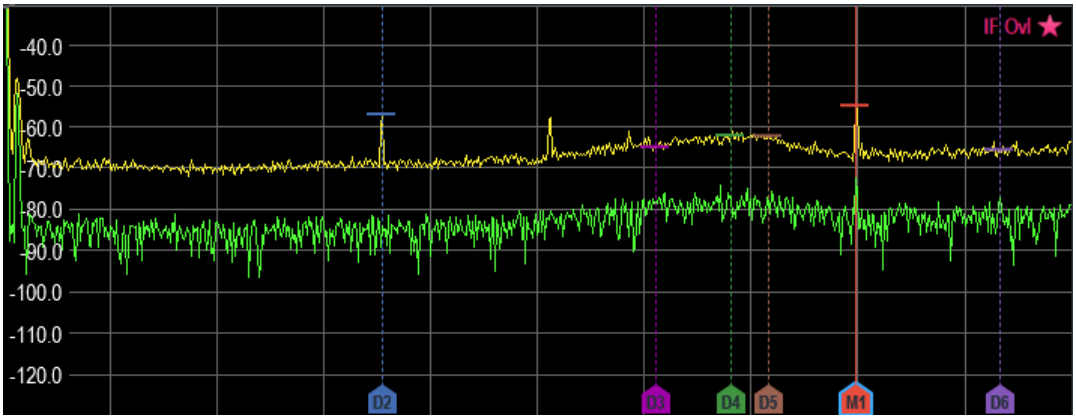
Table 3-1: Highlighted marker

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 73.

3.3.3 Measurement Trace Window

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.



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

NOTICE

Device Warning Message

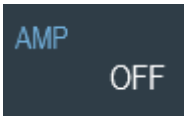
- IF Ovl: This message indicates that the downconverter of the intermediate frequency (IF) is overloaded in R&S Spectrum Rider.
- In general, a star ★ indicates that the measurement is still in progress.

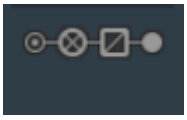
3.3.4 Parameter View

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

It displays the time and date information at the top right corner of the layout and at the bottom right corner it displays the "Configuration Overview" button. See Figure 3-2.

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") selected in the softkey label. See Chapter 3.5.3, "Softkey", on page 42. 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.
"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.
"AMP" 	Select "AMP" to toggle between the "ON" and "OFF" status for the optional preamplifier (R&S FPH-B22) of the spectrum measurement. Note: When the optional preamplifier (R&S FPH-B22) 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 Chapter 3.3.4.1, "Configuration Overview", on page 38.

3.3.4.1 Configuration Overview

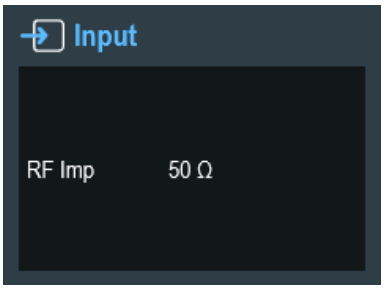
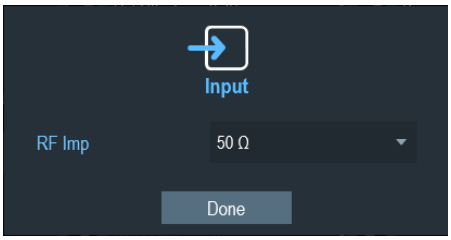
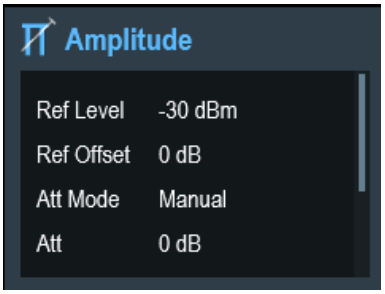
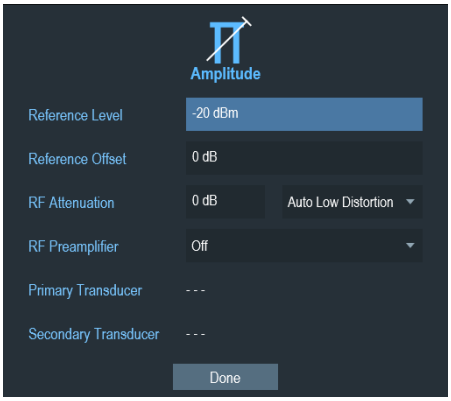
This is a dedicated button located at the bottom of the "Parameter View", it is operation mode dependent. See Figure 3-2.

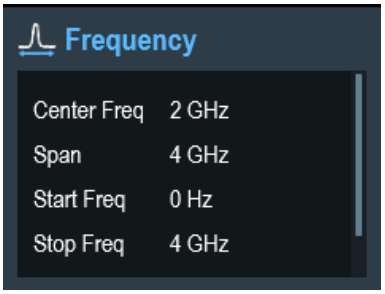
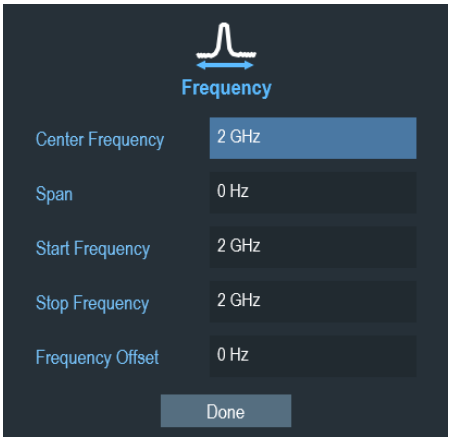
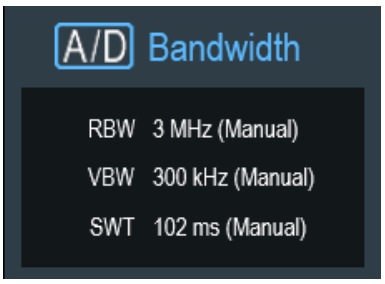
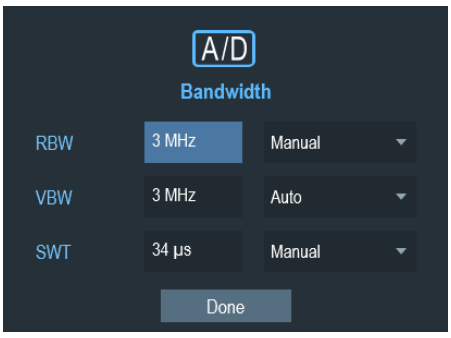
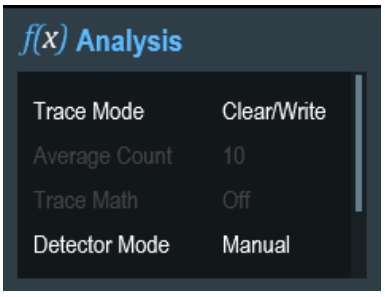
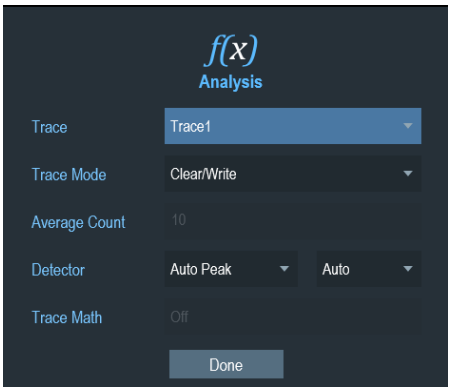
When you select this button, it opens the "Config Overview" window. Accessing it without the touchscreen input is possible via the SETUP key. See Chapter 3.5.4, "System Keys", on page 42.

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 3-2: 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, preamplifier (R&S FPH-B22, order number 1321.0680.02), RF attenuation level and mode. It also provides configuration to set the transducer table used in the signal measurement. Note: When the optional preamplifier (R&S FPH-B22) 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.

3.4 On-screen Keyboard

The on-screen keyboard is an additional means of interacting with the instrument. It provides an ease of use together with the touch-screen 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 will be disabled.

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

3.5 Front Panel Keys

3.5.1 POWER Key

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

See Chapter 2.2, "Switching the Instrument On and Off", on page 21.

See also Chapter 3.1, "Overview Control", on page 25.

3.5.2 Screenshot Key

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

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

3.5.3 Softkey

The six softkeys on the front panel are used to access the softkey label. See Chapter 3.1, "Overview Control", on page 25.

The softkeys label are function specific depending on the key selected on the front panel of the instrument. See Chapter 3.5.5, "Function Keys", on page 43.

3.5.4 System Keys

System keys configure the instrument to a predefined state, change basic settings, configure evaluation setting and provide save and recall functions.

A detailed description of the corresponding functions is provided 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
MODE	Provides the selection between applications.

SYSTEM Keys	Descriptions
LINES	Configures limit lines.
SAVE RECALL	Provides a file manager function to facilitate the saving and recalling of result and instrument settings.

3.5.5 Function Keys

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

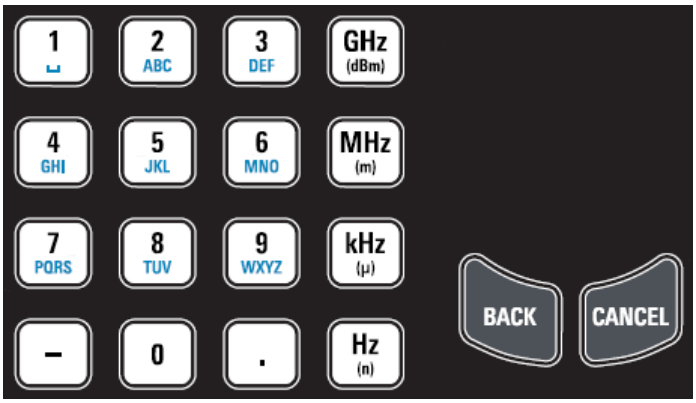
A detailed description of the corresponding functions is provided in the R&S Spectrum Rider user manual.

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 preamplifier (R&S FPH-B22, order number 1321.0680.02). Set 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
MARKER	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. Provide the following marker functions: • Marker mode function which provide 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.
MEAS	This key provides functionality to select and configure measurement such as: • Spectrum

3.5.6 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.

Type of key	Description
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 a 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 the back key restores the value entered before. This can be used to toggle for example between two frequencies.

3.5.7 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 and limit lines on the screen
- Moves the scroll bar vertically if the scroll bar is in focused
- Acts as the enter key when pressed

3.6 Managing Options

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

3.6.1 Enabling Options

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

1. Press the SETUP key.
2. Select the "Installed Options" softkey.
   A list of all available options and the current status of the options is displayed.
   See Chapter 2.3, "Checking the Supplied Options", on page 22.
3. Select the "Install Option" button 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 message: "installation successful".
   If you have entered an incorrect code, the instrument displays message: "invalid key code!".
6. Enter the correct code again.

3.6.2 Checking Options

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

1. Press the SETUP key.
2. Select the "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 from the R&S Spectrum Rider and is ready to be transferred to another R&S Spectrum Rider.

3.6.3 Managing Options with R&S License Manager

If you are using the R&S Spectrum Rider in a local area network (LAN), you can manage the firmware options with a web browser (e.g. Microsoft Internet Explorer or Mozilla Firefox).

For more information on connecting the R&S Spectrum Rider to a LAN, see Chapter 3.8.1, "LAN Connection", on page 63.

After you have connected the R&S Spectrum Rider, open your web browser.

1. Enter the IP address of the R&S Spectrum Rider in the address bar of the web browser.

The browser will access the R&S License Manager. In this part of the R&S License Manager, you can install and activate licenses on the R&S Spectrum Rider.
This page features three areas:

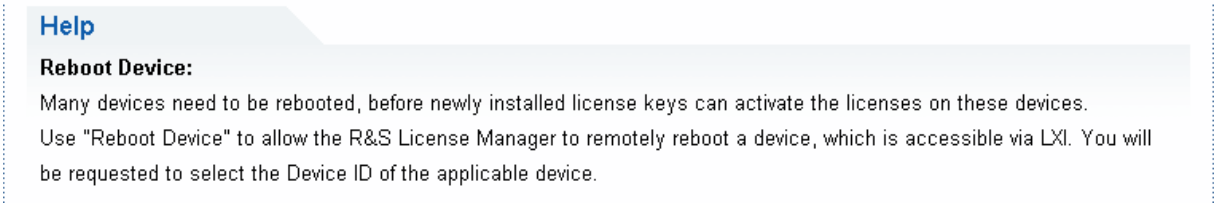
- The first area shows the details of the connected device including the device ID and the IP address.

- The second area provides functionality to install and activate licenses.

  - **Install Registered License Keys and Activate Licenses**
    Follow this link if you have purchased a registered license. Registered licenses only work in combination with a specific device ID.
  - **Register Licenses, Install License Keys and Activate Licenses**
    Follow this link if you have purchased an unregistered license. Unregistered licenses are not connected to a specific device ID.

– **Reboot Device**
Follow this link to reboot the R&S Spectrum Rider.
–
Opens a detailed online help to the corresponding topic.

- The third area provides hints on using the license manager when you move the mouse over one of the options.



If you already have one or more R&S Spectrum Rider equipped with options, you can manage the licenses of these options on the license manager web page.

2. Select the Manage Licenses button.
The browser will access another part of the R&S License Manager. In this part of the license manager you can manage licenses already installed on your R&S Spectrum Rider.
This page features two areas:

- The first area provides functionality to manage licenses already installed on a device.

– **Register Licenses**
Follow this link if you have purchased an unregistered license. Unregistered licenses only work in combination with a specific device ID.
– **Unregister License**
Follow this link if you have installed a portable license. Portable licenses work in combination with several device IDs. However, you have to unregister it on one device before you can use it on another.
– **Move Portable License**
Follow this link if you want to move a portable license. Moving a portable license is possible without unregistering the license.
–
Opens a detailed online help to the corresponding topic.

- The second area provides hints on using the R&S License Manager when you move the mouse over one of the options.

After you have followed one of the links, follow the instructions displayed in the browser. If you encounter any problems during the licensing procedure, you can access the online help at any time with the icon . The online help contains an extensive description of all functionality that the license manager features.

3.7 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 the "Instrument Setup" softkey.
   A corresponding dialog box to configure instrument opens.
3. Select the item you want to modify.

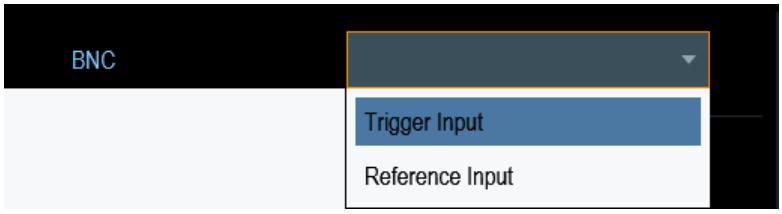
3.7.1 Configuring the Hardware

The hardware setting controls the setting of internal hardware.

Configuring the BNC connector

You can use the BNC connectors for various applications. For more information on the supported applications, see Chapter 3.2.2, "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.

3.7.2 Using the GPS receiver

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

Location to secure GPS receiver

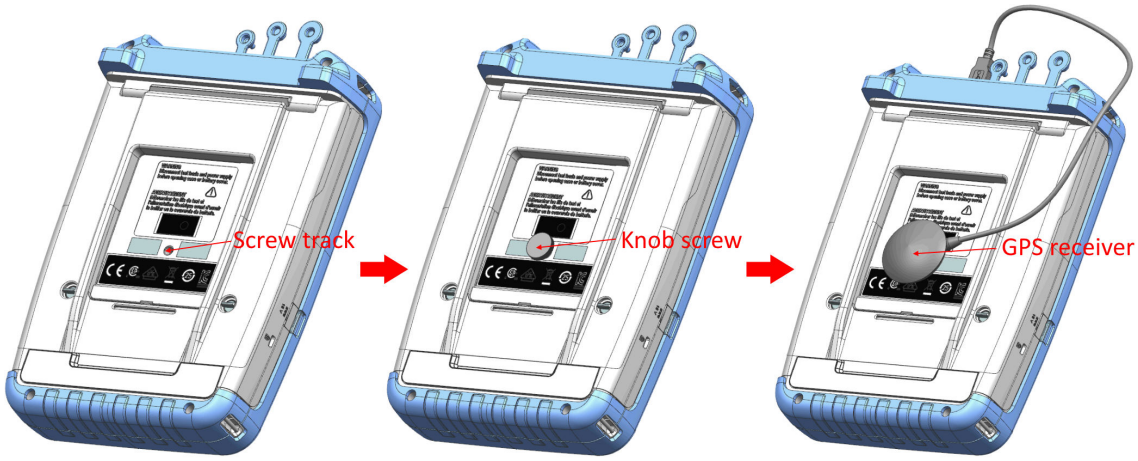


Figure 3-3: Location of GPS receiver

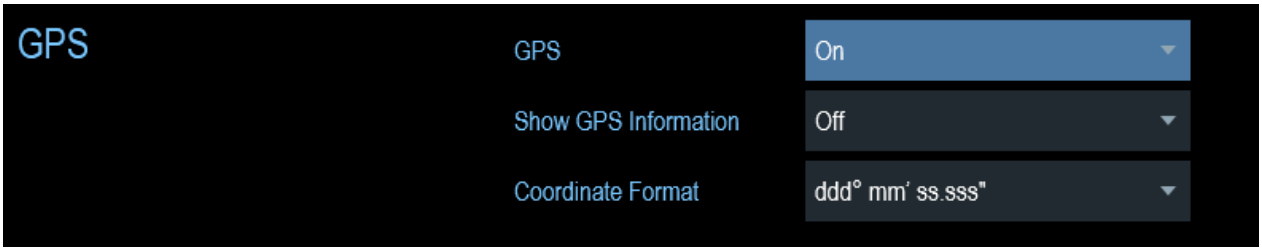
- Tighten the knob screw supplied with the GPS receiver (R&S order number 1321.1392.02) to the screw track located at the back of R&S Spectrum Rider.
- The GPS receiver can be conveniently attached to the knob screw as shown in Figure 3-3.

GPS reference frequency

The reference frequency is automatically adjusted as soon as the GPS receiver is enabled and a fix connection with enough satellites is established.

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

It also shows some information about the GPS connection like the number of tracked satellites and the signal quality.



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 set on, the R&S Spectrum Rider is ready to receive GPS data.

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 coordinates on and off.
2. Turn the display of GPS coordinates 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.

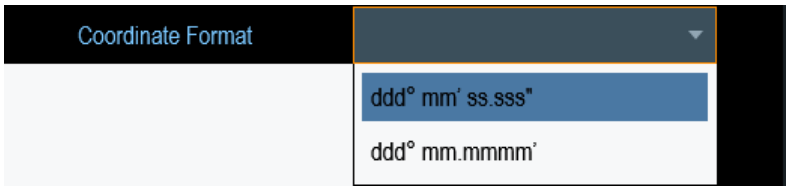
The state of the satellite lock is shown in the title bar.

- GPS in the title bar 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 in the title bar indicates that the GPS receiver is enabled but that there is no fix connection to a satellite.
- ~~GPS~~ in the title bar 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

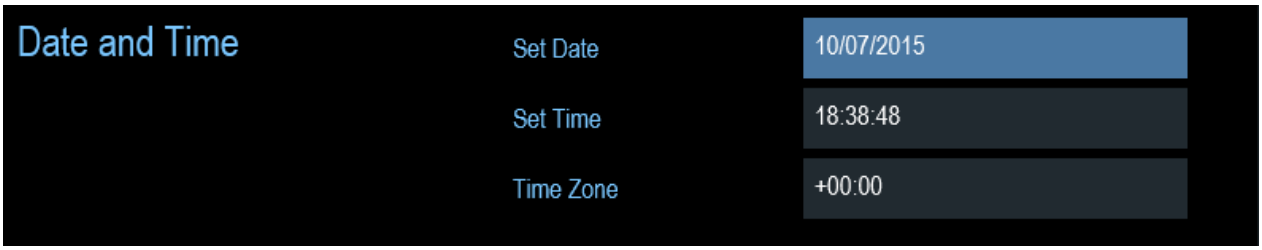
1. In the "Instrument Setup" dialog box, select the "Coordinate Format" item.
   A drop-down menu opens to select the coordinate format.



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

3.7.3 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 you want with the numeric keys. The sequence depends on the selected date format. See "Setting the date format" on page 55.

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 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 the next valid time.

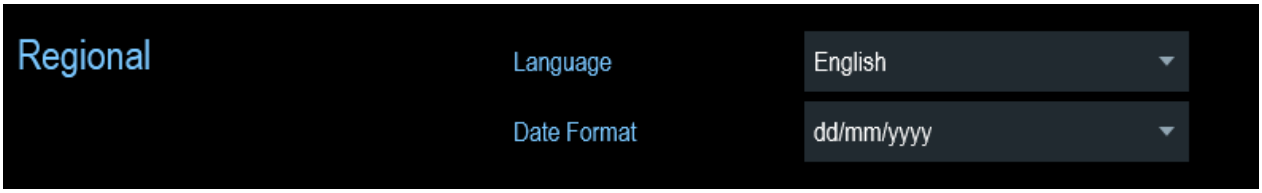
Selecting the time zone

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.

3.7.4 Selecting Regional Settings

The regional settings allow you to select a different language and date format.



Selecting 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

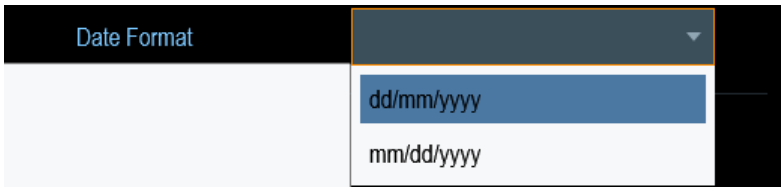
1. In the "Instrument Setup" dialog box, select the "Language" item.
   A drop-down menu opens to select the language.

2. Select one of the languages from the drop-down menu.
3. Reboot the device in order to activate the choice of selected language.

Setting the date format

The R&S Spectrum Rider provides 2 different formats to display the date.

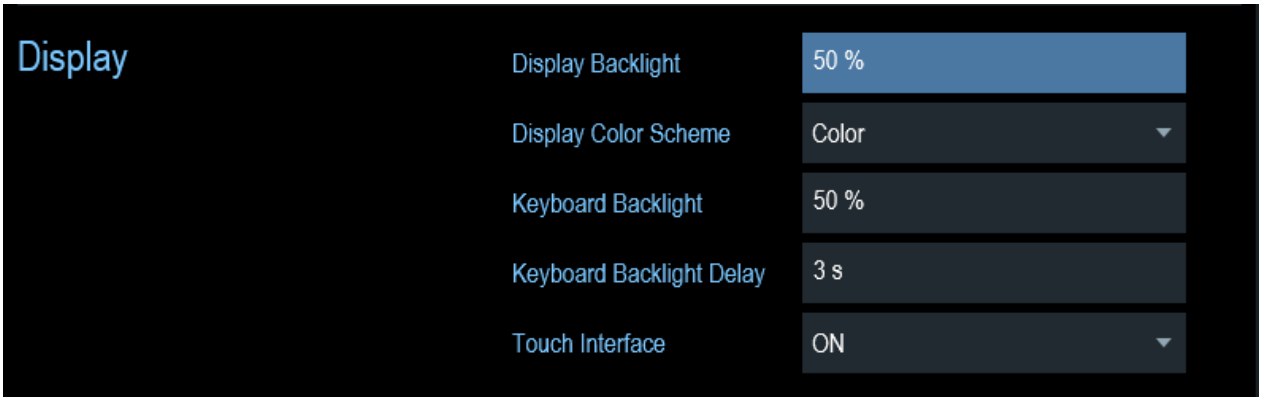
1. In the "Instrument Setup" dialog box, select the "Date Format" item.
   A drop- down menu opens to select the date format.



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

3.7.5 Configuring the Display

The display settings configure 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 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

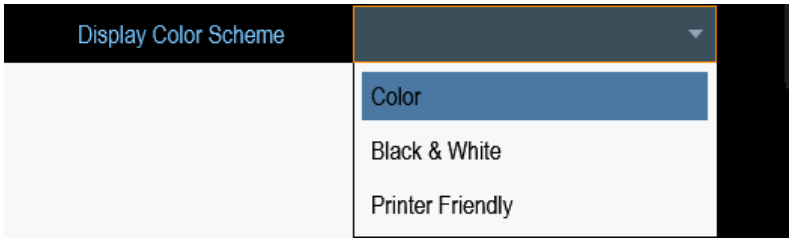
1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the backlight intensity you want with the numeric keys.

   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 desire color scheme from the drop-down menu.
   a) "Color" selects a color display.
   b) "Black & White" selects monochrome display.
   c) "Printer Friendly" inverts the colors.

Adjusting the keyboard backlight

1. In the "Instrument Setup" dialog box, select the "Keyboard Backlight" item.
2. Enter the backlight intensity 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.

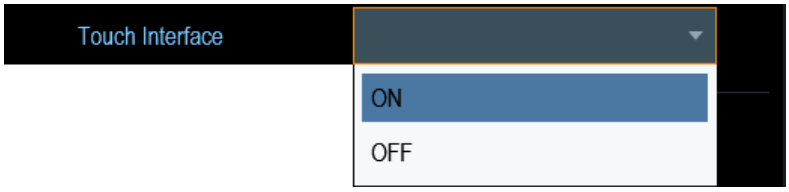
Adjusting the keyboard backlight delay

1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the time 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

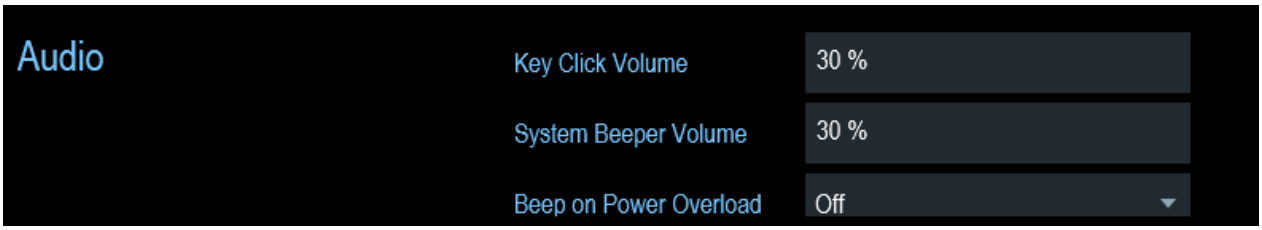
1. In the "Instrument Setup" dialog box, select the "Touch Interface" item.
2. Select "ON" to activate the touchscreen interface with R&S Spectrum Rider.



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

3.7.6 Configuring the Audio Output

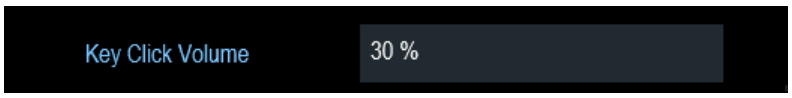
The audio settings control the audio output of the system.



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 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 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 in case of a power overload on and off

In case the R&S Spectrum Rider detects an overload at one of its inputs, you can configure it to make a sound.

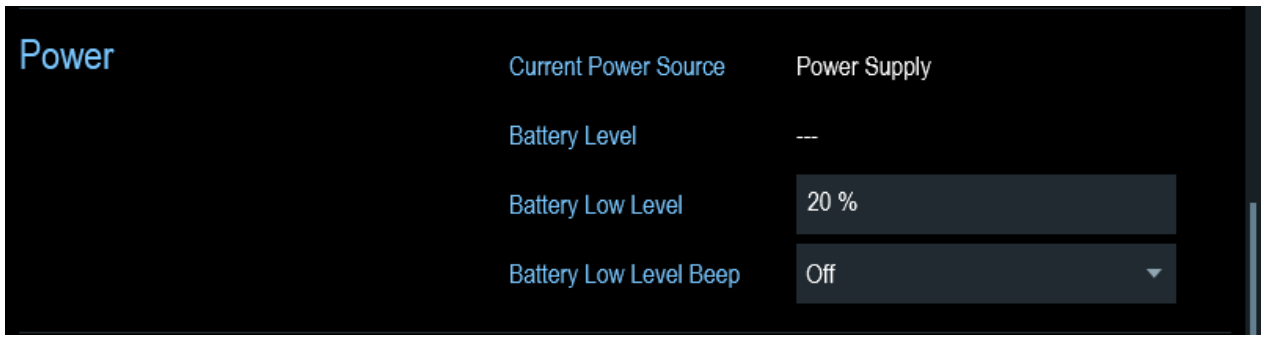
1. In the "Instrument Setup" dialog box, select the "Beep on Power Overload" item.
2. Select "Beep on Power Overload" to "On".
   When this beeper is turned on, the R&S Spectrum Rider will make a sound every time it detects an overload.

3.7.7 Configuring Power Supply

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

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

The power sets the low power indicator on the power supply of the R&S Spectrum Rider.



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 Chapter 2.1.5, "Battery Operation", on page 16 and Chapter 3.3.1, "Title Bar", on page 34.

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 in case of battery low level state on and off

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 the audio signal on.
   If you have selected "Once", the R&S Spectrum Rider will beep once if the battery runs out of power. For a continuous beep, select "Repetitive".
3. Select "Off" to turn off the beeper.

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

► Press the PRESET key.

Resetting the R&S Spectrum Rider

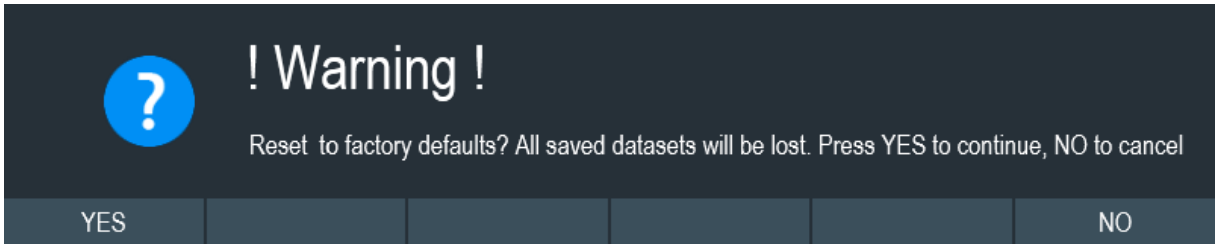
A "Reset to Factory Settings" resets the R&S Spectrum Rider to the factory defaults.

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 will be 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.

Selecting "Yes" performs the reset. During the reboot, it shows a corresponding message.
Selecting "No" cancels the reset.

3.8 Connecting the R&S Spectrum Rider to a PC

The R&S Spectrum Rider comes with the R&S InstrumentView software package. This software package features several tools that allow you to document measurement results or create and edit limit lines or channel tables among other things.

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. See Chapter 3.2.7, "Mini USB and LAN Port", on page 30.

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

1. Run the CD-ROM delivered with the R&S Spectrum Rider.
2. Navigate to the "Software" section and start the setup file.
3. Follow the instructions on the screen.
   Alternatively, you can download the latest R&S InstrumentView from the R&S Spectrum Rider product homepage.

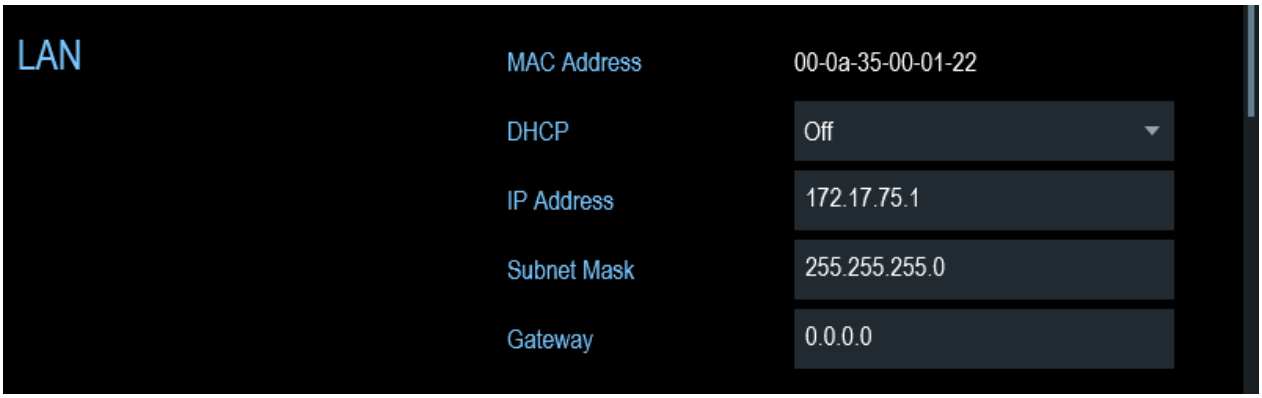
Firewall settings

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.

3.8.1 LAN Connection

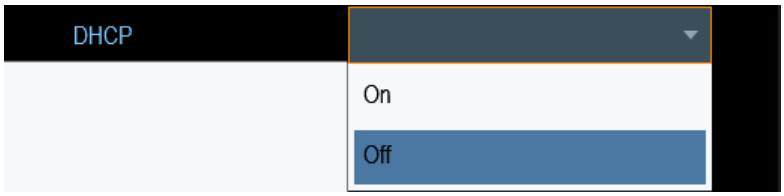
You can connect the R&S Spectrum Rider directly to the PC with a LAN cable. The LAN port is located on the right side of the R&S Spectrum Rider behind a protective cap. See Chapter 3.2.7, "Mini USB and LAN Port", on page 30.

You can set up the LAN connection in the "Instrument Settings" dialog box. See Chapter 3.7, "Configuring the R&S Spectrum Rider", on page 49.



For a direct connection between a PC and the R&S Spectrum Rider, DHCP (Dynamic Host Configuration Protocol) 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.

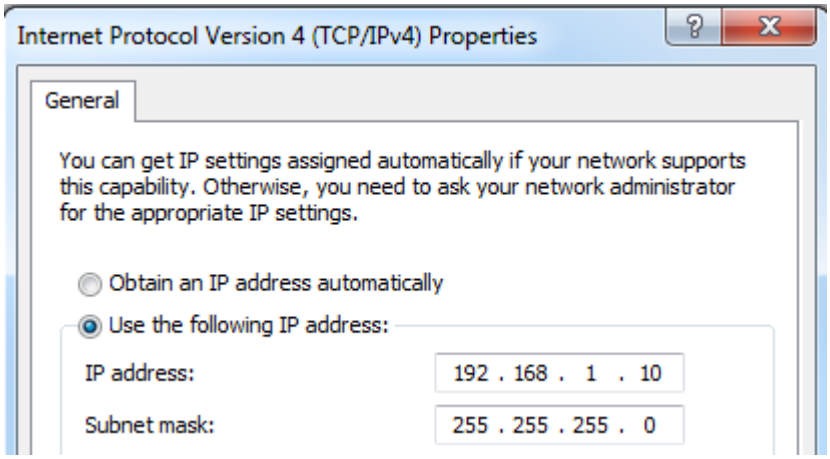


Setting an IP address and subnet mask

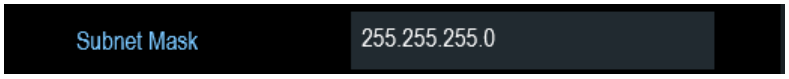
To establish a connection, the PC and the R&S Spectrum Rider have to be in the same subnet.

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:

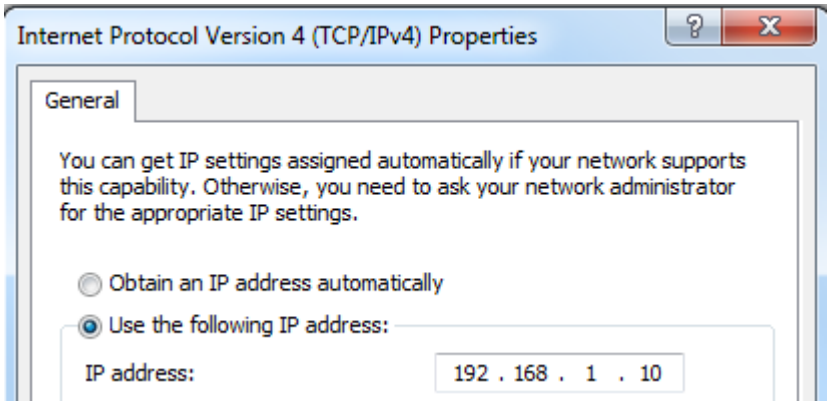
Example:

IP address PC: 192.168.1.10

IP address 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".

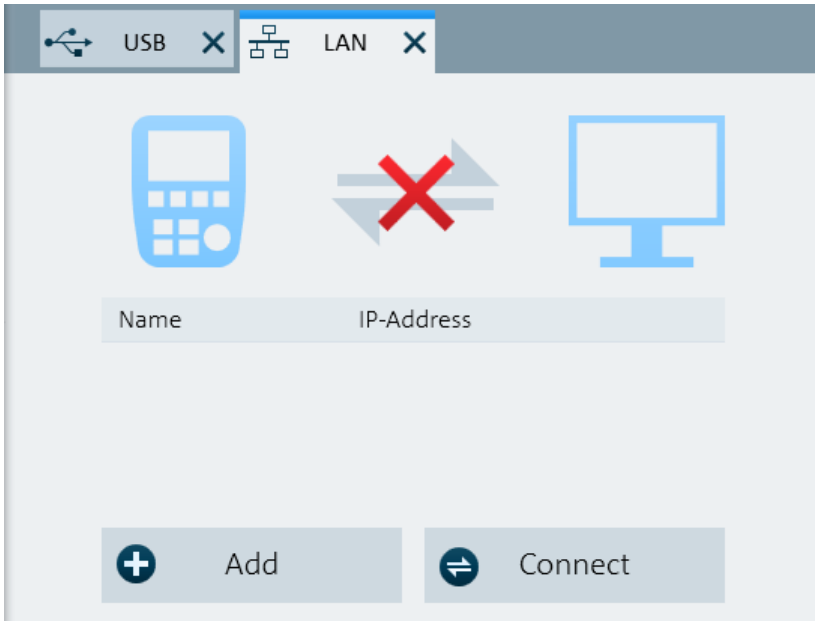


2. In the "Instrument Settings" dialog box, select the "IP Address" item.

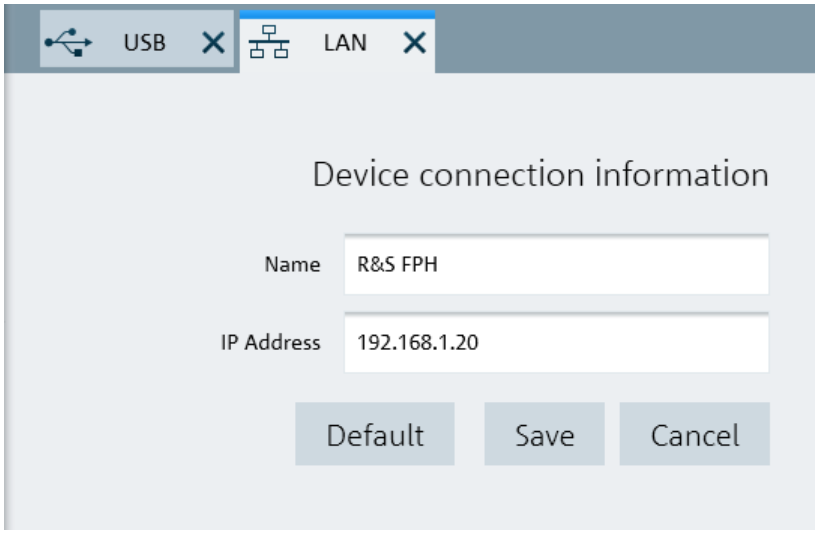
3. Confirm the entry with the rotary knob.
4. Enter the IP address of the PC with the numeric keys.

Configuring the R&S InstrumentView software

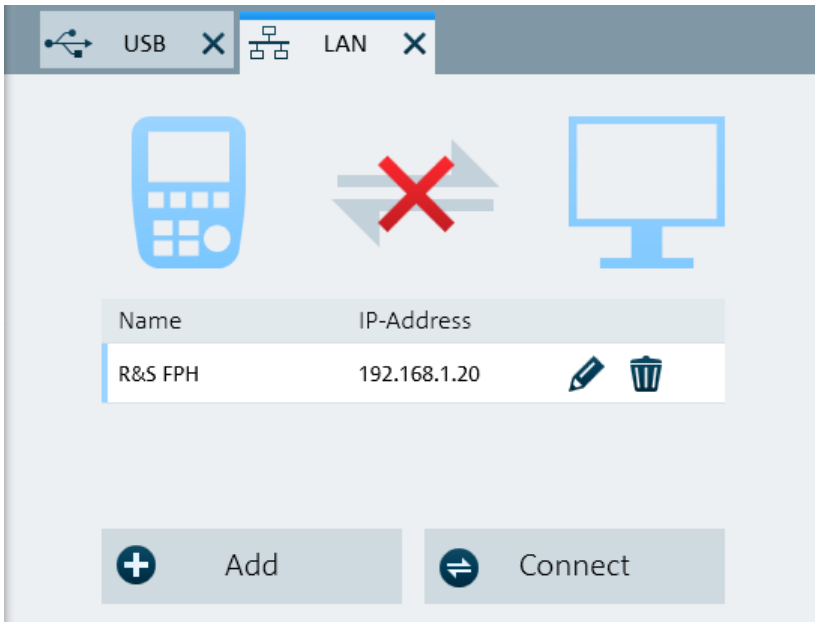
1. Start R&S InstrumentView.
2. Select the "LAN" tab in the screen layout.



3. Select the "Add" button to create a new network connection.



4. Specify a name for the new network connection, e.g. R&S Spectrum Rider.
5. Enter the IP address for the R&S Spectrum Rider (in this case 192.168.1.20).
6. Confirm the entry with the "Save" button.
   The connection is now created and configured.



7. Select the new connection labeled R&S Spectrum Rider.
8. Select the "Connect" button to establish the connection.

Connecting the R&S Spectrum Rider in an existing LAN

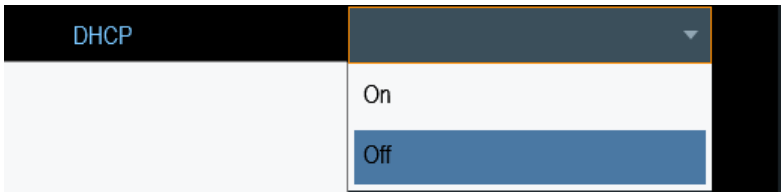
You can either draw the R&S Spectrum Rider IP address automatically from the DHCP server or manually assign a fixed address. With manual allocation, a fixed IP address and subnet mask must be assigned to the R&S Spectrum Rider as described in Chapter 3.8.1, "LAN Connection", on page 63. Then the R&S InstrumentView software has to be configured as described in "Configuring the R&S InstrumentView software" on page 65 with the assigned IP address.

Free IP address
Contact your IT system manager to get a free IP address.

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

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 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 Chapter 3.8.1, "LAN Connection", on page 63.

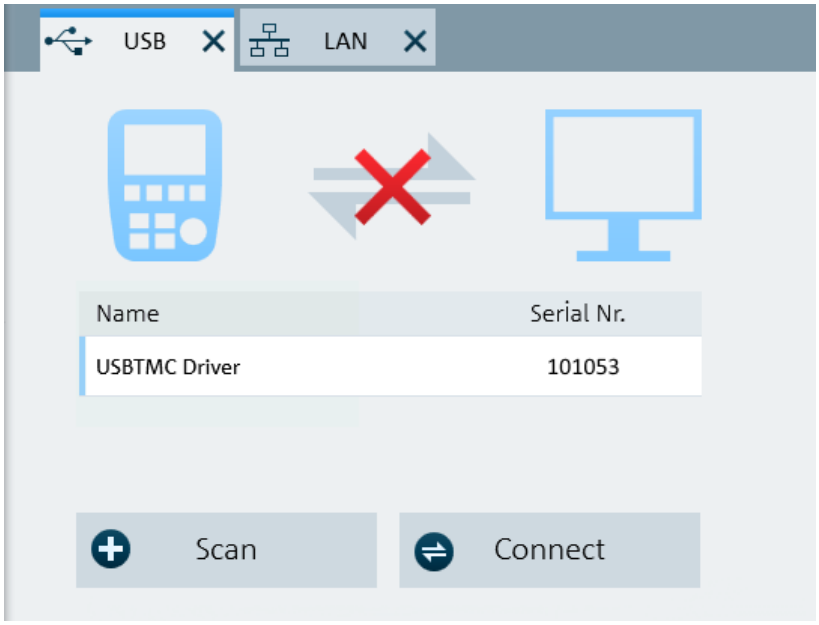
3.8.2 USB Connection

Alternatively, you can connect the R&S Spectrum Rider to the PC with a USB cable. The Mini USB interface is located on the right side of the R&S Spectrum Rider behind a protective cap. For more information, see Chapter 3.2.7, "Mini USB and LAN Port", on page 30.

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 R&S InstrumentView on the PC.
3. Select the "USB" tab in the screen layout.



4. Select the "Scan" button to identify the R&S Spectrum Rider.
5. Confirm the selection with the "Connect" button.

4 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.

4.1 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.

4.1.1 Attenuating the Signal

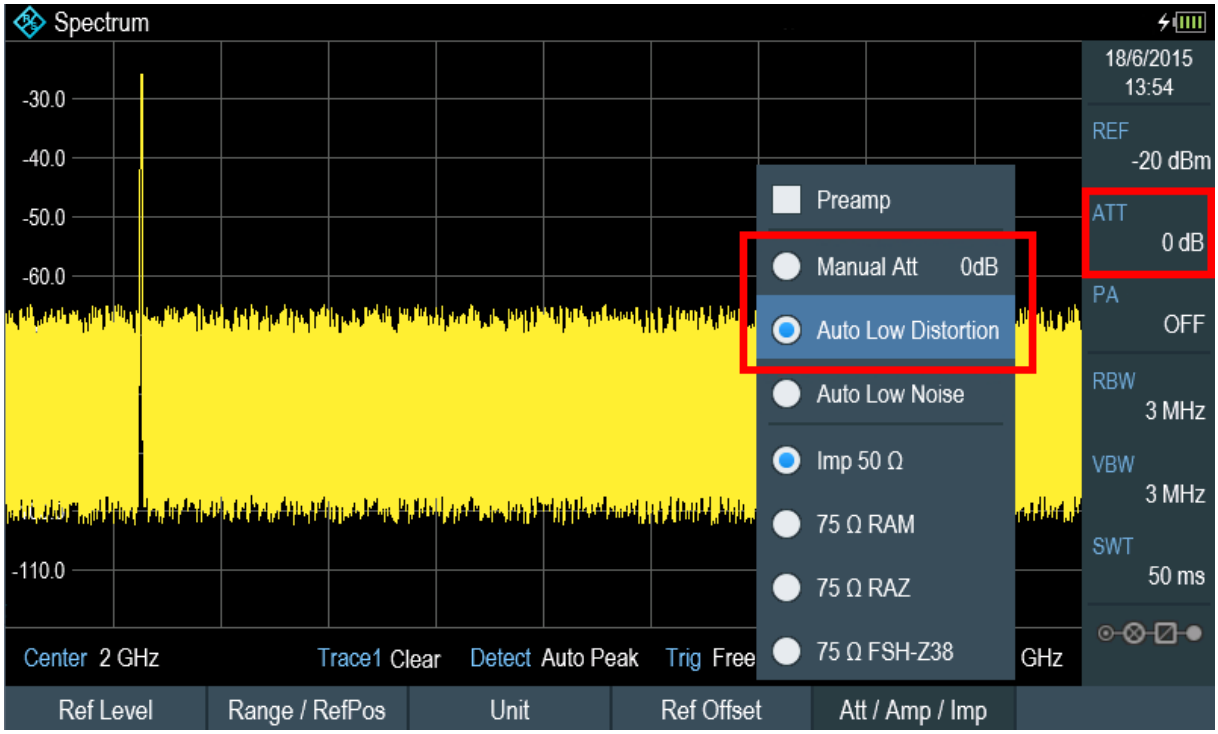
You can attenuate the signal to a suitable level either manually or automatically.

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 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 the AMPT key.
2. Select the "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 to 40 dB in 5 dB steps.

4. Press the AMPT key.
5. Select the "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".

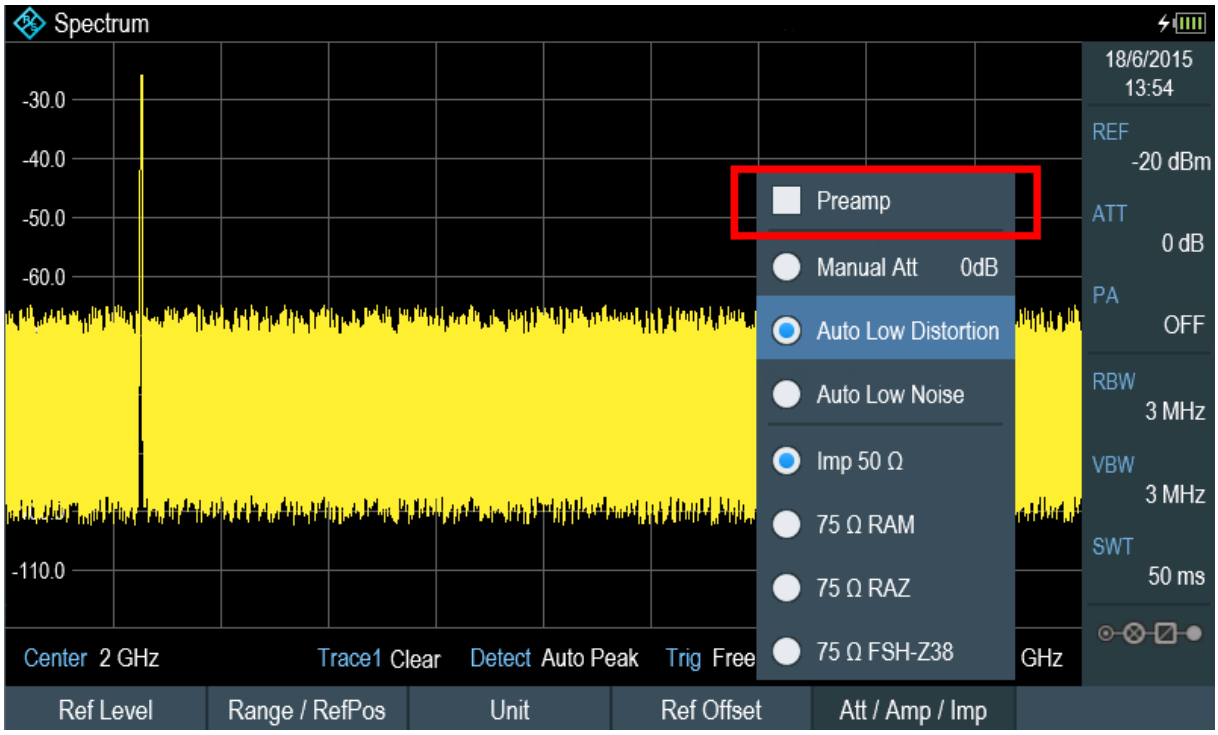
4.1.2 Using the Preamplifier

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 to 20 dB and increases the sensitivity by 10 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 the AMPT key.
2. Select the "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.

4.1.3 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

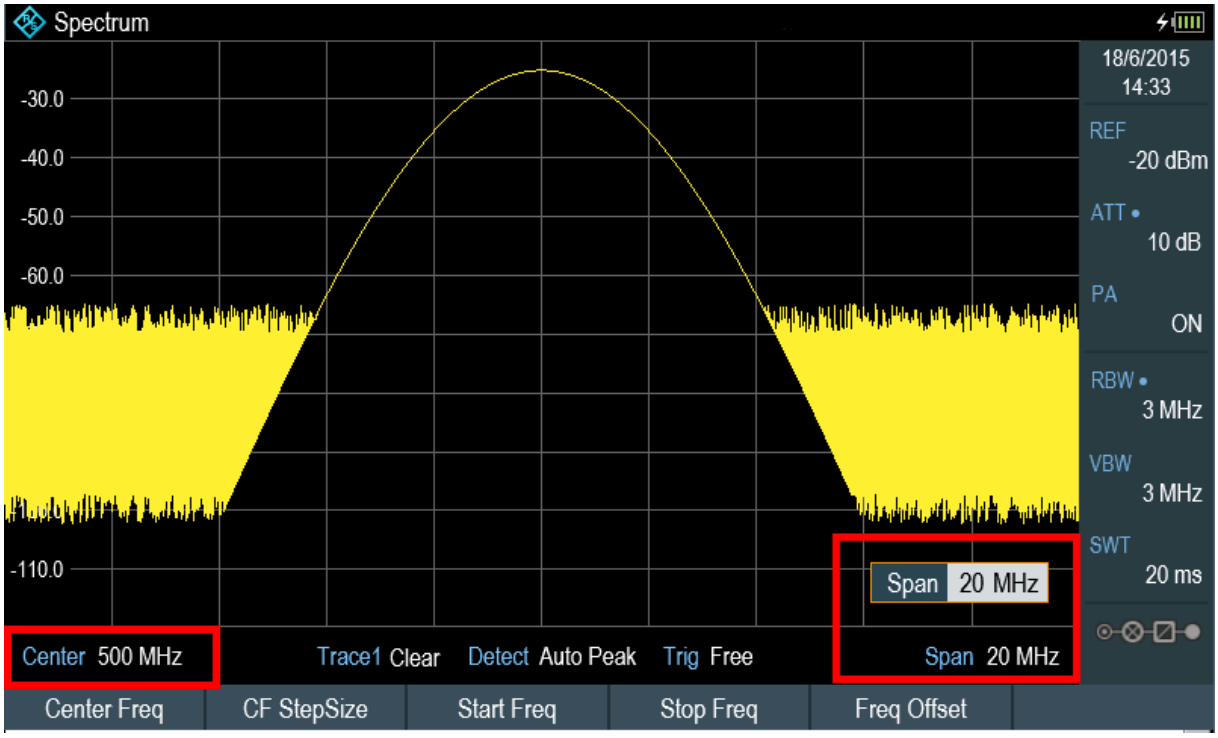
Connect the RF output of the signal generator to the RF input of the R&S Spectrum Rider.

Signal generator settings:

- Frequency: 500 MHz
- Level: -25 dBm

Measuring the level

1. Press the 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. Press 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. Press 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).

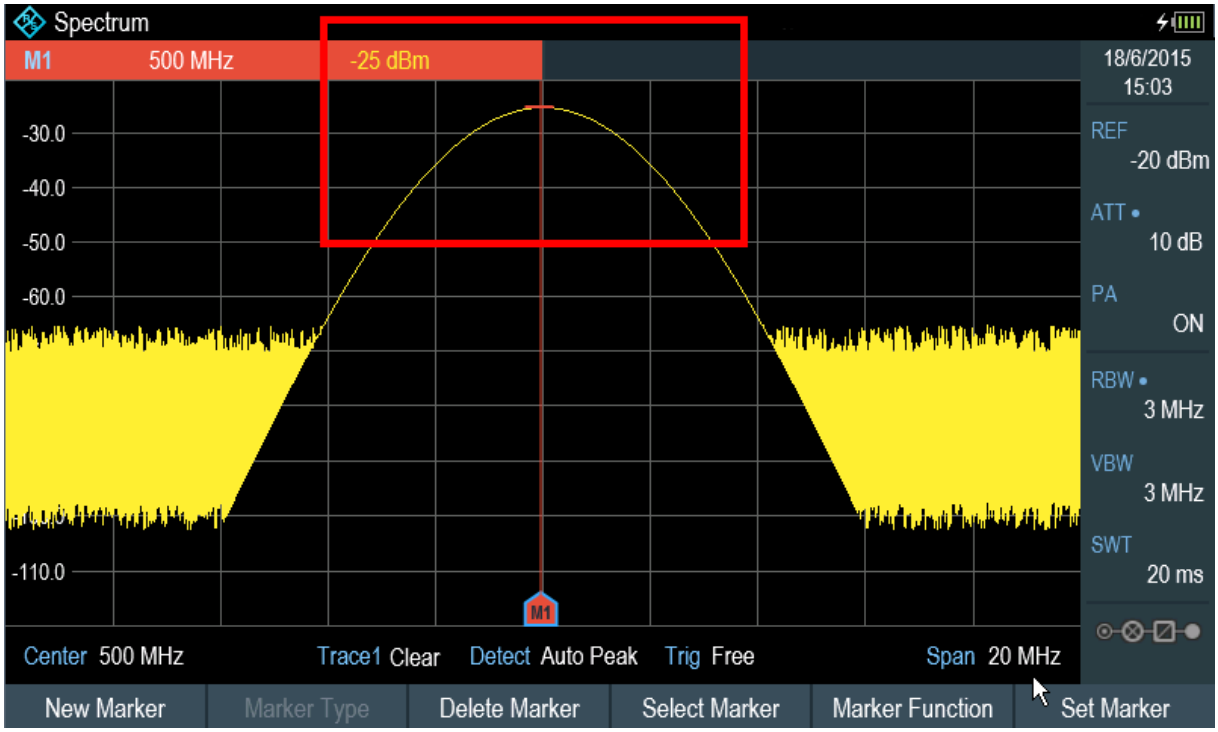
1. Press the "REF" softkey at the "Parameter view".
   The R&S Spectrum Rider opens an entry box to enter the reference level.
2. Enter a reference level of -25 dBm.
   The R&S Spectrum Rider reduces the reference level by 5 dB.

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 the 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 is 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).



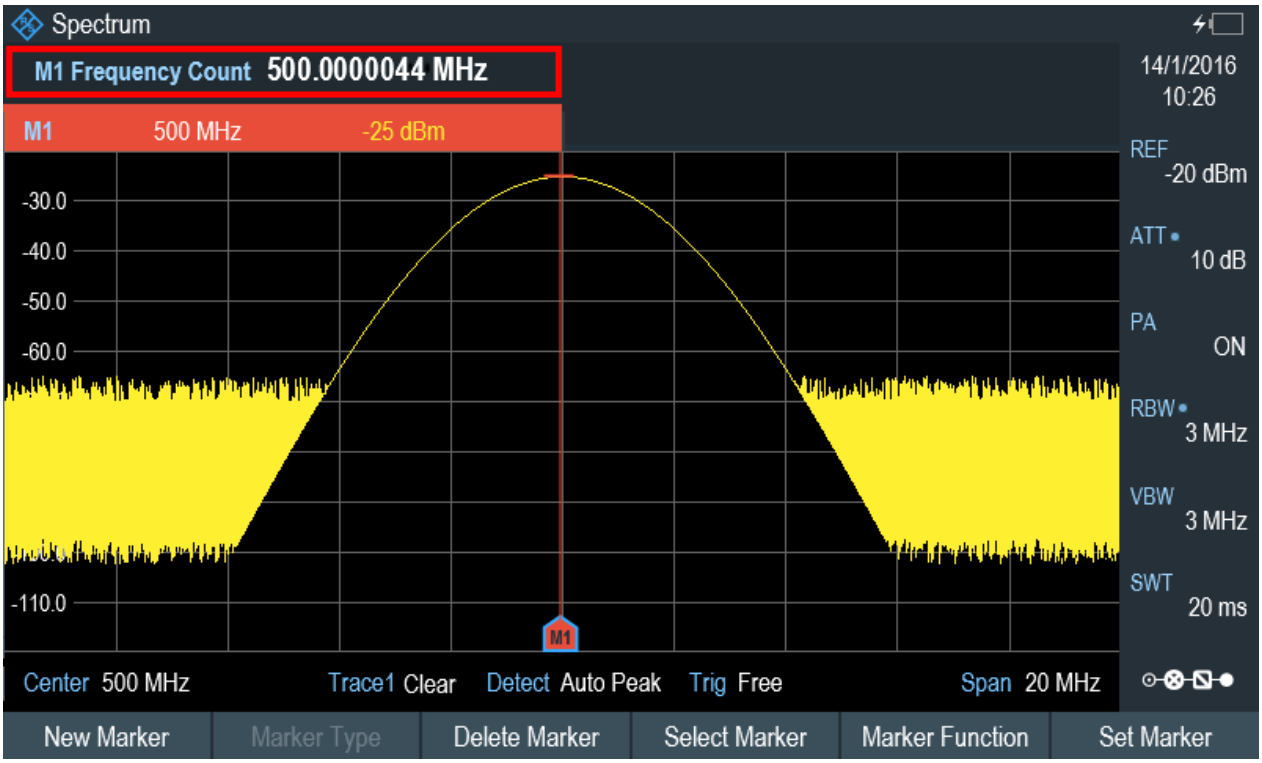
Measuring the frequency

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 resolution of the frequency readout is always 0.1 Hz, regardless of the span. The accuracy is determined by the internal reference frequency which is far more exact than that of the pixel-oriented marker readout.



4.1.4 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 measurement tasks like that.

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

Test setup

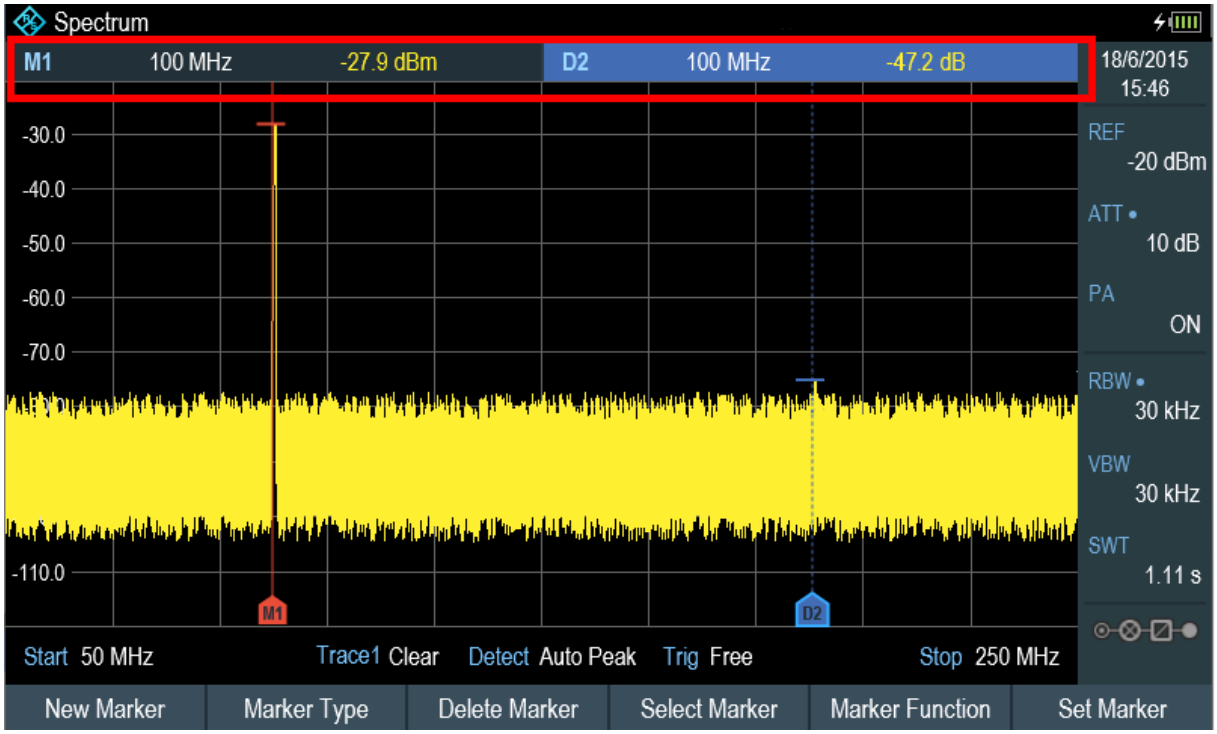
Connect the RF output of the signal generator to the RF input of the R&S Spectrum Rider.

Signal generator settings:

- Frequency: 100 MHz
- Level: -20 dBm

Detecting harmonics

1. Press the 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 the 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 the 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".

4.2 Using a Power Sensor

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

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 power sensor mode.

For a list of R&S Spectrum Rider supported power sensor, refer to "Power Meter" chapter in the R&S Spectrum Rider user manual.

You can connect the power sensors available for R&S Spectrum Rider to the USB port of R&S Spectrum Rider. This connector allows you to control the power sensor and supplies it with power. For more information, see Chapter 3.2.4, "USB Port", on page 29.

4.2.1 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

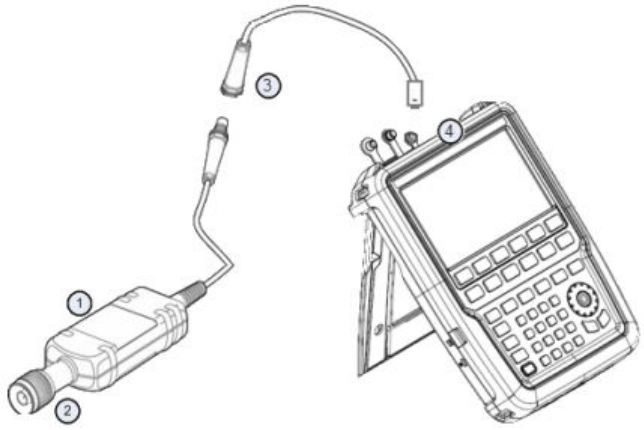
Because of high input power,

- 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-Z144 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-Z144)
4 = USB port connector (see Chapter 3.2.4, "USB Port", on page 29)

Measuring the power

1. Press the MODE key.
2. Press the "Power Meter" softkey.
   The R&S Spectrum Rider switches its operating mode. See "R&S Spectrum Rider option" on page 78.

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

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

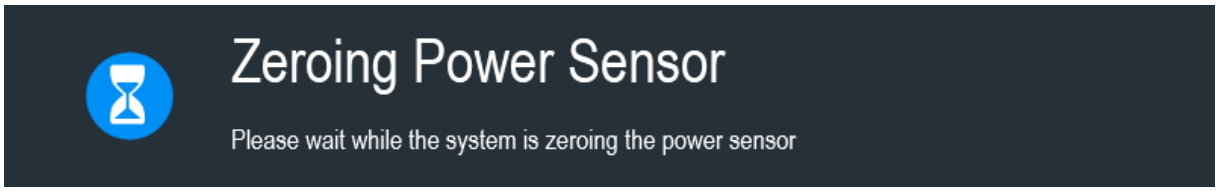
If there are communication problems between the R&S Spectrum Rider and the power sensor, the R&S Spectrum Rider displays an error message that indicates a possible cause. For more information, see the R&S Spectrum Rider user manual.

Zeroing the power sensor

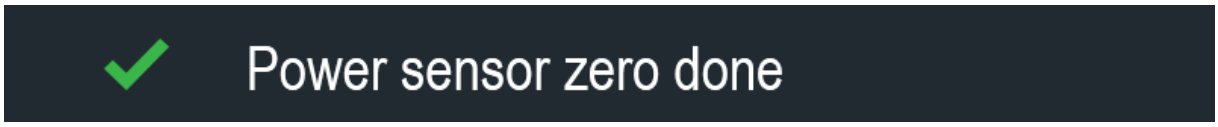
To compensate internal offsets of the power meter, it needs to be compensated for before starting the measurement.

1. Press the "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.

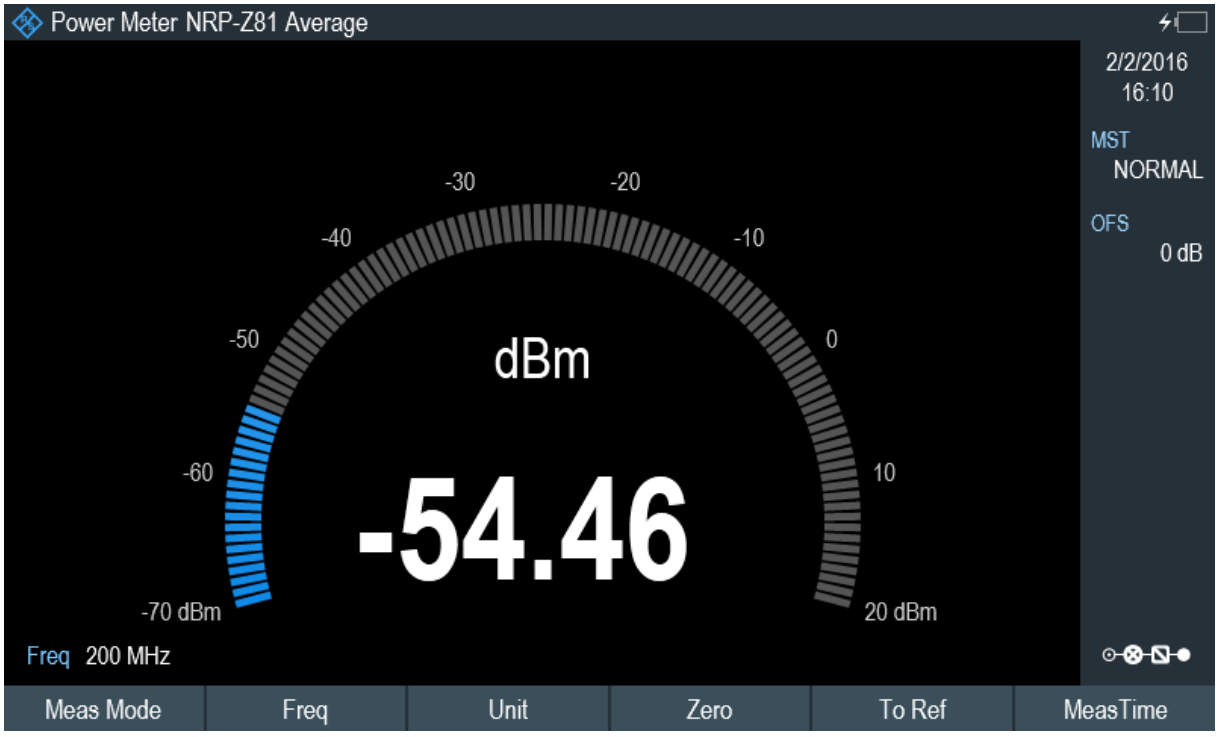
2. Disconnect the power sensor from any signal sources.
3. Press the "Continue" softkey to start zeroing.
   The R&S Spectrum Rider starts the zeroing process.



4. Wait for the zeroing process to finish.
   After zeroing is done, 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.



Set the frequency

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

1. Press the "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.

4.2.2 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.

See "R&S Spectrum Rider option" on page 78.

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

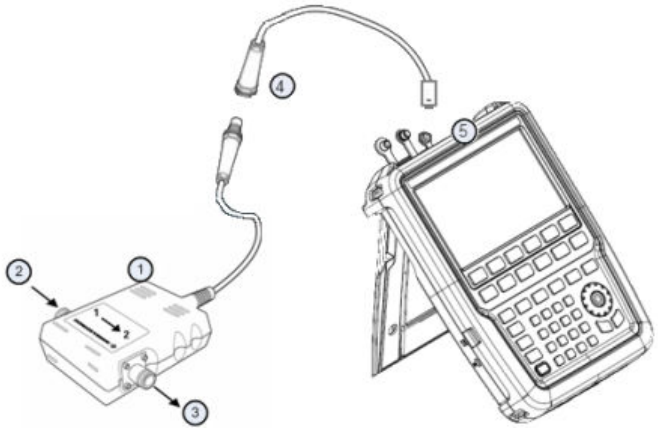
Danger of skin burns and damage to the instrument

- 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 (see Chapter 3.2.4, "USB Port", on page 29)

Measuring the power

1. Press the MODE key.

2. Press the "Power Meter" softkey.

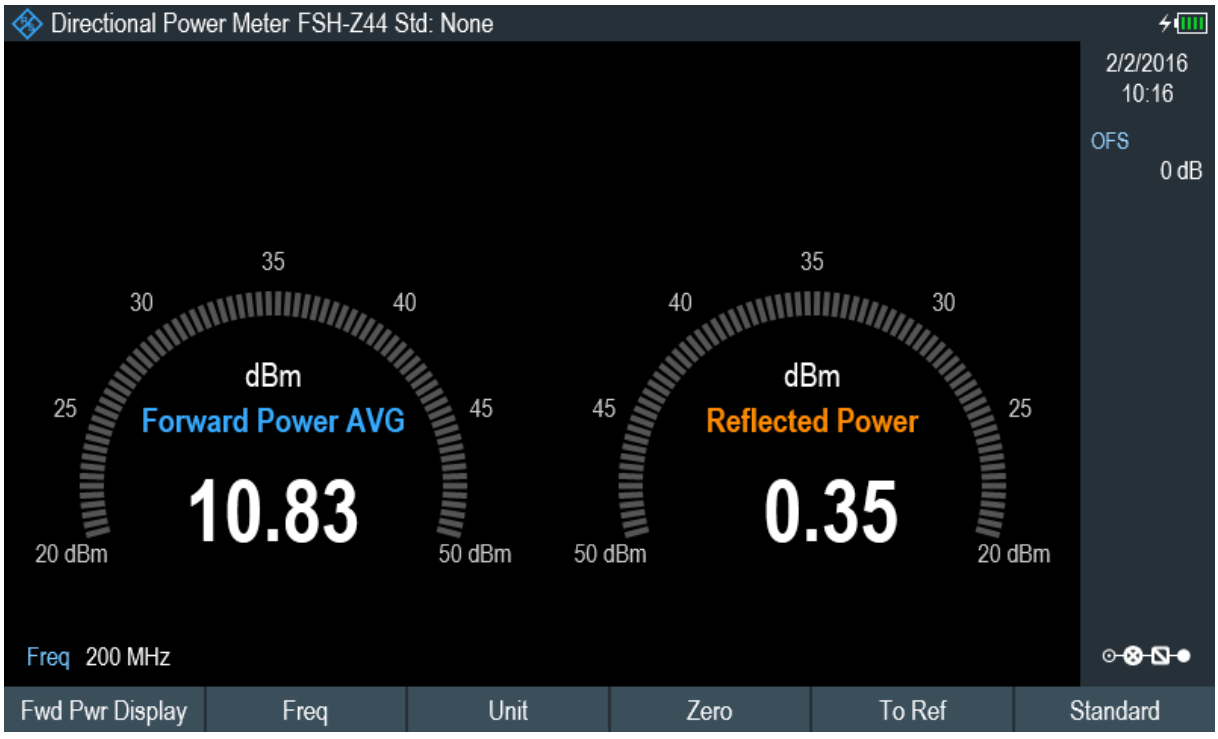
As soon as the R&S Spectrum Rider recognizes the power sensor, it shows the type of the directional power sensor that is connected in the "Title bar" (see Figure 3-2). After a few seconds it also shows the forward power and return loss currently measured at the load.

Zeroing the power sensor

Before performing the power measurement, you should zero the power sensor. For more information, see Chapter 4.2.1, "Measuring the Power with a Power Sensor", on page 78).

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.



To get the best results, you should also define the frequency of the signal. For more information, see Chapter 4.2.1, "Measuring the Power with a Power Sensor", on page 78.

4.3 Saving and Recalling Results and Settings

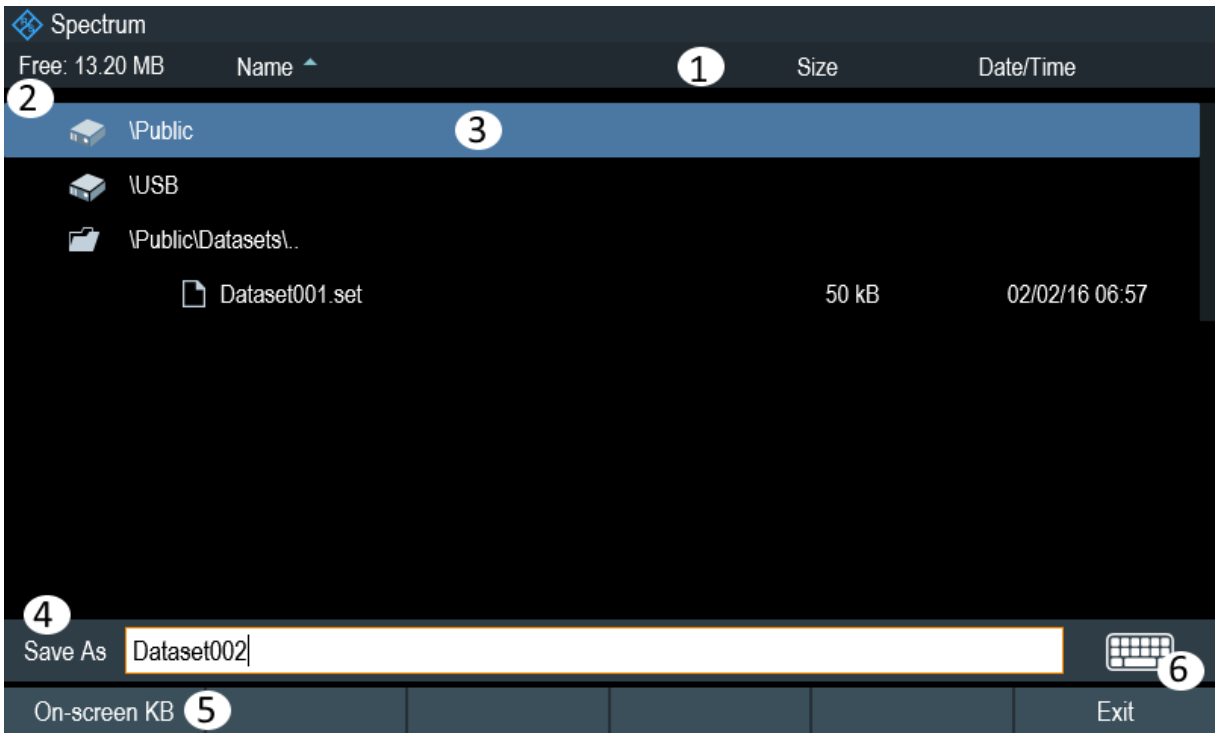
The R&S Spectrum Rider can store measurement results and settings in the internal memory, on a removable SD memory card or on a memory stick via the USB interface.

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 a SD card slot. For more information, see Chapter 3.2.4, "USB Port", on page 29 and Chapter 3.2.8, "SD Card Slot", on page 31.

4.3.1 Saving Measurement Results

1. Press the SAVE RECALL key.
2. Select the "Save" softkey.
   The R&S Spectrum Rider opens the file manager dialog box.
   The file manager provides file navigation function in the internal storage, SD card and USB.



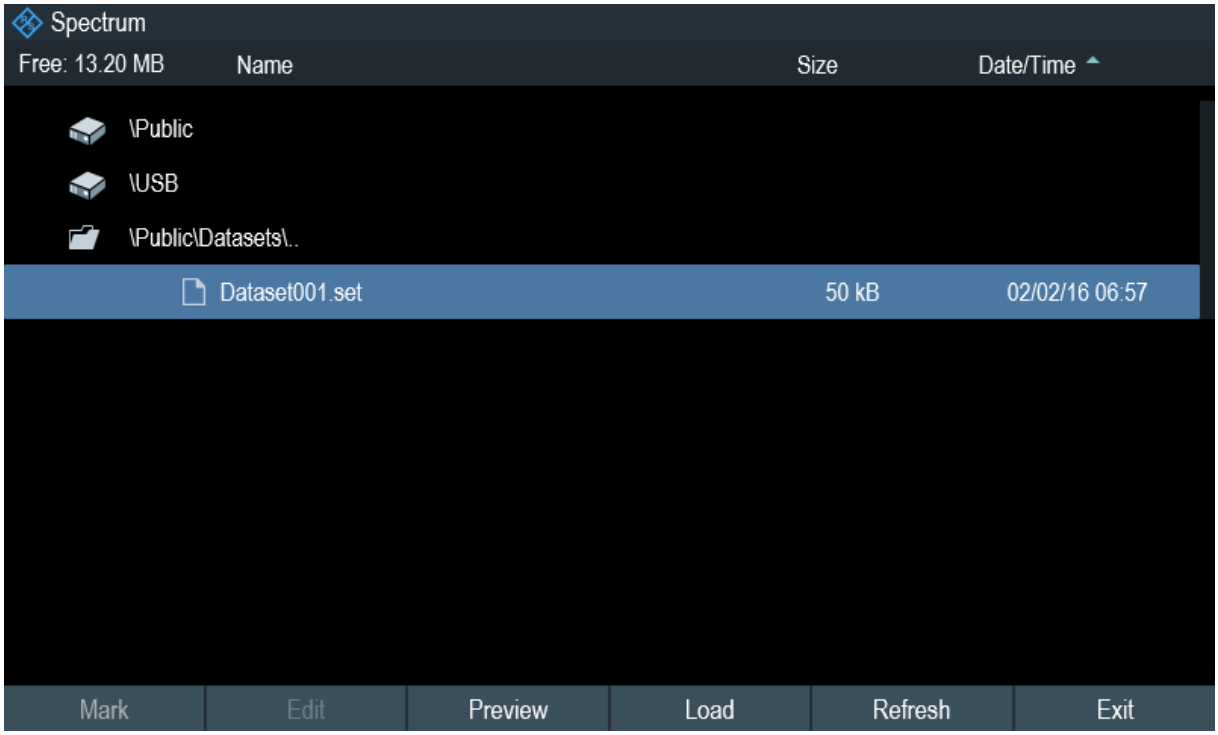
1 = Header bar
2 = Remaining memory on selected data storage
3 = Selected data sets and folder structure
4 = Input field for dataset name
5 = On-screen Keyboard
6 = On-screen Keyboard icon

3. Specify a name for the data set in the input field of the dialog box with the on-screen keyboard.
   Note: If touch interface is not activated, the "On-screen KB" softkey is disabled.
   In addition, use the BACK key to delete a character and the CANCEL key to quit the entry. You can either:
   - Overwrite a data set that already exists by selecting it from the available data sets in the list.
   - Edit the name of an existing data set using the on-screen keyboard function.
   - Create a new data set by entering a new name with the on-screen keyboard function.
   - Sort the files by selecting the respective column of the "Header bar" and the list will be sorted according to the type (i.e. "Name", "Size", "Date/ Time") selected.
4. Select the storage medium that you want to use.
5. Select the "Save" softkey.
   The R&S Spectrum Rider saves the data set.

4.3.2 Recalling Measurement Results

Use the R&S Spectrum Rider recall function to review previously saved measurement results and settings.

1. Press the SAVE RECALL key.
2. Select the "Recall" softkey.
   A list of all saved data sets opens.
   If you want to recall the results from the SD card or a USB stick, select "Preview" softkey to preview its contents.



3. Confirm your selection with the "Load" softkey.

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