R&S®FPS
Signal and Spectrum Analyzer
Getting Started

ROHDE&SCHWARZ

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.
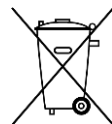
The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. 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.

Basic Safety Instructions

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)
	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.

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Symbol	Meaning	Symbol	Meaning
	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.

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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.

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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 Vrms > 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.

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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.

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- **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.

8. Follow the transport stipulations of the carrier (IATA-DGR, IMDG-Code, ADR, RID) when returning lithium batteries to Rohde & Schwarz subsidiaries.

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.

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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.

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.
	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.		

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.).

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.

8. En caso de devolver baterías de litio a las filiales de Rohde & Schwarz, debe cumplirse las normativas sobre los modos de transporte (IATA-DGR, código IMDG, ADR, RID).

Instrucciones de seguridad elementales

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.

Instrucciones de seguridad elementales

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.

Contents

1   Preface

1.1   Key Features

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

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

For a detailed specification refer to the data sheet.

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

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

1.2   About this Manual

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

ℹ **Manual operation using an external monitor and keyboard**

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

The following topics are included:

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

1.3   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.

Convention	Description
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

2   Documentation Overview

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

www.rohde-schwarz.com/manual/FPS

2.1   Getting Started Manual

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

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

2.2   User Manuals and Help

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

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

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

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

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

2.3   Service Manual

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

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

https://gloris.rohde-schwarz.com

2.4   Instrument Security Procedures

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

2.5   Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

2.6   Data Sheets and Brochures

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

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

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

2.7   Release Notes and Open Source Acknowledgment (OSA)

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

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

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

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

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

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

3   Preparing for Use

3.1   Putting into Operation

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

⚠ WARNING

Risk of injury due to disregarding safety information

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

● Do not open the instrument casing.

NOTICE

Risk of instrument damage due to inappropriate operating conditions

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

NOTICE

Instrument damage caused by electrostatic discharge

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

NOTICE

Risk of instrument damage due to inappropriate operating conditions

An unsuitable operating site or test setup can damage the instrument and connected devices. Before switching on the instrument, observe the information on appropriate operating conditions provided in the data sheet. In particular, ensure the following:

- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are connected correctly 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.

3.1.1   Unpacking and Checking the Instrument

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

Packing material

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

⚠ WARNING

Risk of injury during transportation

The carrying handles at the front and side of the casing are designed to lift or carry the instrument. Do not apply excessive force to the handles. If a handle is ripped off, the falling instrument can cause injury.

Be aware of the weight of the instrument when lifting it. Observe the information on transporting heavy instruments in the basic safety instructions provided with the instrument.

3.1.2   Accessory List

The instrument comes with the following accessories:

● Power cable
● "Getting Started" printed manual

3.1.3   Placing or Mounting the Instrument

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

Bench Top Operation

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

⚠ **WARNING**

Risk of injury if feet are folded out

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

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

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

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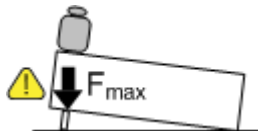
⚠ **WARNING**

Risk of injury when stacking instruments

A stack of instruments can tilt over and cause injury if not stacked correctly. Furthermore, the instruments at the bottom of the stack can be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

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

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

- It is best if all instruments have the same dimensions (width and length). If you need to stack smaller instruments on the top, the overall load imposed on the lowest instrument must not exceed 250 N.

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

Correct   Too many instruments   Different dimensions   Feet folded out
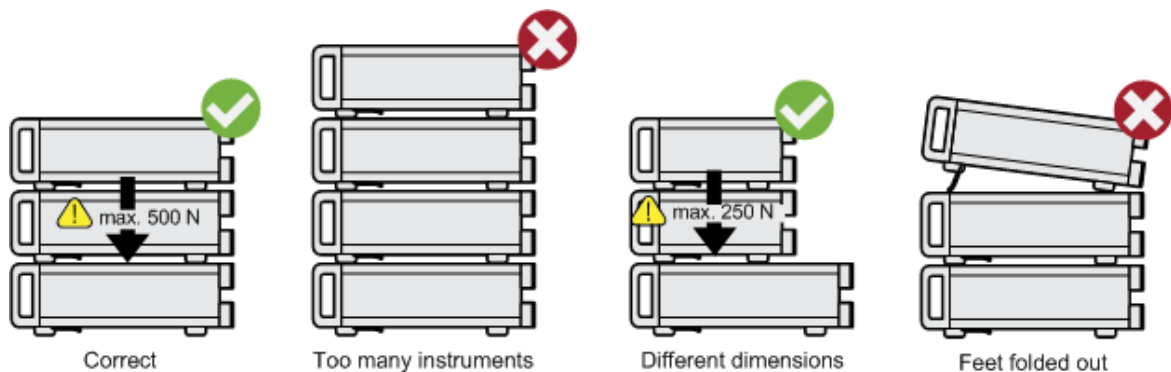
Rackmounting

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

> **NOTICE**
>
> **Risk of instrument damage due to insufficient airflow in a rack**
>
> If the instrument is run with insufficient airflow for a longer period, the instrument overheats, which can disturb the operation and even cause damage.
>
> Make sure that all fan openings are unobstructed, that the airflow perforations are unimpeded, and that the minimum distance from the wall is 10 cm.

3.1.4   Connecting the AC Power

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

For details on the connector refer to Chapter 4.2.10, "AC Power Supply Connection and Main Power Switch", on page 38.

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

3.1.5   Switching the Instrument On and Off

Switching the instrument on

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

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

ⓘ **Warm-up time for OCXO**

When the instrument is switched on, the OCXO requires an extended warm-up time (see data sheet).

Switching the instrument off

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

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

   The R&S FPS changes into off mode.

NOTICE

Risk of losing data

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

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

3.2   Windows Operating System

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

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

> **NOTICE**
>
> **Risk of rendering instrument unusable**
>
> The instrument is equipped with the Windows 7 operating system. You can install additional software on the instrument, however, additional software can impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.
>
> The drivers and programs used on the instrument under Windows 7 are adapted to the instrument. Only install update software released by Rohde & Schwarz to modify existing instrument software.

The following program packages have been tested:

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

> **Error message display**
>
> Note that any error messages caused by the Windows 7 operating system are only visible on an external monitor or via Remote Desktop from a controller PC. Thus, if operation of the R&S FPS seems to fail for no obvious reason, try connecting a monitor or a controller PC to check for any messages awaiting confirmation or action.
>
> (See Chapter 3.3, "Connecting USB Devices", on page 24 or Chapter 6.6, "How to Set Up Remote Desktop", on page 74)

3.2.1   Virus Protection

Take appropriate steps to protect your instruments from infection. Use strong firewall settings and scan any removable storage device used with a Rohde & Schwarz instrument regularly. It is also recommended that you install anti-virus software on the instrument. Rohde & Schwarz does NOT recommend running anti-virus software in the background ("on- access" mode) on Windows-based instruments, due to potentially degrading instrument performance. However, Rohde & Schwarz does recommend running it during non-critical hours.

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

- 1EF73: Malware Protection Windows XP

- 1DC01: Malware Protection Windows 7
- 1EF96: Malware Protection Windows 10

3.2.2   Service Packs and Updates

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

For details and recommendations, see the Rohde & Schwarz White Papers "1DC01: Malware Protection" or "1EF73: Malware Protection" (for Windows XP).

For details and recommendations, see the Rohde & Schwarz White Paper 1DC01: Malware Protection.

For details and recommendations, see the Rohde & Schwarz White Paper 1EF96: Malware Protection Windows 10

3.2.3   Login

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

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

> **Secure user mode**
>
> If the secure user mode option (R&S FPS-K33) is installed, an additional account is provided: the **"SecureUser"**.
>
> The "SecureUser" is a standard user account with limited functionality. In particular, administrative tasks such as LAN configuration or general instrument settings are not available. Furthermore, for a "SecureUser", data that the R&S FPS normally stores on the solid-state drive is redirected to volatile memory instead. You can access data that is stored in volatile memory during the current instrument session. However, when the instrument's power is removed, all data in volatile memory is erased.
>
> For details, see Chapter 3.6, "Protecting Data Using the Secure User Mode", on page 28.

Automatic login

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

For information on how to deactivate or reactivate the automatic login, refer to Chapter 3.2.3.1, "Automatic Login Function", on page 21.

Passwords

For all default user accounts, the initial password is *894129*. Note that this password is very weak, and it is recommended that you change the password for both users after initial login.

You can change the password in Windows 7 for any user at any time via "Start > Control Panel > User Accounts".

You can change the password in Windows 7 for any user at any time via "Start > Settings > Account > SignIn Options > Password > Change".

NOTICE

Changing the password and use of auto-login function

Note that when you change the default passwords, the default auto-login function no longer works! Reactivate it manually as described in "Reactivating the automatic login function" on page 23.

Be aware if the auto-login function is deactivated and the R&S FPS is rebooted: since the R&S FPS has no real display, you require an external monitor and keyboard or a Remote Desktop access to the R&S FPS to enter the password. Otherwise, the Windows operating system does not complete login and the R&S FPS remains inoperable.

3.2.3.1 Automatic Login Function

When shipped, the instrument automatically logs on the default "Instrument" user to Windows 7 using the default password.

To change the settings for the automatic login function for the R&S FPS, a controller PC or an external monitor and keyboard must be connected to the R&S FPS. See Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

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

Switching users when using the automatic login function

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

1. Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS (see also Chapter 3.2.4, "Accessing the Start Menu", on page 23).

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

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

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

Deactivating the automatic login function

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

1. Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS (see also Chapter 3.2.4, "Accessing the Start Menu", on page 23).

2. In the "Start" menu, select "Run".
   In the "Start" menu, select "All applications > Windows System > Run".
   The "Run" dialog box is displayed.

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

4. Press the ENTER key to confirm.
   This command deactivates the automatic login function. The next time you switch on the instrument, the operating system prompts you to enter your user name and password before it starts the firmware. (You must use an external monitor and keyboard or Remote Desktop from a controller PC, not the R&S FPS miniature display!)

Adapting the automatic login function to a new password

If you change the "Instrument" user's password, which is used during automatic login, this function no longer works. Adapt the settings for the command that activates the auto login function first.

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

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

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

3. Save the changes to the file.

Reactivating the automatic login function

1. Select the "Windows" icon in the toolbar to access the operating system of the R&S FPS (see also Chapter 3.2.4, "Accessing the Start Menu", on page 23).

2. In the "Start" menu, select "Run".
   In the "Start" menu, select "All applications > Windows System > Run".
   The "Run" dialog box is displayed.

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

4. Press the ENTER key to confirm.
   This command reactivates automatic login function. It is active the next time the instrument reboots.

3.2.4   Accessing the Start Menu

The Windows "Start" menu provides access to the Windows 7 functionality and installed programs.

To open the "Start" menu:

1. In Windows 10:

   Press the "Windows" key or the CTRL + ESC key combination on your (external) keyboard.

2. In Windows 7:

   Select the "Windows" icon on the R&S FPS toolbar, or press the "Windows" key or the CTRL + ESC key combination on the (external) keyboard.

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

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

3.2.5   Accessing the Windows Taskbar

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

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

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

3.3   Connecting USB Devices

The USB interfaces of the R&S FPS allow you to connect USB devices directly to the instrument. Increase the number of possible connections using USB hubs. Due to the large number of available USB devices, there is almost no limit to the expansions that are possible with the R&S FPS.

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

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

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

If Windows does not find a suitable driver, it prompts you to specify a directory that contains the driver software. If the driver software is on a CD, connect a USB CD-ROM drive to the instrument before proceeding.

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

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

Connecting a memory stick or CD-ROM drive

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

Connecting a keyboard

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

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

Select "Start > Settings > Time & language > Region & language > Add a language" to configure the keyboard language. To access the Windows operating system, press the Windows key on the external keyboard.

Connecting a mouse

The mouse is detected automatically when it is connected.

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

Select "Start > Settings > Devices > Mouse & touchpad" to configure the mouse properties. To access the Windows operating system, press the Windows key on the external keyboard.

Connecting a printer

When printing a file, the instrument checks whether a printer is connected and turned on and whether the appropriate printer driver is installed. If necessary, printer driver installation is initiated. You only have to install a printer driver once.

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

To install a printer, select "Start > Settings > Devices > Add a printer or scanner". To access the Windows operating system, press the Windows key on the external keyboard.

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

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

Select "Start > Settings > Devices > Device Manager > Update Device drivers" to install the driver.

3.4 Performing a Self Alignment and a Self Test

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

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

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

Operating temperature

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

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

► In the R&S FPS's mini display, navigate to "System commands" > "Self align". For details on working with the mini display, see Chapter 5, "Miniature Display", on page 40.

To perform a self alignment via Remote Desktop

Performing a self alignment via Remote Desktop requires a controller PC to be connected, see Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

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

2. Select the "Alignment" softkey.

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

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

> **To display the alignment results again later**
> - Select the SETUP key in the soft front panel on the Remote Desktop.
> - Select the "Alignment" softkey.

Self tests

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

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

► In the R&S FPS's mini display, navigate to "System commands" > "Selftest". For details on working with the mini display, see Chapter 5, "Miniature Display", on page 40.

To perform a self test via Remote Desktop

Performing a self alignment via Remote Desktop requires a controller PC to be connected, see Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

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

2. Select the "Service" softkey.

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

4. Select the "Start Selftest" button.

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

3.5   Checking the Supplied Options

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

Checking the supplied options via Remote Desktop requires a controller pc or an external monitor, mouse and keyboard to be connected, see Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

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

2. Select the "System Config" softkey.

3. Switch to the "Versions + Options" tab in the "System Configuration" dialog box.
   A list with hardware and firmware information is displayed.

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

3.6   Protecting Data Using the Secure User Mode

During normal operation, the R&S FPS uses a solid-state drive to store its operating system, instrument firmware, instrument self-alignment data, and any user data created during operation. If necessary, the solid-state drive can be removed from the R&S FPS and locked in a secure place to protect any classified data it may contain.

Redirecting storage to volatile memory

Alternatively, to avoid storing any sensitive data on the R&S FPS permanently, the *secure user mode* was introduced (option R&S FPS-K33). In secure user mode the instrument's solid-state drive is write-protected so that no information

can be written to memory permanently. Data that the R&S FPS normally stores on the solid-state drive is redirected to volatile memory instead, which remains available only until the instrument is switched off. This data includes:

● Windows 7 operating system files

● Firmware shutdown files containing information on last instrument state

● Self-alignment data

● General instrument settings such as the IP address

● Measurement settings

● User data created during operation

● Any data created by other applications installed on the R&S FPS, for example text editors (Notepad), the Clipboard, drawing tools, etc.

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

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

Limited storage space

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

Storing required data permanently

Any data that is to be available for subsequent sessions with the R&S FPS must be stored on the instrument permanently, *before activating the secure user mode*. This includes predefined instrument settings, transducer factors and self-alignment data.

Self-alignment data

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

Restricted operation

Since permanent storage is not possible, the following functions are not available in secure user mode:

● Firmware update
● Activating a new option key

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

Remote Desktop restricted for "SecureUser" by default

For security reasons, the "SecureUser" is not allowed Remote Desktop access to the R&S FPS by default. You must explicitly add the "Secure-User" to the Remote Desktop group (see Chapter 6.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 81). If you do not allow this user Remote Desktop access, the "SecureUser" can only operate the R&S FPS using remote commands or via the miniature display.

Activating and deactivating secure user mode

Only a user with administrator rights can activate (and deactivate) the secure user mode. Once activated, a restart is required. The special user "SecureUser" is then logged on to the R&S FPS automatically (using the automatic login function, see Chapter 3.2.3.1, "Automatic Login Function", on page 21). While the secure user mode is active, a message is displayed in the status bar at the bottom of the screen, and in the miniature display "SecUsr" is displayed.

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

Switching users when using the automatic login function

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

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

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

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

Alternatively, you can activate or deactivate the secure user function via the miniature display (see "Enable SecureUser/Disable SecureUser" on page 44. In this case, enter the administrator ("Instrument" user) password.

Remote control

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

4   Instrument Tour

4.1   Front Panel View

This chapter describes the front panel, including all function keys and connectors.
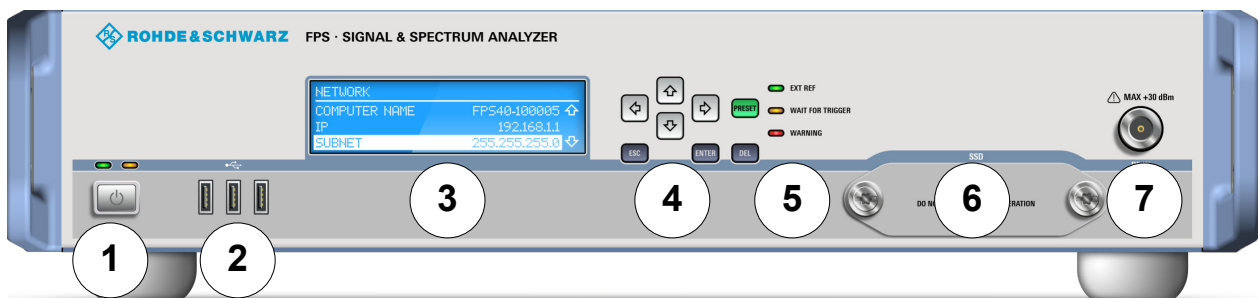
Figure 4-1: Front panel view

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

NOTICE

Instrument damage caused by cleaning agents

Cleaning agents contain substances such as solvents (thinners, acetone, etc.), acids, bases, or other substances. Solvents can damage the front panel labeling, plastic parts, or screens, for example.

Never use cleaning agents to clean the outside of the instrument. Use a soft, dry, lint-free dust cloth instead.

On / off button

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

See also Chapter 3.1.5, "Switching the Instrument On and Off", on page 16.

Mini display

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

The R&S FPS is equipped with a miniature display on the front panel that pro-
vides basic information and allows for very basic instrument configuration (such
as changing the IP address). For details see Chapter 5, "Miniature Display",
on page 40.

USB

The front panel provides three female USB connectors (USB-A) to connect devi-
ces like an external monitor, a mouse or a keyboard. In addition, a memory stick
can be connected to store and reload instrument settings and measurement data.

The rear panel provides further USB connectors, including a male (USB-B)
connector. See Chapter 4.2.9, "USB", on page 38.

Navigation Keys

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

Data Input Controls

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

Status LEDs

Indicate the instrument's operating status:

Table 4-1: Status LEDs

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

Removable Solid State Disk (SSD)

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

RF INPUT 50Ω

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

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

NOTICE

Risk of instrument damage

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

4.2   Rear Panel View

This figure shows the rear panel view of the R&S FPS. The individual elements are described in more detail in the subsequent sections.
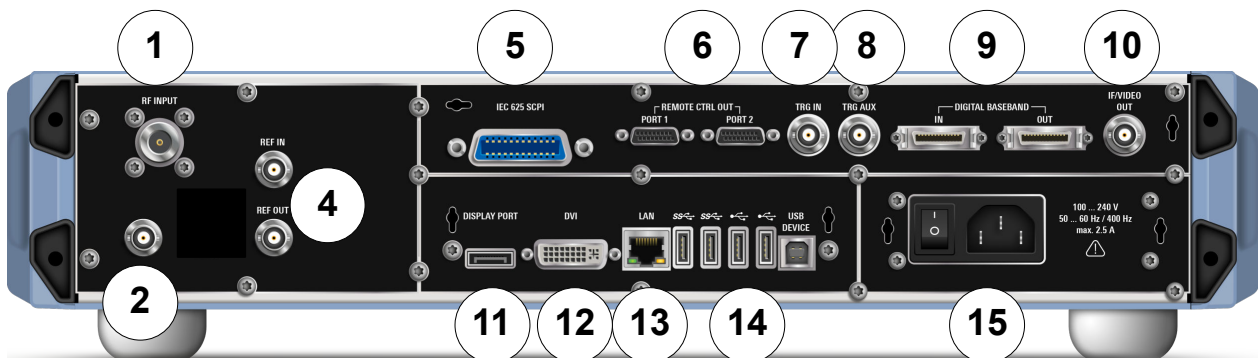
Figure 4-2: Rear panel view

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

4.2.1   RF INPUT 50Ω

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

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

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

4.2.2   NOISE SOURCE CONTROL

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

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

4.2.3   REF INPUT / REF OUTPUT

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

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

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

4.2.4   GPIB (SCPI) Remote Control Connector

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

more details refer to Chapter 6, "Controlling the R&S FPS Remotely",
on page 50.

4.2.5   TRIGGER INPUT / OUTPUT

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

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

4.2.6   IF/VIDEO OUTPUT

The female BNC connector can be used for various outputs:

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

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

4.2.7   DISPLAY PORT and DVI

You can connect an external monitor or other display device to the R&S FPS to
operate the instrument from a remote PC (see also Chapter 6.6, "How to Set Up
Remote Desktop", on page 74).

Two different types of connectors are provided for this purpose:
- DISPLAY PORT
- DVI (Digital visual interface)

4.2.8   LAN

The LAN interface can be used to connect the R&S FPS to a local network for
remote control, printouts and data transfer. The assignment of the RJ-45 connec-

tor supports twisted-pair category 5 UTP/STP cables in a star configuration (UTP stands for *unshielded twisted pair*, and STP for *shielded twisted pair*).

For details see Chapter 6, "Controlling the R&S FPS Remotely", on page 50.

4.2.9 USB

The rear panel provides four additional female USB (USB-A) connectors to connect devices like a keyboard, a mouse or a memory stick (see also "USB" on page 33). The two left-most connectors provide USB 3.0 interfaces.

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

4.2.10 AC Power Supply Connection and Main Power Switch

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

Main power switch function:

Position 1: The instrument is in operation.

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

For details refer to Chapter 3.1.4, "Connecting the AC Power", on page 16.

4.3 Additional Hardware Options Without External Connectors

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

4.3.1   OCXO Option (R&S FPS-B4)

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

Warm-up time for OCXO

When the instrument is switched on, the OCXO requires an extended warm-up time (see data sheet).

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

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

5 Miniature Display

The R&S FPS is equipped with a miniature display on the front panel (see also "Mini display" on page 33).

The display provides the following information:

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

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

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

> The miniature front panel display is meant as a service interface, not for measurement display. If the display fails for any reason, switch the instrument off and back on again to restore the display.
>
> Note that any error messages *caused by the Windows 7 operating system* are not displayed on the miniature front panel display. They are only visible on an external monitor or via RemoteDesktop from a controller PC. Thus, if operation of the R&S FPS seems to fail for no obvious reason, try connecting a monitor or a controller PC to check for any messages awaiting confirmation or action.
>
> (See Chapter 3.3, "Connecting USB Devices", on page 24 or Chapter 6.6, "How to Set Up Remote Desktop", on page 74)

5.1 Functions and Settings in the Mini Display Menu

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

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

Network

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

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

For details, see Chapter 6, "Controlling the R&S FPS Remotely", on page 50.

Computer Name ← Network

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

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

<Type><variant>-<serial_number>

For example `FPS13-123456`

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

DHCP ← Network

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

IP Address ← Network

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

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

Subnet Mask ← Network

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

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

System commands
Provides basic system functions.

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

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

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

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

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

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

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

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

Clear All Messages ← System commands
Deletes all system messages.

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

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

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

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

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

If disabled, the R&S FPS requires a reboot. The R&S FPS attempts to login using the "Instrument" (administrator) account. You must enter the administrator ("Instrument" user) password on the R&S FPS (default: "894129"). For details see "To enter a password" on page 48.

Note: Deactivated auto-login function. If the auto-login function is deactivated and the R&S FPS is rebooted, you require an external monitor and keyboard and a RemoteDesktop access on the R&S FPS to enter the password. Otherwise, the Windows operating system will not complete login and the R&S FPS remains inoperable.
For details see Chapter 3.2.3.1, "Automatic Login Function", on page 21

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

The secure user mode can only be activated or deactivated by a user with administrator rights. You must enter the administrator ("Instrument" user) password on the R&S FPS (default: "894129"). For details see "To enter a password" on page 48.

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

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

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

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

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

For details see Chapter 3.2.3.1, "Automatic Login Function", on page 21

For details on the secure user mode see Chapter 3.6, "Protecting Data Using the Secure User Mode", on page 28.

GPIB

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

GPIB Address ← GPIB

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

LXI parameters

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

Note that LXI parameters are not available for the "SecureUser" or "NormalUser" accounts (see "Enable NormalUser/Disable NormalUser" on page 44 and "Enable SecureUser/Disable SecureUser" on page 44). See also the restrictions mentioned in Chapter 6.1.1.4, "LXI Web Browser Interface", on page 55.

Version ← LXI parameters

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

Features ← LXI parameters

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

Computer Name ← LXI parameters

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

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

<Type><variant>-<serial_number>

For example `FPS13-123456`

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

MAC ← LXI parameters

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

IP ← LXI parameters

IP address of the R&S FPS as defined in the operating system (see also "IP Address" on page 42).

ICMP/VXI-11 Discovery ← LXI parameters

"ICMP" indicates whether the ping responder is active or not.

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

System messages

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

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

Display

Provides functions for the display itself.

Backlight saving ← Display

If enabled, the backlight of the display is turned off to save energy.

Normal/inverse color ← Display

Switches between a display with light characters on a dark background (normal) or dark characters on a light background (inverted).

Info

Provides information on the R&S FPS installation.

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

Serial ← Info

Serial number of the R&S FPS

FW version ← Info

Currently installed firmware version

Model ← Info

Instrument model

uC version ← Info

Microcontroller version

5.2   Working with the Miniature Instrument Display

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

To display a particular setting in the menu

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

► To navigate within the menu structure, do one of the following:
  ● Press the <Up Arrow> and <Down Arrow> keys to scroll through the menus.

- Press the ENTER key to select a particular menu item (either to edit a setting or to select the submenu).
- Press the ESC key to move back up in the menu structure.

To edit a configuration value

1. Navigate to the required menu item as described in "To display a particular setting in the menu" on page 47.

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

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

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

To enter a password

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

1. Navigate to the required menu item as described in "To display a particular setting in the menu" on page 47.

2. Press the ENTER key to select the function.

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

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

5.3   Configuring the Display Settings

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

To change the display colors

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

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

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

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

To turn off the display backlight

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

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

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

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

6   Controlling the R&S FPS Remotely

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

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

Various methods for remote control are supported:

- Connecting the instrument to a (LAN) network (see Chapter 6.2, "How to Configure a Network", on page 63)
- Using the LXI browser interface in a LAN network (see Chapter 6.2.3, "How to Configure the LAN Using the LXI Web Browser Interface", on page 66)
- Using the Windows Remote Desktop application in a LAN network (see Chapter 6.6, "How to Set Up Remote Desktop", on page 74)

Remote operation

Remote operation of the instrument from a connected computer is possible using SCPI commands. Sending remote commands requires the instrument to be configured in a LAN network or connected to a PC via the GPIB interface as described in Chapter 6.2, "How to Configure a Network", on page 63 and Chapter 6.5, "How to Start a Remote Control Session from a PC", on page 74.

Manual operation via Remote Desktop

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

remote (manual) operation of the instrument is possible. The following tasks can be performed using Remote Desktop:

- Access to the control functions via a virtual front panel
- Printout of measurement results directly from the controller
- Storage of measured data on the controller's hard disk

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

6.1   Remote Control Interfaces and Protocols

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

Table 6-1: Remote control interfaces and protocols

Inter-face	Protocols, VISA*) address string	Remarks

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

GPIB (IEC/IEEE Bus Interface)	VISA*) address string: `GPIB::primary address[::INSTR]` (no secondary address)	A GPIB bus interface according to the IEC 625.1/IEEE 488.1 standard is located on the rear panel of the instrument. For a description of the interface refer to 6.1.2 GPIB Interface (IEC 625/IEEE 418 Bus Interface).

Inter-face	Protocols, VISA*) address string	Remarks

USB	VISA*) address string:
	`USB::<vendor ID>::<product_ID>::`
	`<serial_number>[::INSTR]`
		USB connectors are located on the front and rear panel of the instrument.
		For a description of the interface refer to 6.1.3 USB Interface.

*) VISA is a standardized software interface library providing input and output functions to communicate with instruments. A VISA installation on the controller is a prerequisite for remote control using the indicated interfaces. (See also Chapter 6.1.4, "VISA Libraries", on page 62).		

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

6.1.1   LAN Interface

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

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

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

VISA library

Instrument access is usually achieved from high level programming platforms using VISA as an intermediate abstraction layer. VISA encapsulates the low level VXI, GPIB, LAN or USB function calls and thus makes the transport interface transparent for the user. See Chapter 6.1.4, "VISA Libraries", on page 62 for details.

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

IP address

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

The VISA resource string has the form:

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

or

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

where:

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

Example:

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

Identifying instruments in a network

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

For details on configuring the LAN connection, see Chapter 6.2, "How to Configure a Network", on page 63.

6.1.1.1   VXI-11 Protocol

The VXI-11 standard is based on the ONC RPC (Open Network Computing Remote Procedure Call) protocol which in turn relies on TCP/IP as the network/transport layer. The TCP/IP network protocol and the associated network services are preconfigured. TCP/IP ensures connection-oriented communication, where the order of the exchanged messages is adhered to and interrupted links are identified. With this protocol, messages cannot be lost.

6.1.1.2   HiSLIP Protocol

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

HiSLIP has the following characteristics:

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

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

For more information see also the application note:

1MA208: Fast Remote Instrument Control with HiSLIP

6.1.1.3 Socket Communication

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

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

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

6.1.1.4 LXI Web Browser Interface

LAN eXtensions for Instrumentation (LXI) is an instrumentation platform for measuring instruments and test systems that is based on standard Ethernet technology. LXI is intended to be the LAN-based successor to GPIB, combining the advantages of Ethernet with the simplicity and familiarity of GPIB. The LXI browser interface allows for easy configuration of the LAN and remote control of the R&S FPS without additional installation requirements.

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

Via the LXI browser interface to the R&S FPS you can control the instrument remotely from another PC. Manual instrument controls are available via the front panel simulation. File upload and download between the instrument and the remote PC is also available. Using this feature, several users can access *and operate* the R&S FPS simultaneously. This is useful for troubleshooting or training purposes.

For details, see Chapter 6.2.3, "How to Configure the LAN Using the LXI Web Browser Interface", on page 66 and Chapter 6.7, "How to Control the R&S FPS via the Web Browser Interface", on page 84.

If you do not want other users in the LAN to be able to access and operate the R&S FPS you can deactivate this function.

See Chapter 6.8, "How to Deactivate the Web Browser Interface", on page 86.

Restrictions

Only user accounts with administrator rights can use the LXI functionality.

For details, see Chapter 3.2.3, "Login", on page 19.

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

If no external monitor is connected to the R&S FPS, an additional driver is required on the instrument in order to control the R&S FPS via its web browser interface. If the driver is not available, the browser shows only a black screen.

Download the **TightVNC DFMirage driver** from the official TightVNC website (http://www.tightvnc.com/download.php) and install it on the R&S FPS as described on the website.

The current R&S FPS firmware was tested with the TightVNC DFMirage driver version 2.0.301.

To display the LXI web browser interface

► Type the host name or IP address of the instrument in the address field of the browser on your PC, for example "http://10.113.10.203".

The instrument home page (welcome page) opens.

Note: If only a black screen is displayed in the browser, install the required driver (see "Restrictions" on page 56).
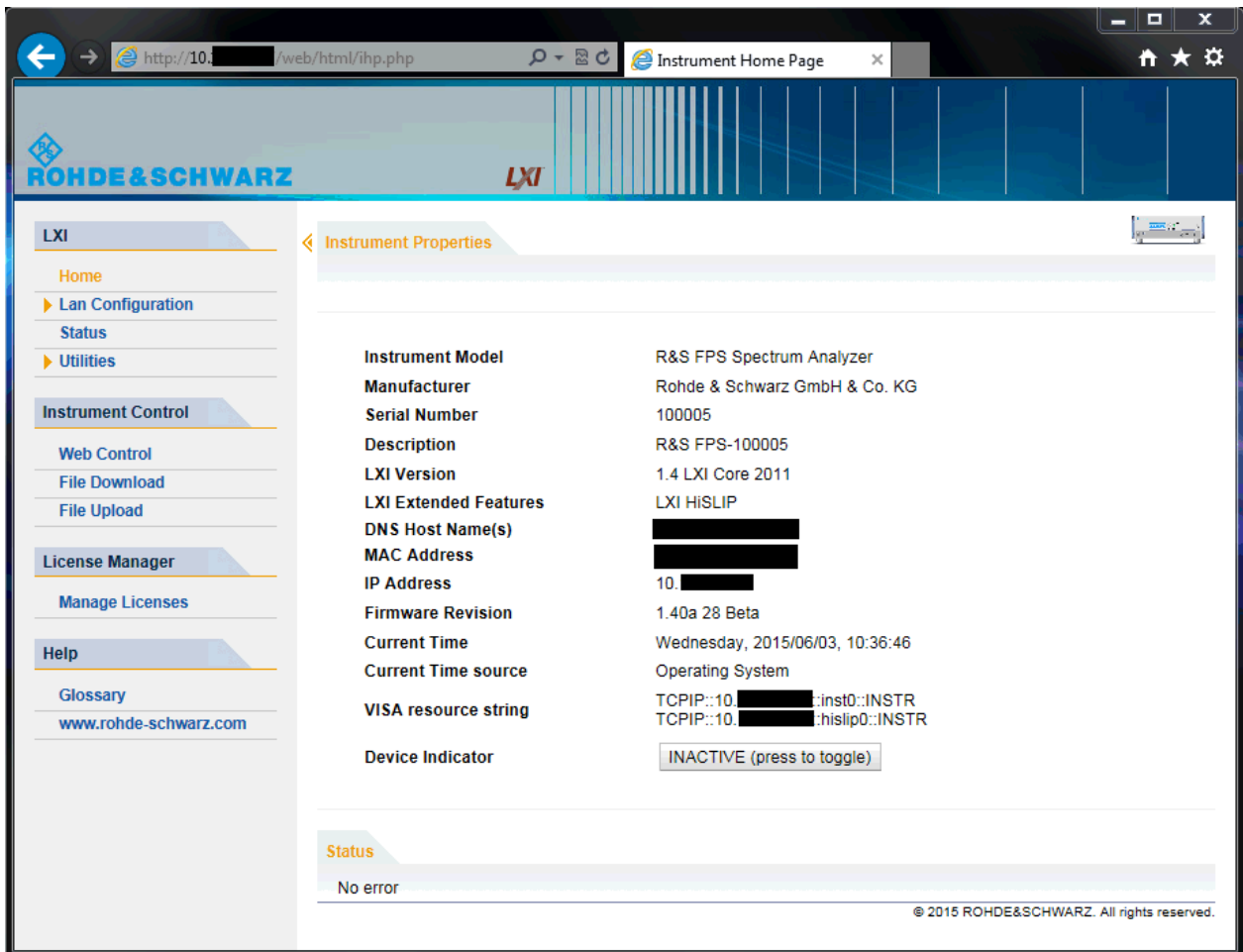
The navigation pane of the browser interface contains the following elements:

● "LXI"

  – "Home" opens the instrument home page.
    The home page displays the device information required by the LXI standard, including the VISA resource string in read-only format.
    The "Device Indicator" button allows you to physically identify the instrument. This is useful if you have several instruments and want to know which instrument the LXI home page belongs to. To identify the instru-

ment, activate the "Device Indicator" . Then check the "LAN Status" indicator of the instruments.

- – "LAN Configuration" allows you to configure LAN parameters and to initiate a ping.
  (See "Ping Client" on page 69.)
  (See

- – "Status Bar" displays information about the LXI status of the instrument.

- – "Utilities" provides access to the LXI event log functionality required by the LXI standard.

- "Instrument Control"

  - – "Web Control" provides remote access to the instrument via VNC (no installation required). Manual instrument controls are available via the front panel simulation.

  - – "File Download" downloads files from the instrument.

  - – "File Upload" uploads files to the instrument.

  (See Chapter 6.7, "How to Control the R&S FPS via the Web Browser Interface", on page 84.)

- "License Manager"

  - – "License Manager" allows you to install or uninstall license keys and to activate, register or unregister licenses.

- "Help"

  - – "Glossary" explains terms related to the LXI standard.

  - – "www.rohde-schwarz.com" opens the Rohde & Schwarz home page.

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

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

To be able to control the instrument via the GPIB bus, the instrument and the controller must be linked by a GPIB bus cable. A GPIB bus card, the card drivers and the program libraries for the programming language used must be provided in the controller. The controller must address the instrument with the GPIB bus address (see Chapter 6.2.4, "How to Change the GPIB Instrument Address", on page 69). You can set the GPIB address and the ID response string. The GPIB language is set as SCPI by default and cannot be changed for the R&S FPS.

Notes and Conditions

In connection with the GPIB interface, note the following:

● Up to 15 instruments can be connected

● The total cable length is restricted to a maximum of 15 m or 2 m times the number of devices, whichever is less; the cable length between two instruments should not exceed 2 m.

● A wired "OR"-connection is used if several instruments are connected in parallel.

● Any connected IEC-bus cables should be terminated by an instrument or controller.

6.1.2.1   GPIB Interface Messages

Interface messages are transmitted to the instrument on the data lines, with the attention line (ATN) being active (LOW). They are used for communication between the controller and the instrument and can only be sent by a computer which has the function of a GPIB bus controller. GPIB interface messages can be further subdivided into:

● **Universal commands**: act on all instruments connected to the GPIB bus without previous addressing

● **Addressed commands**: only act on instruments previously addressed as listeners

The following figure provides an overview of the available communication lines used by the GPIB interface.
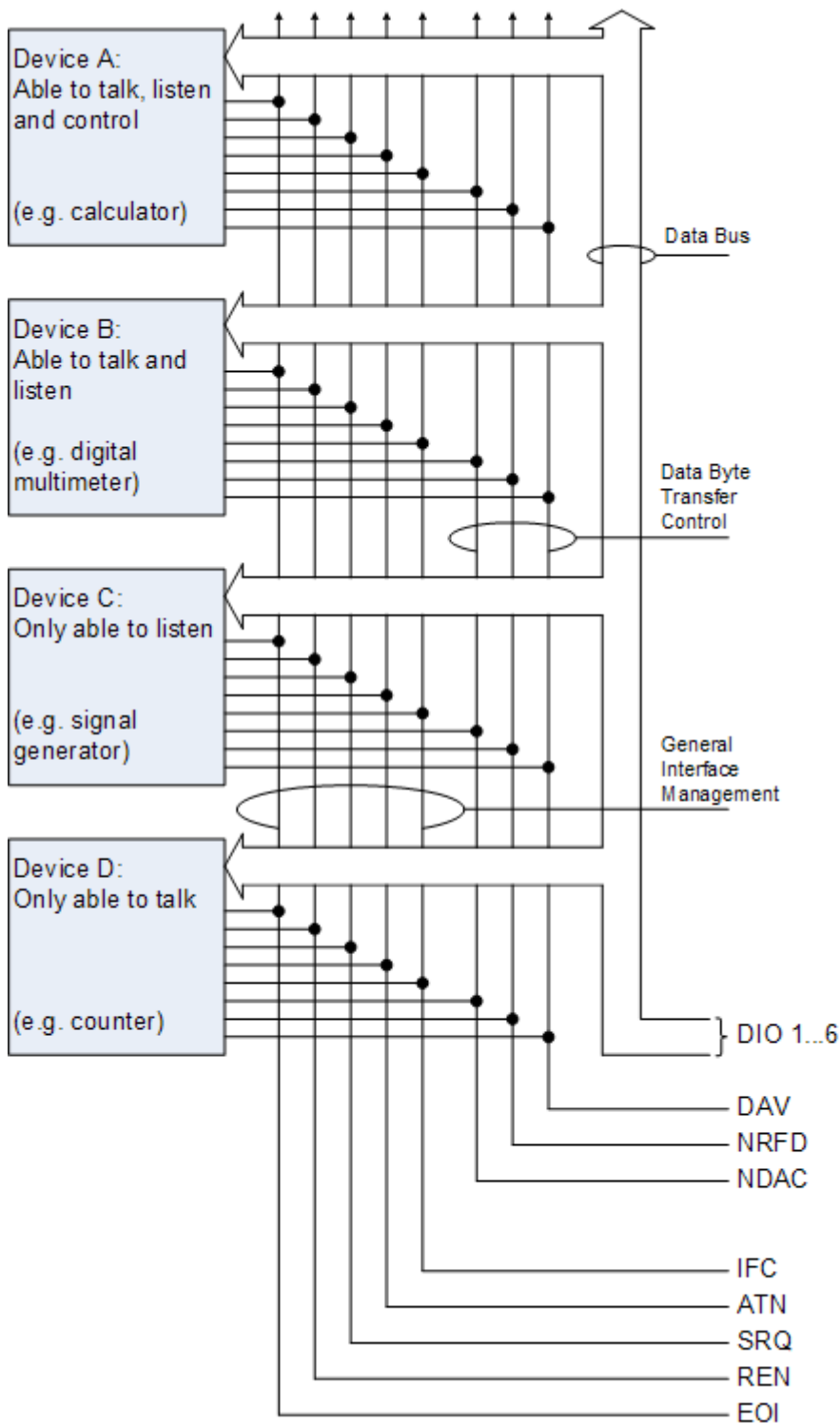
Figure 6-1: Communication lines used by the GPIB interface

Universal Commands

Universal commands are encoded in the range 10 through 1F hex. They affect all instruments connected to the bus and do not require addressing.

Command	Effect on the instrument
DCL (Device Clear)	Aborts the processing of the commands just received and sets the command processing software to a defined initial state. Does not change the instrument settings.
IFC (Interface Clear) *)	Resets the interfaces to the default setting.
LLO (Local Lockout)	The "Local" softkey is disabled. Manual operation is no longer available until `GTL` is executed.
SPE (Serial Poll Enable)	Ready for serial poll.
SPD (Serial Poll Disable)	End of serial poll.
PPU (Parallel Poll Unconfigure)	End of the parallel-poll state.
*) IFC is not a real universal command, it is sent via a separate line; however, it also affects all instruments connected to the bus and does not require addressing	

Addressed Commands

Addressed commands are encoded in the range 00 through 0F hex. They only affect instruments addressed as listeners.

Command	Effect on the instrument
GET (Group Execute Trigger)	Triggers a previously active instrument function (e.g. a sweep). The effect of the command is the same as with that of a pulse at the external trigger signal input.
GTL (Go to Local)	Transition to the "local" state (manual control).
GTR (Go to Remote)	Transition to the "remote" state (remote control).
PPC (Parallel Poll Configure)	Configures the instrument for parallel poll.
SDC (Selected Device Clear)	Aborts the processing of the commands just received and sets the command processing software to a defined initial state. Does not change the instrument setting.

6.1.3   USB Interface

For remote control via the USB connection, the PC and the instrument must be connected via the USB type B interface. A USB connection requires the VISA library to be installed. VISA detects and configures the R&S instrument automati-

cally when the USB connection is established. You do not have to enter an address string or install a separate driver.

USB address

The used USB address string is:

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

where:

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

Table 6-2: Product IDs for R&S FPS

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

Example:

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

0x0AAD is the vendor ID for Rohde&Schwarz

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

100001 is the serial number of the particular instrument

6.1.4   VISA Libraries

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

- The channel–specific address string ("VISA resource string") indicated in
  Table 6-1
- An appropriately defined VISA alias (short name).

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

- Chapter 6.1.2, "GPIB Interface (IEC 625/IEEE 418 Bus Interface)", on page 58
- Chapter 6.1.1, "LAN Interface", on page 52
- Chapter 6.1.3, "USB Interface", on page 61

For more information about VISA, refer to the user documentation.

6.2   How to Configure a Network

NOTICE

Risk of network failure

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses
- Exchanging hardware

Errors can affect the entire network.

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

- To transfer data between a controller and the tester, e.g. in order to run a remote control program; see the "Remote Control" chapter in the R&S FPS User Manual
- To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool); see Chapter 6.6, "How to Set Up Remote Desktop", on page 74
- To connect external network devices (e.g. printers)
- To transfer data from a remote computer and back, e.g. using network folders

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

Windows Firewall Settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. Rohde & Schwarz highly recommends the use of the firewall on your instrument. R&S instruments are shipped with the Windows firewall enabled and preconfigured in such a way that all ports and connections for remote control are enabled. For more details on firewall configuration see the Rohde & Schwarz White Paper 1DC01: Malware Protection and the Windows 7 help system.

6.2.1 How to Connect the Instrument to the Network

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

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

- A dedicated network connection (Point-to-point connection) between the instrument and a single computer made with a (crossover) RJ-45 network cable. The computer must be equipped with a network adapter and is directly connected to the instrument. The use of hubs, switches, or gateways is not required, however, data transfer is still performed using the TCP/IP protocol. An IP address has to be assigned to the instrument and the computer, see Chapter 6.2.2, "How to Assign the IP Address", on page 65.
  Note: As the R&S FPS uses a 1 GBit LAN, a crossover cable is not necessary (due to Auto-MDI(X) functionality).

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

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

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

6.2.2   How to Assign the IP Address

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

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

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

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

NOTICE

Risk of network errors

Connection errors can affect the entire network. If your network does not support DHCP, or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information before connecting the instrument to the LAN. Contact your network administrator to obtain a valid IP address.

Assigning the IP address directly on the R&S FPS

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

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

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

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

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

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

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

6.2.3 How to Configure the LAN Using the LXI Web Browser Interface

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

If no external monitor is connected to the R&S FPS, an additional driver is required on the instrument in order to control the R&S FPS via its web browser interface. If the driver is not available, the browser shows only a black screen.

Download the **TightVNC DFMirage driver** from the official TightVNC website (http://www.tightvnc.com/download.php) and install it on the R&S FPS as described on the website.

The current R&S FPS firmware was tested with the TightVNC DFMirage driver version 2.0.301.

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

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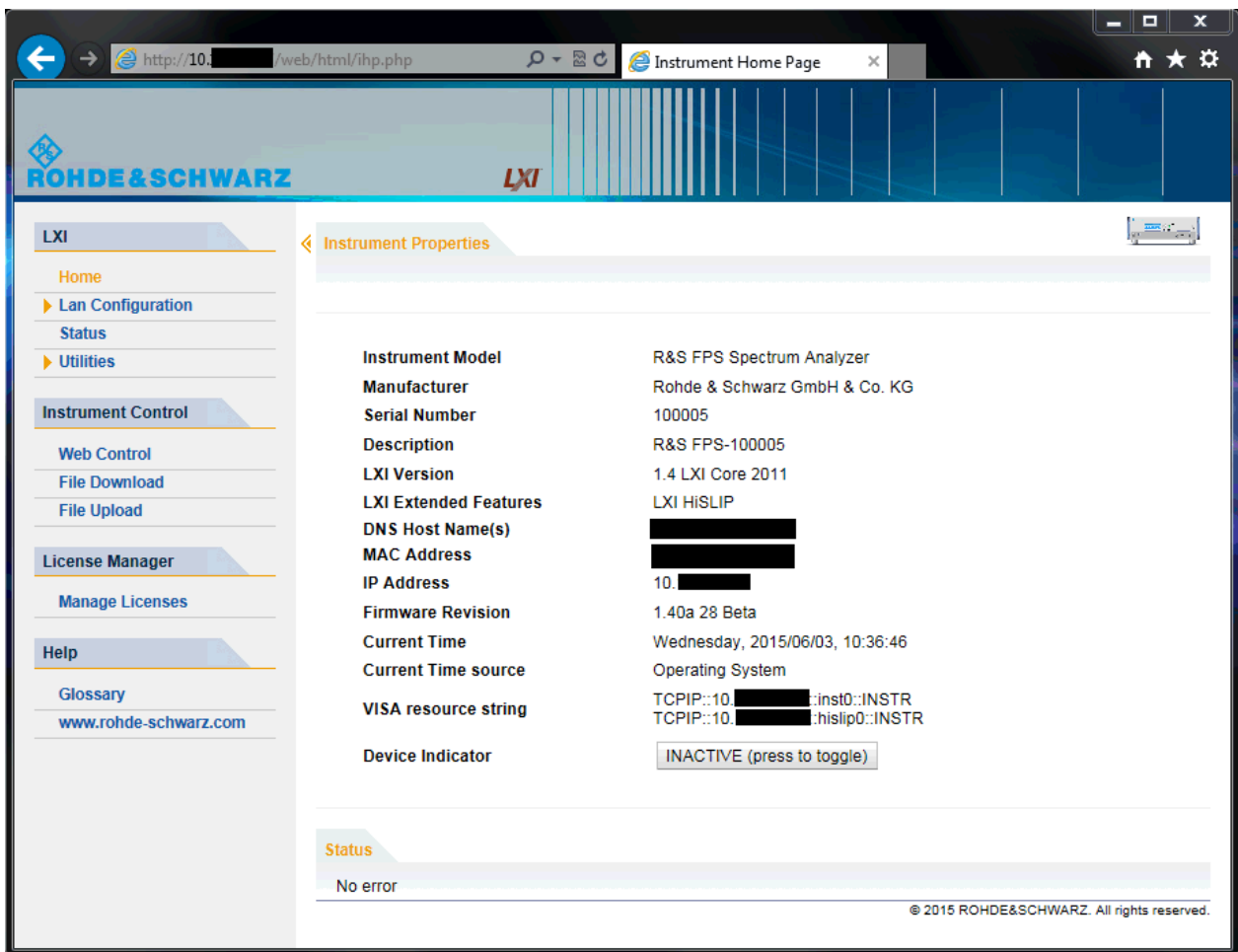
The instrument home page displays the device information required by the LXI standard including the VISA resource string in read-only format.

► Press the "Device Indicator" button on the "Instrument Home Page" to activate or deactivate the LXI status icon on the status bar of the R&S FPS. A green LXI status symbol indicates that a LAN connection has been established; a red symbol indicates an error, for example, that no LAN cable is connected. When a device is connecting to the instrument, the LXI logo blinks. The "Device Indicator" setting is not password-protected.

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

- "LAN Configuration" opens the menu with configuration pages.
- "Status" displays information about the LXI status of the instrument.

● "Help > Glossary" opens a document with a glossary of terms related to the LXI standard.

6.2.3.1 LAN Configuration

The LAN configuration consists of three parts:

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

IP Configuration

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

The "TCP/IP Mode" configuration field controls how the IP address for the instrument gets assigned (see also Chapter 6.2.2, "How to Assign the IP Address", on page 65).

For the manual configuration mode, the static IP address, subnet mask, and default gateway are used to configure the LAN. The automatic configuration mode uses DHCP server or Dynamic Link Local Addressing (Automatic IP) to obtain the instrument IP address.

> Changing the LAN configuration is password-protected. The default password is *LxiWebIfc* (notice upper and lower case characters).

Advanced LAN Configuration

The "LAN Configuration > Advanced LAN Configuration" parameters are used as follows:

● The "Negotiation" configuration field provides different Ethernet speed and duplex mode settings. In general, the "Auto Detect" mode is sufficient.
● "ICMP Ping" must be enabled to use the ping utility.
● "VXI-11" is the protocol that is used to detect the instrument in the LAN. According to the standard, LXI devices must use VXI-11 to provide a detection mechanism; other additional detection mechanisms are permitted.

- mDNS and DNS-SD are two additional protocols: Multicast DNS and DNS Service Discovery. They are used for device communication in zero configuration networks working without DNS and DHCP

Ping Client

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

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

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

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

3. Select "Submit".

6.2.4   How to Change the GPIB Instrument Address

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

To change the GPIB address

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

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

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

Remote command:

`SYST:COMM:GPIB:ADDR 18`

6.3   How to Log on to the Network

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

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

6.3.1   How to Create Users

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

In order to configure users for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See

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

1.

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

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

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

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

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

   Note: Full firmware functionality requires administrator rights.

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

6.3.2   How to Change the User Password

In order to change the user passwords for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

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

1.

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

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

3. Enter the user account name.

4. Enter the old password.

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

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

6.3.3 How to Activate or Deactivate the Automatic Login Mechanism

In order to activate or deactivate the automatic login mechanism on the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

Deactivating the automatic login mechanism

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

1.

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

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

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

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

Reactivating the automatic login mechanism

1.

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

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

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

4. Select the ENTER key to confirm.
    The automatic login mechanism is reactivated. It will be applied the next time the instrument is switched on.

6.4   How to Share Directories (only with Microsoft Networks)

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

> In order to configure shared directories on the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

1.

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

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

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

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

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

6. Select the "Share" button.

7. Select "Done" to close the dialog box.

The drive is shared and can be accessed by the selected users.

6.5 How to Start a Remote Control Session from a PC

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

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

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

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

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

6.6 How to Set Up Remote Desktop

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

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

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

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

By default, the R&S FPS is configured to allow Remote Desktop access by any user (except for the "SecureUser", see Chapter 6.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 81), and to use a fixed IP address.

To change the settings for remote operation, you must connect an external monitor, mouse and keyboard, or connect a controller PC and set up a Remote Desktop connection with the default settings as described in Chapter 6.6.3, "How to Start and Close the Remote Desktop", on page 79.

To change the settings for Remote Desktop access

To avoid problems, use a fixed IP address (see Chapter 6.2.2, "How to Assign the IP Address", on page 65).

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

1.

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

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

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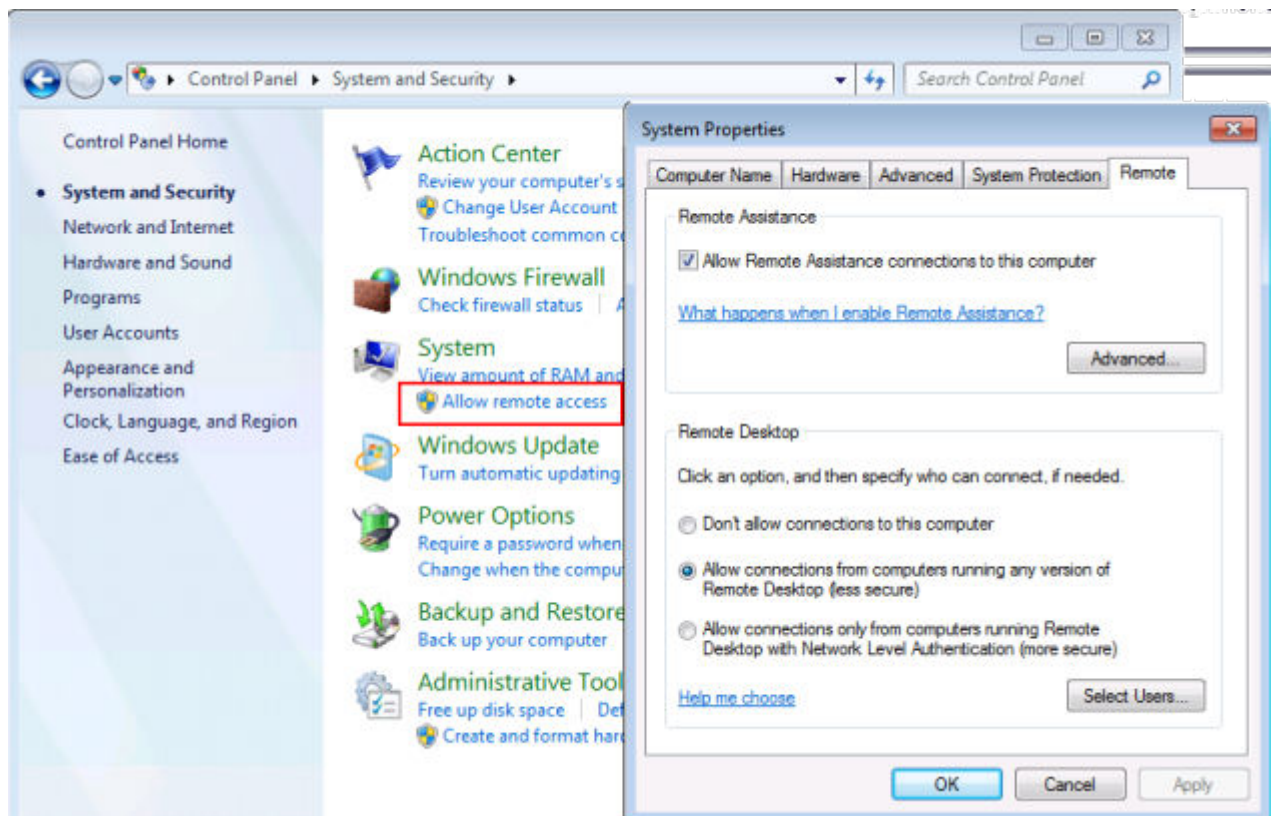
4. In the "Remote" tab, in the "Remote Desktop" area, activate the "Allow connections from computers running Remote Desktop" option.

5. Define which users are to be given access to the R&S FPS via Remote Desktop.
   If the secure user mode is deactivated, the "SecureUser" account is also deactivated. Thus, the procedure described here will not work for the "SecureUser". Instead, see Chapter 6.6.5, "How to Add or Remove Users to the Remote Desktop Users Group", on page 81.
   Note: Administrator user accounts (e.g. "Instrument") are automatically enabled for Remote Desktop.
   a) Select the "Select Users" button.
   b) Select the users or create new user accounts as described in Chapter 6.3.1, "How to Create Users", on page 70.
   c) Select "OK" to confirm the settings.

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

6.6.2   How to Configure the Controller

> ℹ️ **Remote Desktop Client**
>
> With Windows 7, Remote Desktop Client is part of the operating system and can be accessed via "Start > Programs > Accessories > Remote Desktop Connection".
>
> For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on.

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

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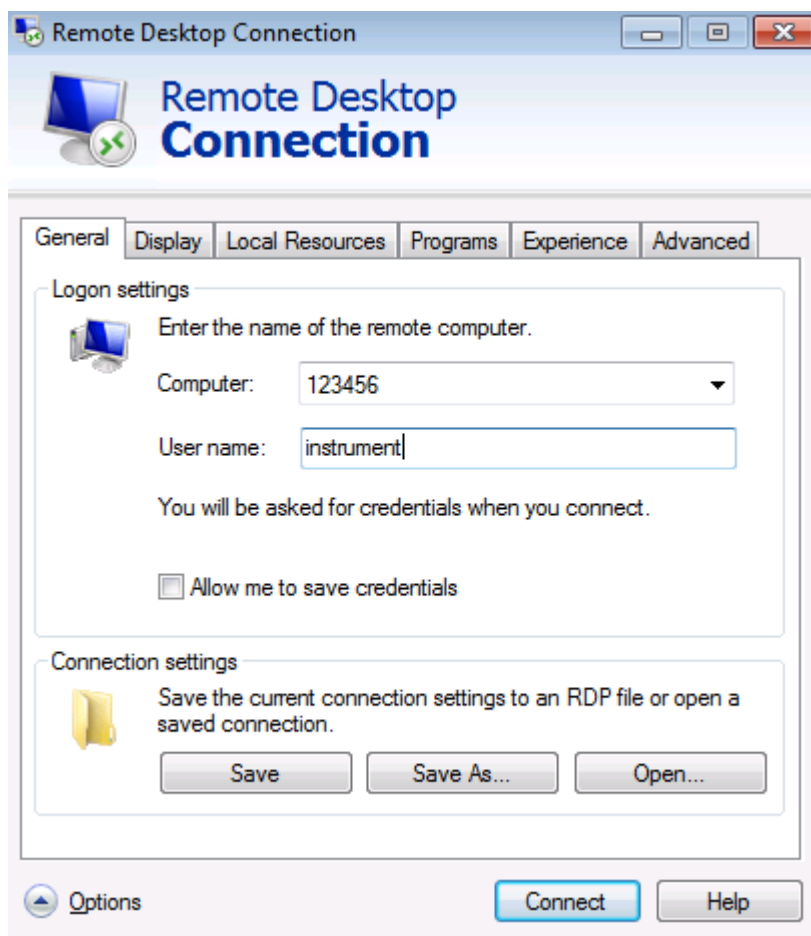
3. Open the "Experience" tab.

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

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

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

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

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

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

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

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

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

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

6.6.3 How to Start and Close the Remote Desktop

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

1. On the controller, in the "Remote Desktop Connection" dialog box (see Chapter 6.6.2, "How to Configure the Controller", on page 77), open the "General" tab.

2. In the "Computer" field, enter the IP address of the R&S FPS (see Chapter 6.2.2, "How to Assign the IP Address", on page 65 to determine the IP address).
   In the "User name" field, enter *instrument* to log in as an administrator, or *Normal User* to log in as a standard user.
   In the "Password" field, enter *894129*.

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

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

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

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

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

   For details on manual operation see Chapter 7, "Operating the Instrument in Manual Mode", on page 88.

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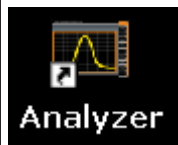
	• Select the key combination ALT + F4. • The R&S FPS firmware is shut down, which may take a few seconds. • On the desktop, double-click the "Analyzer" icon.

The firmware restarts and then automatically opens the graphical user interface from which you can access all instrument functions and settings.
For more information see Chapter 7.1.3, "Front Panels", on page 91.

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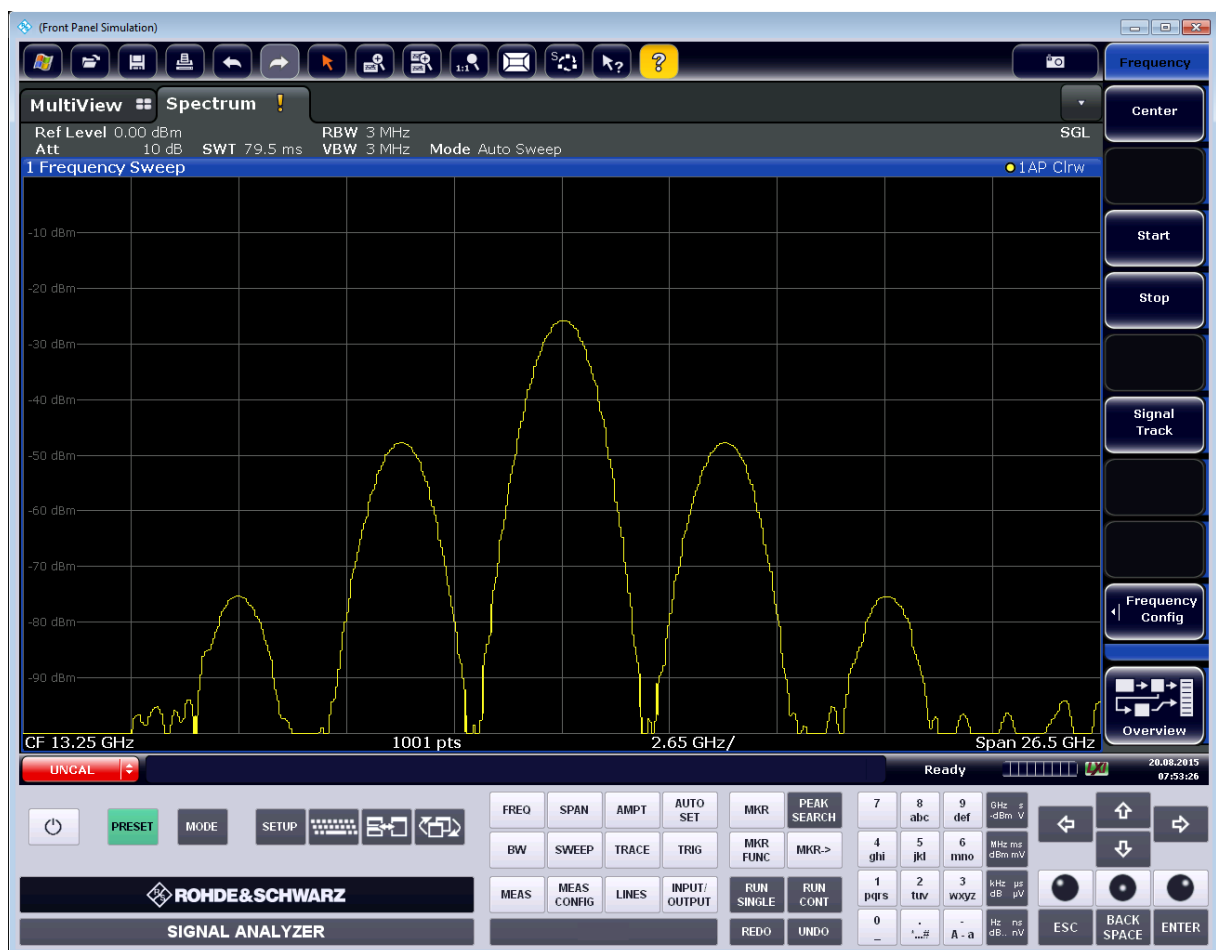
To terminate Remote Desktop control

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

Restoring the connection to the R&S FPS

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

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

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

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

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

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

Only users in the Remote Desktop Users Group are allowed to connect to the R&S FPS via Remote Desktop. You can add the users to this group directly when you allow remote access on the R&S FPS, as described in Chapter 6.6, "How to Set Up Remote Desktop", on page 74. Furthermore, you can add or remove users to this group at any time.

In order to add or remove users to the Remote Desktop users group for the R&S FPS, a controller pc or an external monitor, mouse and keyboard must be connected to the R&S FPS. See Chapter 6.6, "How to Set Up Remote Desktop", on page 74.

Secure User Mode

For security reasons, the "SecureUser" used in secure user mode is not allowed Remote Desktop access to the R&S FPS by default (see Chapter 3.6, "Protecting Data Using the Secure User Mode", on page 28). You must explicitly add the "SecureUser" to the Remote Desktop group. If you do not allow this user RemoteDesktop access, the "SecureUser" will only be able to operate the R&S FPS using remote commands or via the miniature display.

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

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

3. Start a RemoteDesktop connection to the R&S FPS as described in "To set up a connection from the controller to the R&S FPS" on page 79.

4.

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

5. Open the Windows Explorer.

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

7. Double-click "Computer Management".
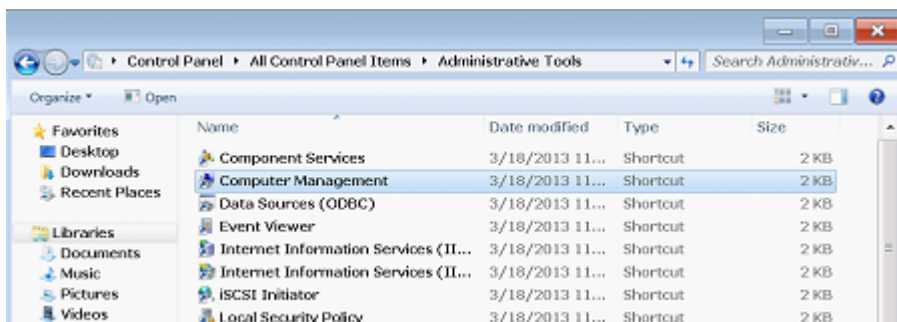
8. In the "Computer Management" dialog box, select "Local Users and Groups \Users" on the left side.
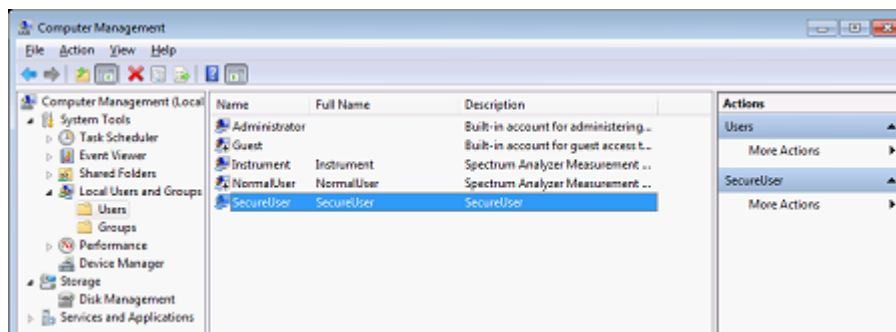
9. Double-click the user to be added, for example: "SecureUser".
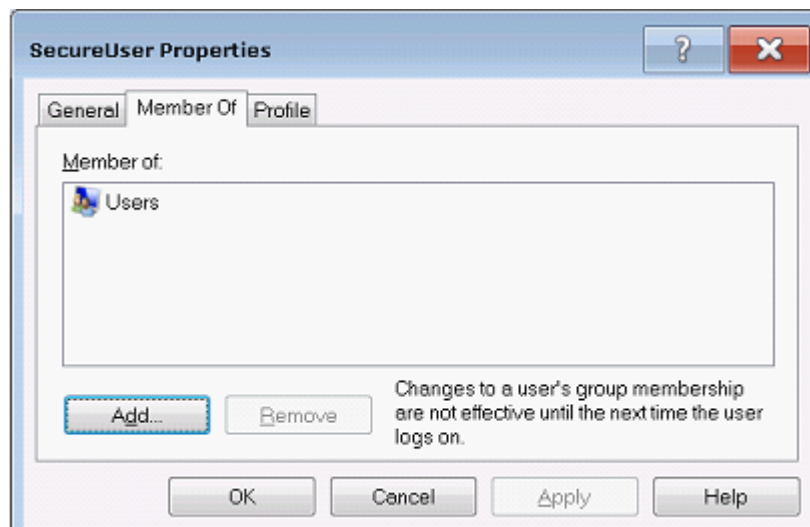
10. In the "SecureUser Properties" dialog box, switch to the "Member of" tab and click "Add".
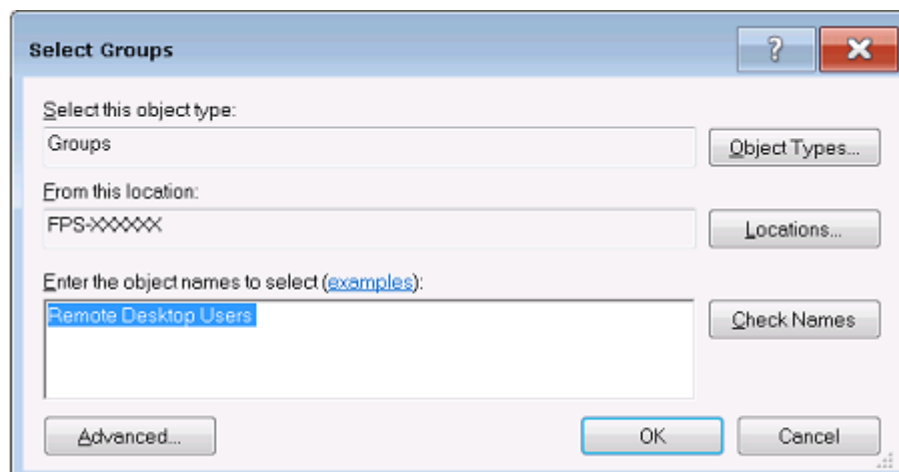
11. In the "Select Groups" dialog box, enter the "Remote Desktop Users" group and select "OK".
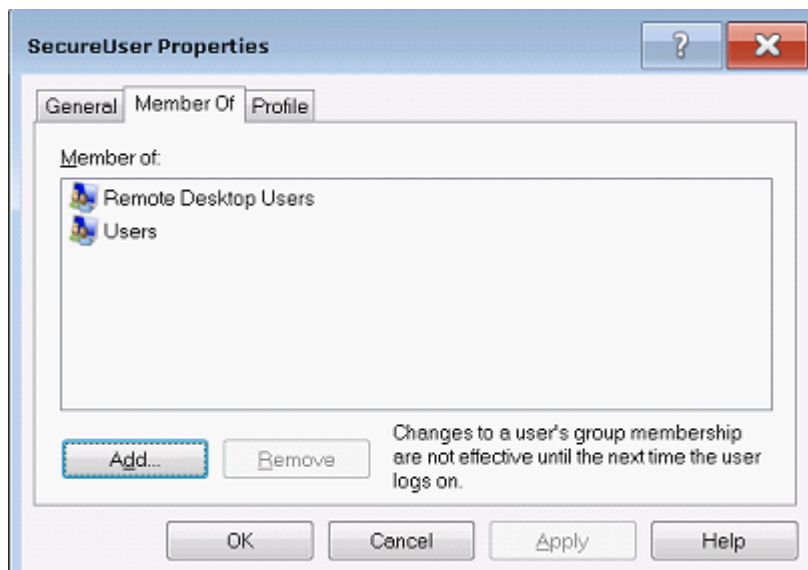
12. Select "Apply".

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

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

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

6.7 How to Control the R&S FPS via the Web Browser Interface

Via the LXI browser interface to the R&S FPS one or more users can control the instrument remotely from another PC without additional installation. Most instrument controls are available via the front panel simulation. File upload and download between the instrument and the remote PC is also available.

If no external monitor is connected to the R&S FPS, an additional driver is required on the instrument in order to control the R&S FPS via its web browser interface. If the driver is not available, the browser shows only a black screen.

Download the **TightVNC DFMirage driver** from the official TightVNC website (http://www.tightvnc.com/download.php) and install it on the R&S FPS as described on the website.

The current R&S FPS firmware was tested with the TightVNC DFMirage driver version 2.0.301.

To access the R&S FPS via the web browser interface

1. Start a web browser that supports html5 (W3C compliant).

2. Enter the IP address of the R&S FPS in the browser's address bar.

   The R&S FPS's Welcome page is displayed.

3. In the navigation pane, select "Instrument Control > Web Control".

   The instrument's display is shown in a new browser window, with a software front panel displayed beside or below it.

4. Use the mouse cursor to access the functionality in the software front panel or in the display as you would directly on the instrument's front panel.

To exchange files with the R&S FPS

You can download files, for example stored measurement data, from the R&S FPS to the remote PC, or upload files, for example limit line definitions, from the PC to the R&S FPS.

1. In the web browser, select the Welcome page window.

2. In the navigation pane, select "Instrument Control" > "File Upload" or "File Download".
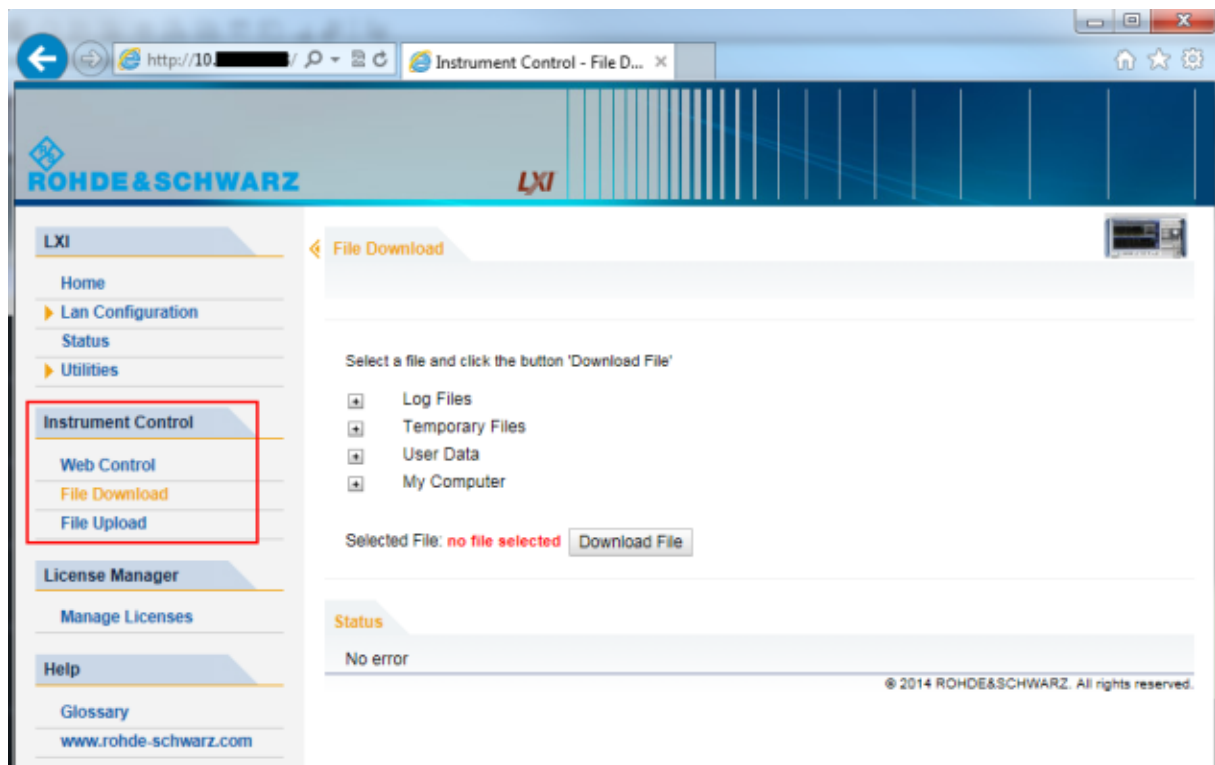
The most commonly used folders on the instrument are displayed, for example those that contain user data, as well as the top-most `My Computer` folder, from which you can access all other folders on the instrument.

3. To download a file from the R&S FPS, select the file from the displayed folders and then select "Download File".

4. To upload a file to the R&S FPS:
   a) From the displayed folders in the web browser window, select the folder on the R&S FPS to which you want to copy a file.
   b) Under "File to Upload", select "Browse" to open a file selection dialog box and select the required file on the PC.
   c) Select "Upload" to copy the file from the PC to the defined folder on the R&S FPS.

6.8   How to Deactivate the Web Browser Interface

If you want to prevent other users in the LAN from accessing or operating the R&S FPS via its LXI web browser interface, you must deactivate this function. Note that **after a firmware update** the function is **automatically active** again until you deactivate it manually.

To deactivate the LXI web browser interface

1.

   Select the "Windows" icon in the toolbar to access the operating system.

2. In the "Start" menu, select "Control Panel".

3. Select "System and Security" > "Administrative Tools".

4. From the list on the right, select "Services".

5. From the list of local services, select "R&S TightVNC Server".
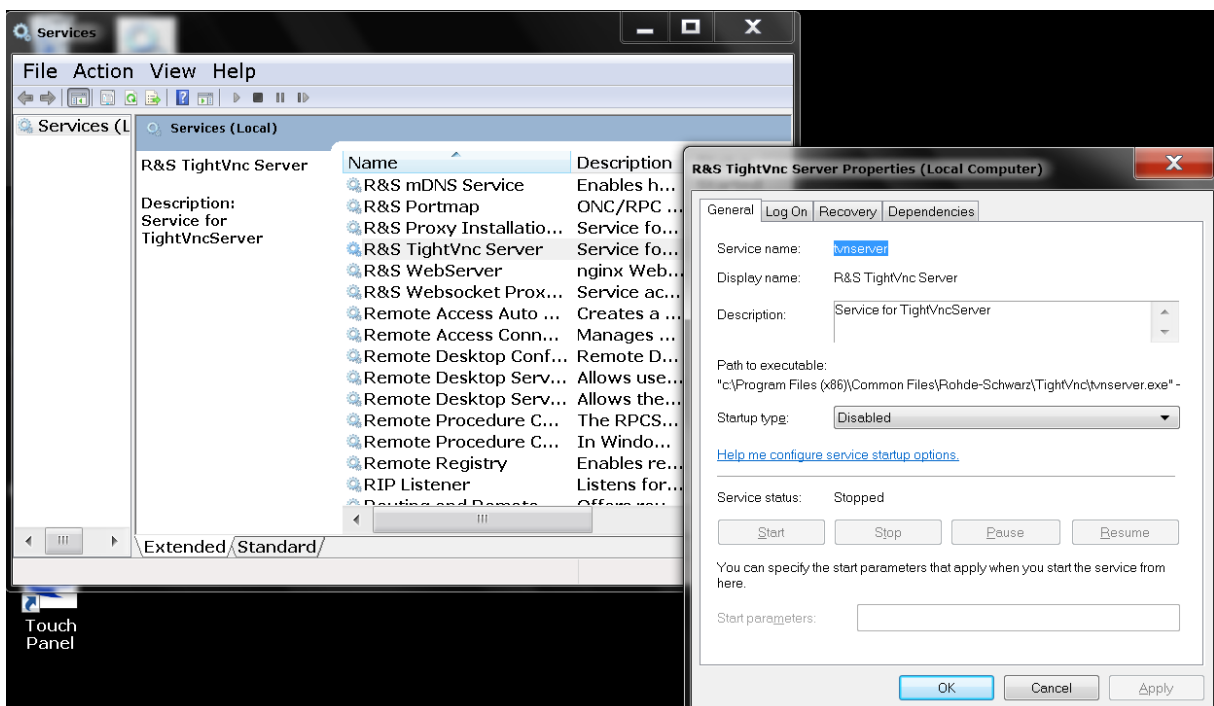
6. Set "Startup type" to "Disabled".

7. Select "Stop".

8. Select "Apply".

    The next time a user enters the IP address of the instrument in a web
    browser, an error message is displayed:
    ```
    Failed to connect to server (code. 1006)
    ```

7   Operating the Instrument in Manual Mode

The R&S FPS is completely remote-controlled; it does not provide a display for manual measurement control. The miniature display on the front panel of the R&S FPS allows only for very basic instrument configuration (see Chapter 5, "Miniature Display", on page 40).

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

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

7.1   Graphical User Interface Elements (Soft Front Panel)

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

All measurement results are displayed. Additionally, the display provides status and setting information, allows you to switch between various measurement tasks, and provides access to all measurement functions.

Figure 7-1: Graphical user interface elements in the R&S FPS's soft front panel

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

7.1.1   Toolbar

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

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

The following functions are available:

Table 7-1: Standard Application Functions in the Toolbar

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

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

7.1.2   Softkeys

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

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

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

Recognizing the softkey status by color

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

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

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

7.1.3   Front Panels

The virtual "Front Panel" provides (static) function keys to access basic instrument functions and softkey menus, as well as a keypad and navigation keys.

Figure 7-2: Front panel elements

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

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

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

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

Mini Front Panel

The Mini Front Panel displays only the basic system and function keys in a detached dialog box that can be moved around the screen.
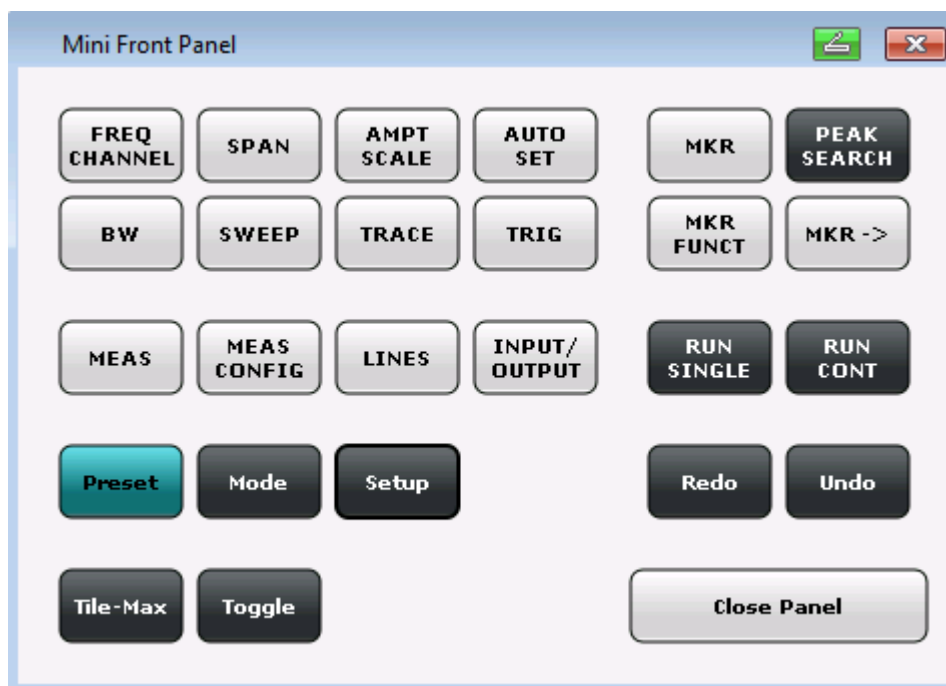
Figure 7-3: Mini Front Panel

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

To display the front panel or mini front panel

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

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

3. Select the "Displayed Items" tab.

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

7.1.3.1 SYSTEM Keys

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

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

Table 7-2: SYSTEM keys

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

7.1.3.2 Function Keys

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

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

Table 7-3: Function keys

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

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

UNDO/REDO keys

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

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

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

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

7.1.3.3 Keypad

The virtual keypad is used to enter alphanumeric parameters, including the corresponding units (see also Chapter 7.4, "Entering Data", on page 109). It contains the following keys:

Table 7-4: Keys on the keypad

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

7.1.3.4 Navigation Controls

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

Rotary knob simulation

The virtual rotary knob has several functions:

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

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

Table 7-5: Rotary know simulation keys

Icon	Function
●	Turn left
●	Enter
●	Turn right

Navigation keys

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

Arrow Up/Arrow Down Keys

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

Arrow Left/Arrow Right Keys

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

Data input keys

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

Table 7-6: Data input keys

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

7.1.4   On-screen Keyboard

The on-screen keyboard is an additional means of interacting with the instrument without having to connect an external keyboard.
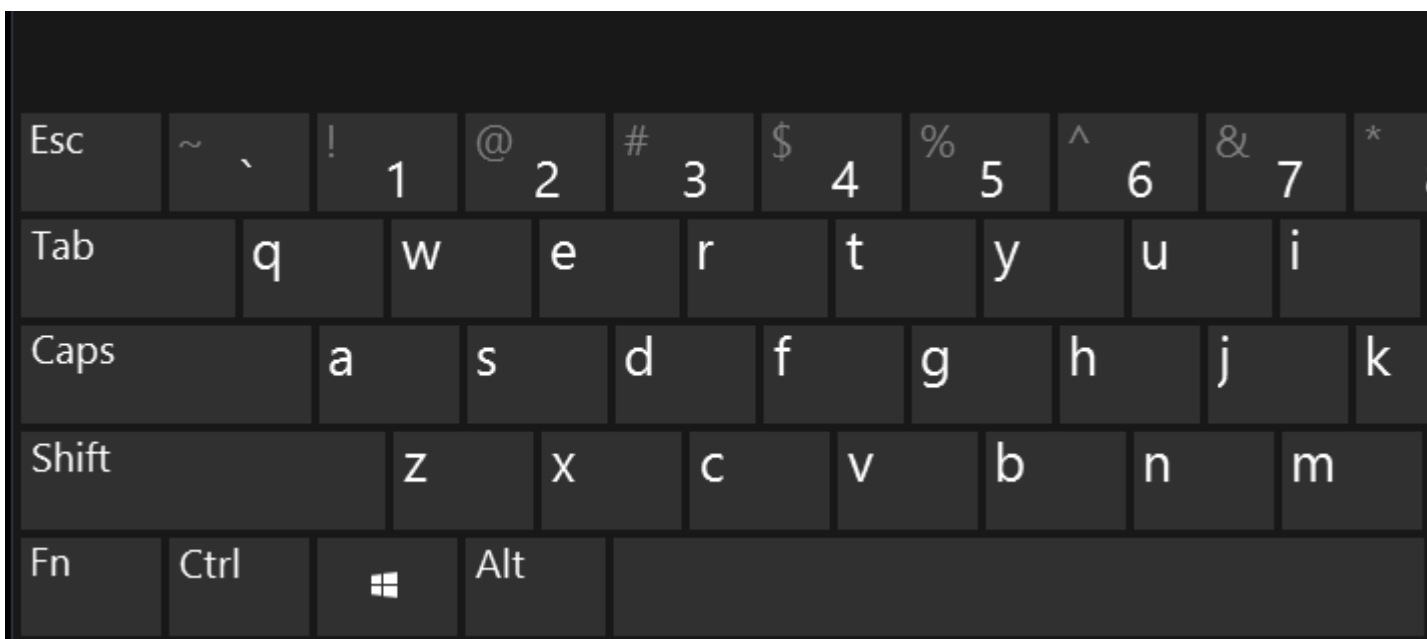
The on-screen keyboard display can be switched on and off as desired using the "On-Screen Keyboard" function key beneath the screen.

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

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

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

7.2 Understanding the Display Information

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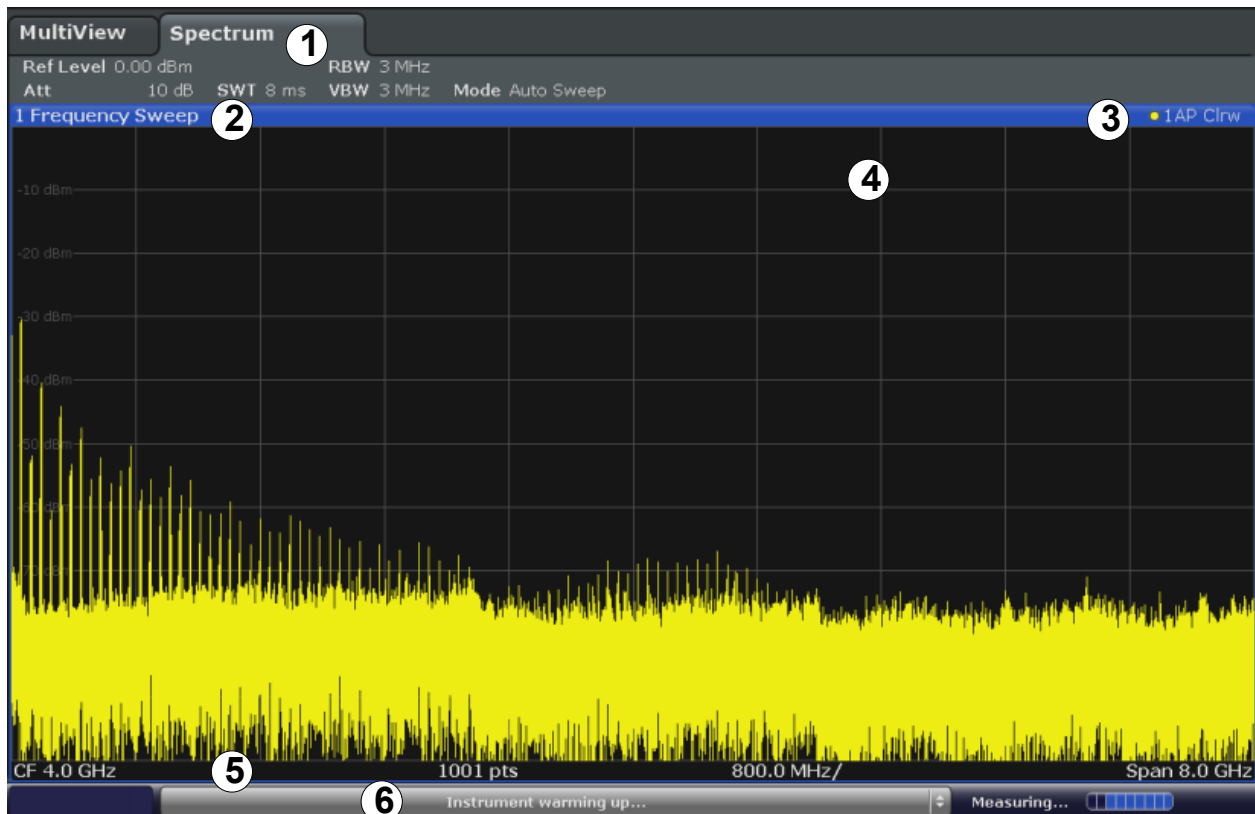
1   = Channel bar for firmware and measurement settings
2+3 = Window title bar with diagram-specific (trace) information
4   = Diagram area with marker information
5   = Diagram footer with diagram-specific information, depending on measurement application
6   = Instrument status bar with error messages,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

7.2.1   Channel Bar

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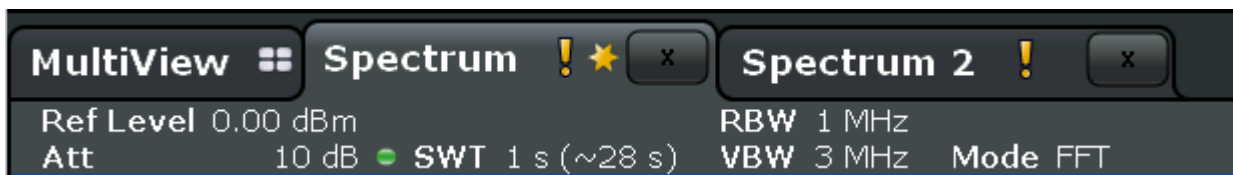
The ⭐ icon on the tab label indicates that the displayed trace no longer matches the current instrument settings. This may be the case, for example, if a trace is frozen and the instrument settings are changed. As soon as a new measurement is performed, the icon disappears.

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

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

Channel-specific settings

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

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

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

Ref Level	Reference level
m.+el.Att	Mechanical and electronic RF attenuation that has been set.
Ref Offset	Reference level offset
SWT	Sweep time that has been set.
	If the sweep time does not correspond to the value for automatic coupling, a bullet is displayed in front of the field. The color of the bullet turns red if the sweep time is set below the value for automatic coupling. In addition, the UNCAL flag is shown. In this case, the sweep time must be increased.
Meas Time	Measurement time, calculated from analysis bandwidth and number of samples (for statistics measurements)

RBW	Resolution bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet appears in front of the field.
VBW	Video bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet is displayed in front of the field.
AnBW	Analysis bandwidth (for statistics measurements)
Compatible	Compatible device mode (default not displayed)
Mode	Indicates which sweep mode type is selected: • "Auto FFT": automatically selected FFT sweep mode • "Auto sweep": automatically selected swept sweep mode • "Sweep": manually selected frequency sweep mode • "FFT": manually selected FFT sweep mode

Common settings

In addition to the channel-specific settings, the channel bar above the diagram also displays information on instrument settings that affect the measurement results even though this is not immediately apparent from the display of the measured values. This information is displayed in gray font and only when applicable for the current measurement, as opposed to the channel-specific settings that are always displayed.
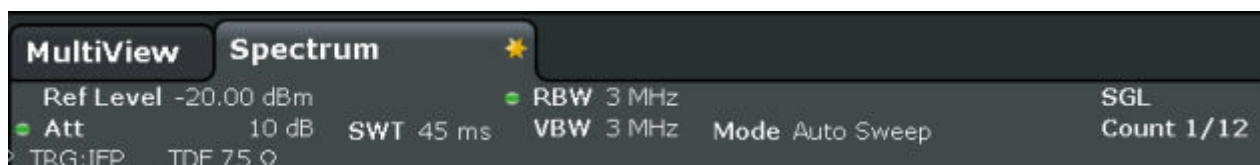
The following types of information may be displayed, if applicable.

Table 7-8: Common settings displayed in the channel bar

SGL	The sweep is set to single sweep mode.
Sweep Count	The current signal count for measurement tasks that involve a specific number of subsequent sweeps
	(see "Sweep Count" setting in "Sweep settings" in the User Manual)
TRG	Trigger source
	(for details see "Trigger settings" in the User Manual) • **EXT**: External • **IFP**: IF power (+trigger bandwidth) • **RFP**: RF power • **VID**: Video

6dB/RRC/ CHN	Filter type for sweep bandwidth (see "Bandwidth settings" in the User Manual)
YIG Bypass	The YIG filter is deactivated.
PA	The preamplifier is activated.
GAT	The frequency sweep is controlled via the TRIGGER INPUT connector.
TDF	A transducer factor is activated.
75 Ω	The input impedance of the instrument is set to 75 Ω.
FRQ	A frequency offset ≠ 0 Hz is set.
DC/AC	An external DC or AC calibration signal is in use.
<NOR | APR> **Ext. Gen**	An external generator is being controlled by the R&S FPS. **NOR**: the measurements are normalized with the results of the external generator calibration **APR** (approximation): the measurements are normalized with the results of the external generator calibration; however, the measurement settings have been changed since calibration If neither label is displayed, no calibration has been performed yet or normalization is not active. For details see the "External Generator Control" section in the R&S FPS User Manual.
LVL	A level offset is applied to the external generator signal (only if external generator control is active).

7.2.2   Window Title Bar

Each channel in the R&S FPS display may contain several windows. Each window can display either a graph or a table as a result of the channel measurement. Which type of result evaluation is displayed in which window is defined in the display configuration (see Chapter 7.5, "Displaying Results", on page 112). The window's title bar indicates which type of evaluation is displayed.

7.2.3   Trace Information in Window Title Bar

Information on the displayed traces is indicated in the window title bar.
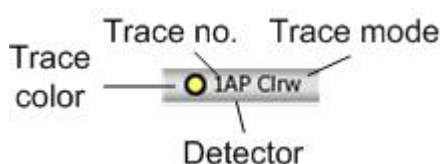
Trace color		Color of trace display in diagram
Trace no.		Trace number (1 to 6)
Detector		Selected detector:
	AP	AUTOPEAK detector
	Pk	MAX PEAK detector
	Mi	MIN PEAK detector
	Sa	SAMPLE detector
	Av	AVERAGE detector
	Rm	RMS detector
Trace Mode		Sweep mode:
	Clrw	CLEAR/WRITE
	Max	MAX HOLD
	Min	MIN HOLD
	Avg	AVERAGE (Lin/Log/Pwr)
	View	VIEW
Norm/NCor		Correction data is not used.

7.2.4   Marker Information

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

Marker information in diagram grid

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

Marker information in marker table

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

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

The functions are indicated with the following abbreviations:

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

7.2.5   Frequency and Span Information in Diagram Footer

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

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

7.2.6   Instrument and Status Information

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

💡 **Hiding the status bar**

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

See the User Manual for details.

The following information is displayed:

Instrument status

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

Progress

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

Date and time

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

💡 You can hide the date and time display in the status bar, or the entire status bar ("Setup > Display > Displayed Items").

For details see the R&S FPS User Manual.

7.2.7   Error Information

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

Note that the status bar is only visible on an external monitor or via Remo-teDesktop from a controller PC (see Chapter 3.3, "Connecting USB Devi-ces", on page 24 or Chapter 6.6, "How to Set Up Remote Desktop", on page 74).

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

Table 7-9: Status bar information - color coding

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

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

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

The following keywords are used:

IF OVLD	Overload of the IF signal path after the input mixer. • Increase the reference level.
INPUT OVLD	The signal level at the RF input connector exceeds the maximum. The RF input is disconnected from the input mixer to protect the device. In order to re-enable measurement, decrease the level at the RF input con-nector and reconnect the RF input to the mixer input.
LOUNL	Error in the instrument's frequency processing hardware was detected.

NO REF	Instrument was set to an external reference but no signal was detected on the reference input.
OVEN	OCXO reference frequency (option R&S FPS-B4) has not yet reached its operating temperature. The message usually disappears a few minutes after power has been switched on.
RF OVLD	Overload of the input mixer. • Increase the RF attenuation (for RF input). • Reduce the input level (for digital input)
UNCAL	One of the following conditions applies: • Correction data has been switched off. • No correction values are available, for example after a firmware update. • Record the correction data by performing a self alignment
WRONG_FW	The firmware version is out-of-date and does not support the currently installed hardware. Until the firmware version is updated, this error message is displayed and self-alignment fails. (For details refer to the R&S FPS User Manual).

7.3 Changing the Focus

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

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

7.4 Entering Data

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

7.4.1   Entering Numeric Parameters

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

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

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

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

7.4.2   Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see Chapter 7.1.4, "On-screen Keyboard", on page 99).

Alternatively, you can use the virtual keypad. Every alphanumeric key represents several characters and one number. The decimal point key (.) represents special characters, and the sign key (-) toggles between capital and small letters. For the assignment refer to Table 7-10. In principle, the input of alphanumeric parameters works like writing an SMS on your cell phone.

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

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

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

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

    With each key stroke the next possible value of this key is displayed. If all possible values have been displayed, the series starts with the first value again. For information on the series refer to Table 7-10.

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

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

To enter a blank

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

To correct an entry

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

2. Select the BACKSPACE key.

   The entry to the left of the cursor is deleted.

3. Enter your correction.

To complete the entry

► Select the ENTER key or the rotary knob.

To cancel the entry

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

Table 7-10: Keys for alphanumeric parameters

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

7.5　Displaying Results

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

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

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

7.5.1　Activating channels

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

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

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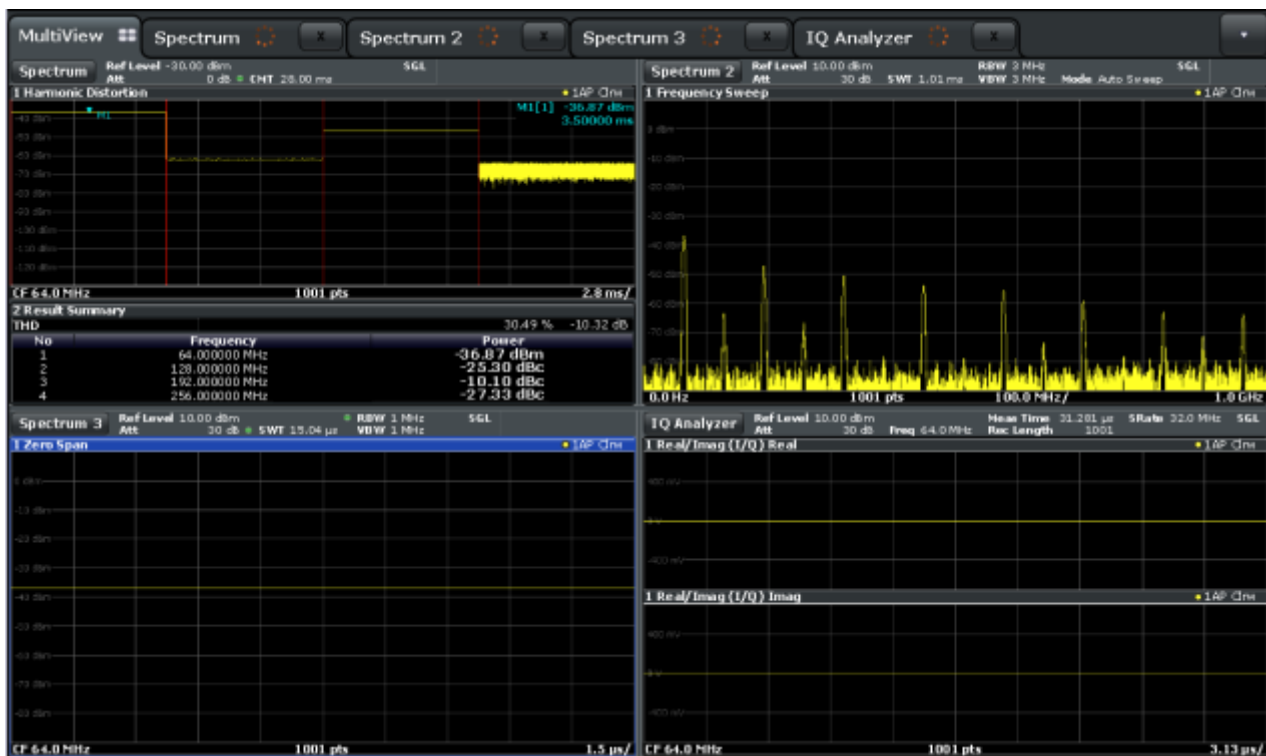
To start a new channel

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

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

To change the application in an active channel

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

2. Select the MODE key.

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

7.5.2   Laying out the Result Display with the SmartGrid

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

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

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

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

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

7.5.2.1   Background Information: The SmartGrid Principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the Smart-Grid where you drop the window determines its position on the screen.
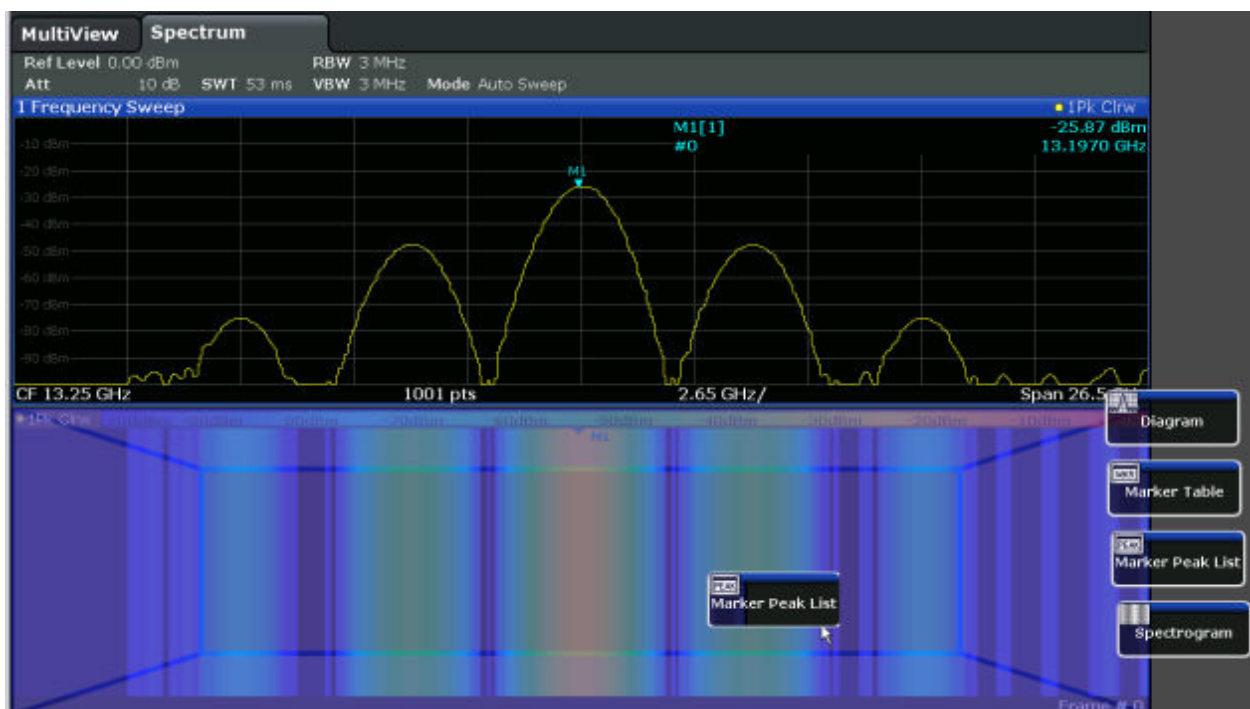
Figure 7-4: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows: above/below, right/left or replacement (as illustrated in Figure 7-5). If an existing window would be replaced, the drop area is highlighted in a darker color shade.

Positioning the window

The screen can be divided into up to four rows. Each row can be split into up to four columns, where each row can have a different number of columns. However, rows always span the entire width of the screen and may not be interrupted by a column. A single row is available as the drop area for the window in the Smart-Grid. The row can be split into columns, or a new row can be inserted above or below the existing row (if the maximum of 4 has not yet been reached).
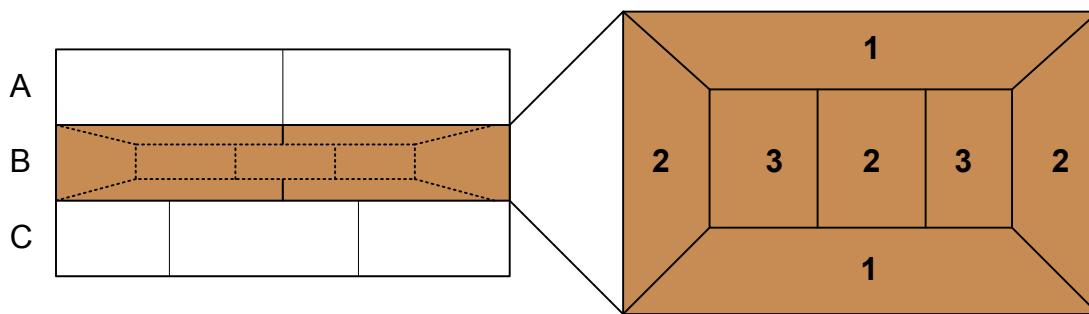
Figure 7-5: SmartGrid window positions

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

SmartGrid functions

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

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

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

7.5.2.2 How to Activate SmartGrid Mode

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

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

●

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

The SmartGrid functions and the evaluation bar are displayed.

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

7.5.2.3   How to Add a New Result Window

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

1. Activate SmartGrid mode.

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

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

3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See Chapter 7.5.2.5, "How to Arrange the Result Windows", on page 117 for more information on positioning the window).

7.5.2.4   How to Close a Result Window

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

7.5.2.5   How to Arrange the Result Windows

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

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

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

4. Drop the window in the target area.

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

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

7.5.3   Changing the Size of Windows

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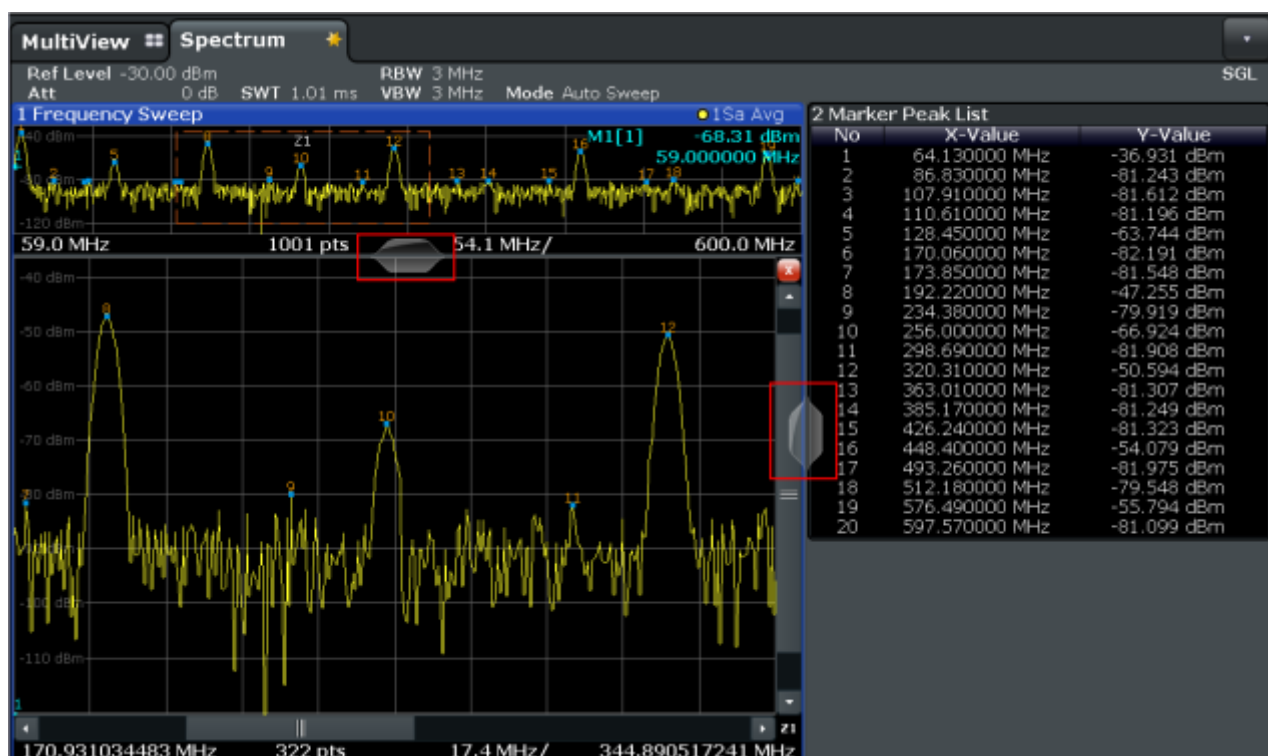
The splitters are not available in SmartGrid mode.

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

7.5.4 Switching Between a Split and Maximized Window Display

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

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

7.5.5 Changing the Display

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

- Displaying or hiding a simulation of the entire front panel of the instrument on the screen ("Soft Front Panel")
- Displaying the main function hardkeys in a separate window on the screen ("Mini Front Panel")
- Hiding or showing various screen elements
- Selecting a display theme and colors
- Changing the display update rate
- Zooming into the diagram

7.6 Getting Help

If any questions or problems concerning the R&S FPS arise, an extensive online help system is provided on the instrument and can be consulted at any time. The help system is context-sensitive and provides information specifically for the cur-

rent operation or setting to be performed. In addition, general topics provide an overview on complete tasks or function groups as well as background information.

7.6.1   Calling Up Help

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

Calling context-sensitive help

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

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

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

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

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

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

7.6.2   Using the Help Window

The Help window contains several tabs:
● "View" - shows the selected help topic
● "Contents" - contains a table of help contents

- "Index" - contains index entries to search for help topics
- "Search" - provides text search

| View | Contents | Index | Search |

The Help toolbar provides some buttons:

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

To search for a topic in the index

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

1. Switch to the "Index" tab.

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

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

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

To search topics for a text string

1. Switch to the "Search" tab.

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

3. Enter the string you want to find.
   If you enter several strings with blanks between, topics containing all words are found (same as AND operator).

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

- Use "Match whole word" and "Match case" to refine the search.
- Use operators AND, OR, and NOT.

To close the Help window

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

8   Collecting Information for Technical Support

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

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

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

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

  An .xml file with information on the system configuration ("Device Footprint") can be created automatically (using the `DIAGnostic:SERVice:SINFo` command or as described in "To collect the support information" on page 123).

- **Error Log:** The `RSError.log` file (in the `C:\R_S\INSTR\log` directory) contains a chronological record of errors.

- **Support file:** a *.zip file with important support information can be created automatically (in the `C:\R_S\INSTR\user` directory). The *.zip file contains the system configuration information ("Device Footprint"), the current eeprom data and a screenshot of the screen display.

To collect the support information

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

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

   The file is stored as
   ```
   C:\R_S\INSTR\user\
   <inst_model>_<serial-no>_<date_and_time>.zip
   ```

For example
```
C:\R_S\INSTR\user\
FPS-13_1319.2008K13-100005-xx_20150420_113652.zip
```

Collect the error information and attach it to an email in which you describe the problem. Send the email to the customer support address for your region as listed on the Internet (http://www.customersupport.rohde-schwarz.com).

Packing and transporting the instrument

If the instrument needs to be transported or shipped, observe the notes described in Chapter 3.1.1, "Unpacking and Checking the Instrument", on page 13.

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