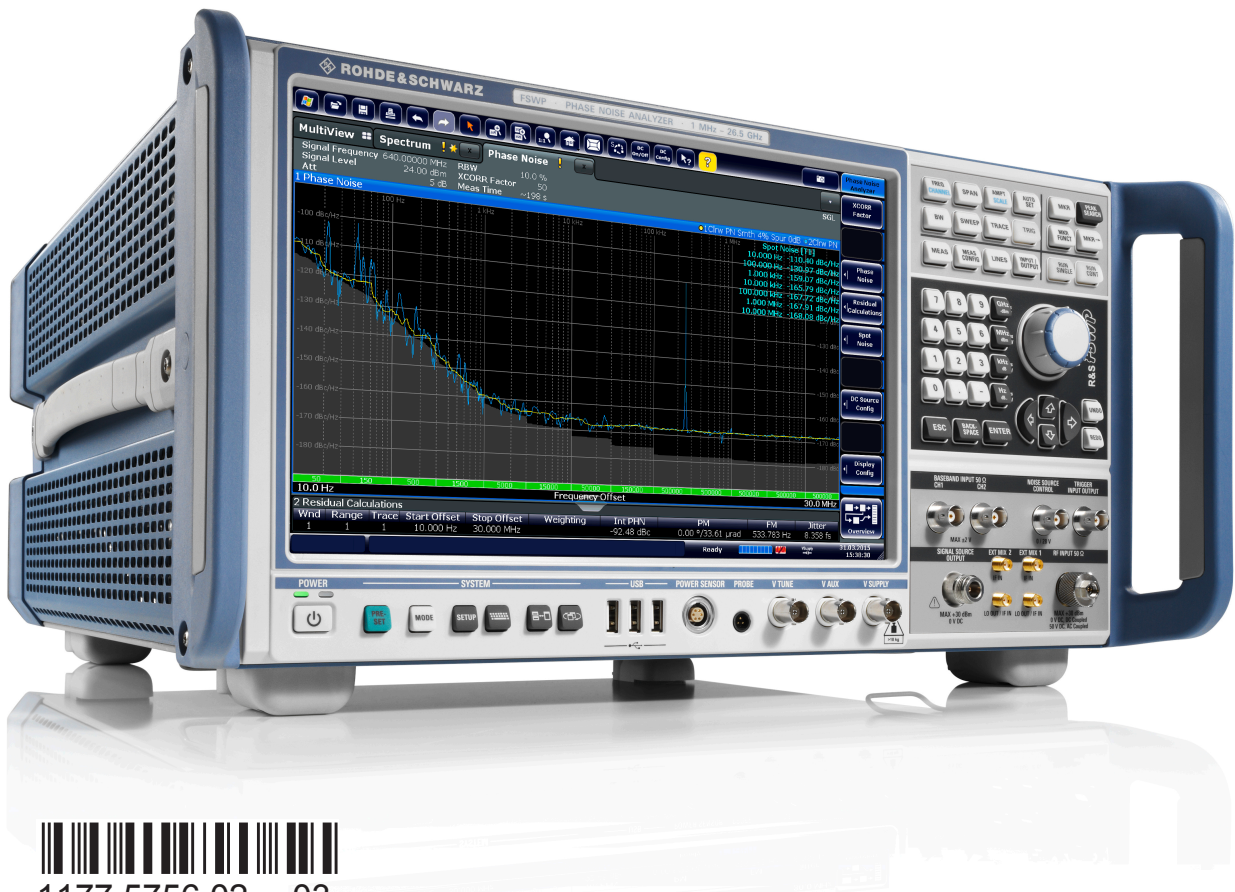


R&S®FSWP

Phase Noise Analyzer

Getting Started



1177.5756.02 – 03

This manual describes the following R&S®FSWP models:

- R&S®FSWP8 (1322.8003K08)
- R&S®FSWP26 (1322.8003K26)
- R&S®FSWP50 (1322.8003K50)

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgment" on the user documentation CD-ROM (included in delivery).

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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Subject to change – Data without tolerance limits is not binding.

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Trade names are trademarks of the owners.

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

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

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

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

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

Safety labels on products

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

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

Basic Safety Instructions

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

Signal words and their meaning

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



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



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



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



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.

Basic Safety Instructions

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 $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency, overvoltage category 2, pollution degree 2.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

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

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

Basic Safety Instructions

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

Operation

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

Basic Safety Instructions

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

Repair and service

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

Basic Safety Instructions

- 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.

- Cells must not be taken apart or crushed.
- 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.
- 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.
- Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
- 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.
- 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.
- Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

- 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.
- 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.
- 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.

Instrucciones de seguridad elementales

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

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















Instrucciones de seguridad elementales

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

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

Señalización de seguridad de los productos

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

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

Instrucciones de seguridad elementales

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

Palabras de señal y su significado

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



Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.



Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

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

Estados operativos y posiciones de funcionamiento

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

Instrucciones de seguridad elementales

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 $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, se pueden causar lesiones o, en determinadas circunstancias, incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

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

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

Instrucciones de seguridad elementales

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

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 señalar 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.

Instrucciones de seguridad elementales

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

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

Transporte

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

Instrucciones de seguridad elementales

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, dirijase a su servicio de atención al cliente de Rohde & Schwarz.
3. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

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

Quality management and environmental management

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde&Schwarz Produktes entschieden. Sie erhalten damit ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unserer Qualitäts- und Umweltmanagementsysteme entwickelt, gefertigt und geprüft. Rohde&Schwarz ist unter anderem nach den Managementsystemen ISO9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet

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

Dear customer,

You have decided to buy a Rohde&Schwarz product. This product has been manufactured using the most advanced methods. It was developed, manufactured and tested in compliance with our quality management and environmental management systems. Rohde&Schwarz has been certified, for example, according to the ISO9001 and ISO 14001 management systems.

Environmental commitment

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

Cher client,

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

Engagement écologique

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



Customer Support

Technical support – where and when you need it

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

Up-to-date information and upgrades

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

Europe, Africa, Middle East

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

North America

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Contents

1 Documentation Overview.....	7
2 Conventions Used in the Documentation.....	9
2.1 Typographical Conventions.....	9
2.2 Conventions for Procedure Descriptions.....	9
2.3 Notes on Screenshots.....	10
3 Preparing for Use.....	11
3.1 Putting into Operation.....	11
3.1.1 Unpacking and Checking the Instrument.....	13
3.1.2 Accessory List.....	14
3.1.3 Placing or Mounting the Instrument.....	14
3.1.4 Connecting the AC Power.....	16
3.1.5 Switching the Instrument On and Off.....	17
3.1.6 Performing a Self-Alignment and a Selftest.....	18
3.1.7 Checking the Supplied Options.....	19
3.2 Windows Operating System.....	19
3.2.1 Virus Protection.....	20
3.2.2 Service Packs and Updates.....	21
3.2.3 Login.....	21
3.2.4 Accessing the Start Menu.....	23
3.3 Connecting USB Devices.....	23
3.4 Connecting an External Monitor.....	25
3.5 Setting Up a Network (LAN) Connection.....	26
3.5.1 Connecting the Instrument to the Network.....	27
3.5.2 Assigning the IP Address.....	28
3.5.3 Using computer names.....	28

3.5.4 Changing the Windows Firewall Settings.....	29
3.6 Setting the Date and Time.....	29
4 Instrument Tour.....	31
4.1 The Front Panel.....	31
4.1.1 Display (Touchscreen).....	32
4.1.2 Power Key.....	37
4.1.3 System Control Keys.....	38
4.1.4 The Function Keys.....	38
4.1.5 The Keypad.....	40
4.1.6 Navigation Control.....	41
4.1.7 RF Input (50 Ω).....	43
4.1.8 Signal Source Output.....	43
4.1.9 USB Ports.....	44
4.1.10 Power Sensors.....	44
4.1.11 Probe Power Connector (3 Pins).....	44
4.1.12 Noise Source Control.....	44
4.1.13 Trigger Input and Output.....	45
4.1.14 DC Power Supply.....	45
4.2 The Rear Panel.....	46
4.2.1 Removable Hard Disk.....	47
4.2.2 AC Power Connector and Main Power Switch.....	47
4.2.3 DisplayPort and DVI.....	47
4.2.4 LAN Connector.....	47
4.2.5 USB Ports.....	48
4.2.6 Sync Trigger Input and Output.....	48
4.2.7 AUX Port.....	48
4.2.8 GPIB Interface.....	49

4.2.9 External Generator Control (Optional).....	49
4.2.10 OCXO (Optional).....	49
4.2.11 REF INPUT / REF OUTPUT.....	50
5 Trying Out the Instrument.....	51
5.1 Measuring Noise Characteristics.....	52
5.1.1 Measuring the Phase Noise.....	52
5.1.2 Measuring Additive Noise.....	55
5.1.3 Measuring the Noise of a Pulse.....	56
5.1.4 Adding Another Measurement Channel.....	57
5.2 Controlling the Displayed Results.....	58
5.3 Controlling the Measurement.....	63
6 Operating the Instrument.....	68
6.1 Understanding the Display Information.....	68
6.1.1 Channel Bar.....	69
6.1.2 Window Title Bar.....	71
6.1.3 Marker Information.....	72
6.1.4 Spot Noise Information.....	73
6.1.5 Measurement Progress Information.....	74
6.1.6 Frequency Information in Diagram Footer.....	75
6.1.7 Instrument and Status Information.....	75
6.1.8 Error Information.....	76
6.2 Accessing the Functionality.....	77
6.3 Changing the Focus.....	78
6.4 Entering Data.....	78
6.4.1 Entering Numeric Parameters.....	79
6.4.2 Entering Alphanumeric Parameters.....	79
6.5 Displaying Results.....	81

6.5.1	Activating and Deactivating Channels.....	81
6.5.2	Laying out the Result Display with the SmartGrid.....	83
6.5.3	Changing the Size of Windows.....	87
6.5.4	Switching Between a Split and Maximized Window Display.....	88
6.5.5	Changing the Display.....	89
6.6	Remote Control.....	89
6.6.1	Using the LXI Browser Interface in a LAN.....	90
6.6.2	Remote Desktop Connection.....	90
6.6.3	Connecting a PC via the GPIB Interface.....	90
7	Obtaining Technical Support.....	91
	Index.....	93

1 Documentation Overview

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

- Printed Getting Started manual
- Online Help system on the instrument
- Documentation CD-ROM with:
 - Getting Started
 - User Manuals for base unit and firmware applications
 - Service Manual
 - Release Notes
 - Data sheet and product brochures

Online Help

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

Web Help

The web help provides online access to the complete information on operating the R&S FSWP and all available options, without downloading. The content of the web help corresponds to the user manuals for the latest product version. The web help is available from the R&S FSWP product page at <http://www.rohde-schwarz.com/product/FSWP.html> > Downloads > Web Help.

Getting Started

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

User Manuals

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

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

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

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

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

Service Manual

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

Release Notes

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

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

2 Conventions Used in the Documentation

2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

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

2.3 Notes on Screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as much as possible of the provided functions and possible interdependencies between parameters.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

3 Preparing for Use

• Putting into Operation.....	11
• Windows Operating System.....	19
• Connecting USB Devices.....	23
• Connecting an External Monitor.....	25
• Setting Up a Network (LAN) Connection.....	26
• Setting the Date and Time.....	29

3.1 Putting into Operation

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

⚠ WARNING

Risk of injury and instrument damage

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

- Do not open the instrument casing.
- Read and observe the "Basic Safety Instructions" at the beginning of this manual or on the documentation CD-ROM, in addition to the safety instructions in the following sections. Notice that the data sheet may specify additional operating conditions.

NOTICE

Risk of instrument damage

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

NOTICE**Risk of electrostatic discharge (ESD)**

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

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

NOTICE**Risk of instrument damage during operation**

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

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

**EMI impact on measurement results**

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

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

• Unpacking and Checking the Instrument.....	13
• Accessory List.....	14
• Placing or Mounting the Instrument.....	14
• Connecting the AC Power.....	16
• Switching the Instrument On and Off.....	17
• Performing a Self-Alignment and a Selftest.....	18
• Checking the Supplied Options.....	19

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.

NOTICE

Risk of damage during transportation and shipment

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

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

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

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



Packing material

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

3.1.2 Accessory List

The instrument comes with the following accessories:

- Power cable
- Printed Getting Started manual
- "R&S FSWP User Documentation" CD-ROM

3.1.3 Placing or Mounting the Instrument

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

Bench Top Operation

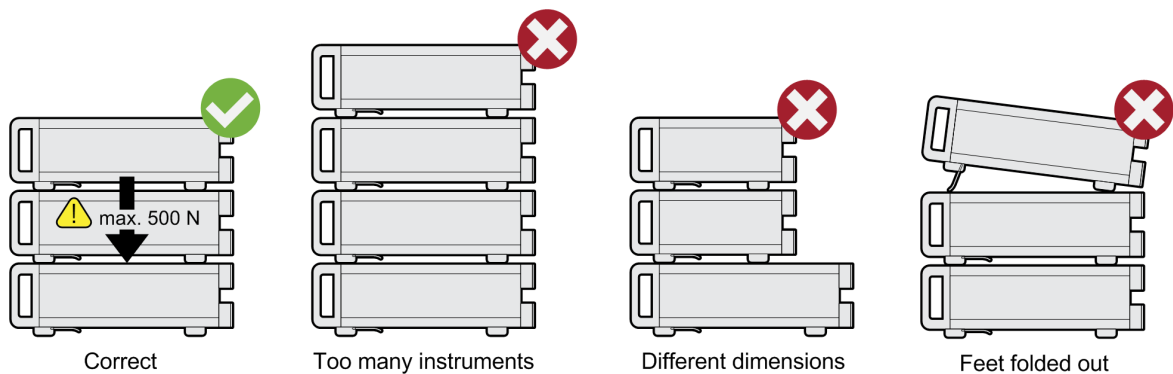
If the R&S FSWP is operated on a bench top, the surface should be flat. The instrument can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended.

⚠ CAUTION**Risk of injury and instrument damage if stacking instruments**

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

Observe the following instructions when stacking instruments:

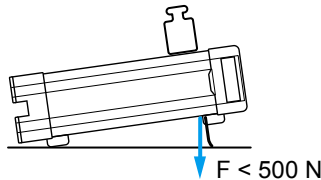
- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.
- The overall load imposed on the lowest instrument must not exceed 500 N.
- All instruments must have the same dimensions (width and length).
- If the instruments have foldable feet, fold them in completely.



⚠ CAUTION**Risk of injury if feet are folded out**

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

- Fold the feet completely in or completely out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.
- When the feet are folded out, do not work under the instrument or place anything underneath.
- The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 500 N.

**Rackmounting**

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

NOTICE**Risk of instrument damage in a rack**

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

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

3.1.4 Connecting the AC Power

In the standard version, the R&S FSWP is equipped with an AC power supply connector. The R&S FSWP 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 4.2.2, "AC Power Connector and Main Power Switch"](#), on page 47.



- ▶ Connect the R&S FSWP 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. An orange LED indicates the instrument is in standby mode



Warm-up time for OCXO

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

Switching the instrument off

1. Press the POWER key on the front panel.
The R&S FSWP switches to standby mode.
2. Set the AC power switch on the rear panel to position "O", or disconnect the instrument from the AC power supply.
The R&S FSWP changes into off mode.

NOTICE**Risk of losing data**

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

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

3.1.6 Performing a Self-Alignment and a Selftest



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 FSWP 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).

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

Performing a self-alignment

1. Press the SETUP key.
2. Press the "Alignment" softkey.
3. Select the "Start Self-Alignment" button in the "Alignment" dialog box.

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

**To display the alignment results again later**

- Press the SETUP key.
- Press the "Alignment" softkey.

Performing a selftest

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

1. Press the SETUP key.
2. Press 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.

3.1.7 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.

1. Press the SETUP key.
2. Press the "System Config" softkey.
3. Switch to the "Versions + Options" tab in the "System Configuration" dialog box.

A list with hardware and firmware information is displayed.

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

3.2 Windows Operating System

The instrument contains the Microsoft Windows operating system which has been configured according to the instrument's features and needs. Changes in the sys-

tem 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 FSWP is started, the operating system boots and the instrument firmware is started automatically.

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

NOTICE**Risk of causing instrument unusability**

The instrument is equipped with the Microsoft Windows operating system. Additional software can therefore be installed on the instrument. The use and installation of additional software may impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.

The drivers and programs used on the instrument under Microsoft Windows have been adapted to the instrument. Existing instrument software must always be modified using only update software released by Rohde & Schwarz.

The following program packages have been tested:

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

3.2.1 Virus Protection

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

For details and recommendations, see the Rohde & Schwarz White Paper [1DC01: Malware Protection](#).

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 Paper [1DC01: Malware Protection](#).

3.2.3 Login

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

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

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 FSWP is started, without having to enter a password. This function is active until you explicitly deactivate it or change the password.

For information on how to deactivate or re-activate the automatic login, refer to [Chapter 3.2.3.1, "The Automatic Login Function"](#), on page 22.

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".



Changing the password and use of auto-login function

Note that when you change the default passwords, the default auto-login function no longer works! You must reactivate it manually as described in ["Reactivating the automatic login function"](#) on page 23.

3.2.3.1 The Automatic Login Function

When shipped, the instrument is already configured to automatically log on under Microsoft Windows using the default administrator account ("Instrument") 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 FSWP (see also [Chapter 3.2.4, "Accessing the Start Menu"](#), on page 23).

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

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

4. Press the ENTER key to confirm.

The automatic login function is deactivated. The next time you switch on the instrument, you are prompted to enter your user name and password before the firmware is started.

Adapting the automatic login function to a new password

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

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

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

3. Save the changes to the file.

Reactivating the automatic login function

1. In the "Start" menu, select "Run".
The "Run" dialog box is displayed.
2. Enter the command `C:\R_S\INSTR\USER\AUTOLOGIN.REG`.
3. Press the ENTER key to confirm.
The automatic login function is reactivated. It will be applied the next time the instrument is rebooted.

Switching users when using the automatic login function

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

- ▶ 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.

3.2.4 Accessing the Start Menu

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

3.3 Connecting USB Devices

The USB interfaces of the R&S FSWP allow you to connect USB devices directly to the instrument. This number can be increased as necessary by using USB hubs. Due to the large number of available USB devices, there is almost no limit to the expansions that are possible with the R&S FSWP.

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

- Memory stick for easy transfer of data to/from a computer (e.g. firmware updates)
- CD-ROM drives for easy installation of firmware applications

- Keyboard or mouse to simplify the entry of data, comments, file names, etc.
- Printer for printing out measurement results

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

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

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

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

Connecting a memory stick or CD-ROM drive

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

Connecting a keyboard

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

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

Connecting a mouse

The mouse is detected automatically when it is connected.

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

Connecting a printer

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

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

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

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

3.4 Connecting an External Monitor

You can connect an external monitor (or projector) to the DVI or DISPLAY PORT connector on the instrument's rear panel (see also [Chapter 4.2.3, "DisplayPort and DVI"](#), on page 47).



Screen resolution and format

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

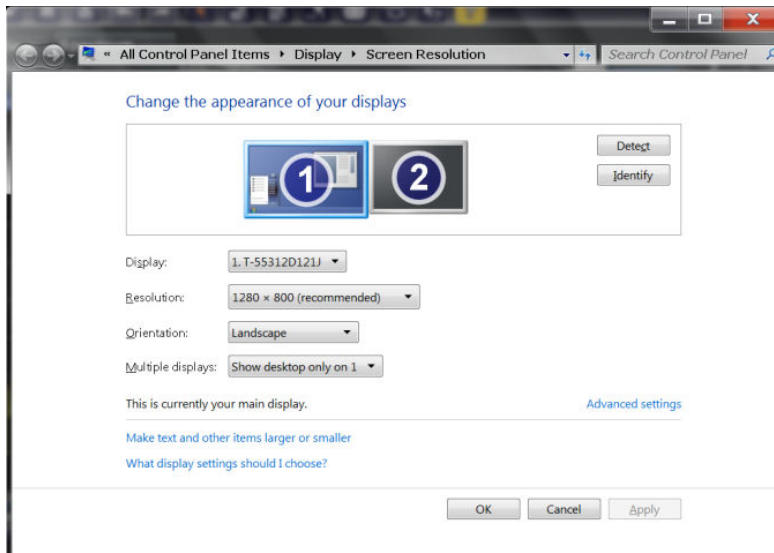
The touchscreen has a screen resolution of 1280x800 pixels. Most external monitors have a higher screen resolution. If the screen resolution of the monitor is set higher than the instrument's resolution, the application window uses an area of 1280x800 pixels on the monitor display. For full screen display, adjust the monitor's screen resolution.

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

1. Connect the external monitor to the R&S FSWP.
2. Press the SETUP key.

Setting Up a Network (LAN) Connection

3. Press the "Display" softkey.
4. Select the "Configure Monitor" tab in the "Display" dialog box.
The standard Windows "Screen Resolution" dialog box is displayed.



5. If necessary, change the screen resolution to be used. Consider the information in the note above.
6. Select the instrument to be used for display:
 - "Display 1": internal monitor only
 - "Display 2": external monitor only
 - "Duplicate": both internal and external monitor
7. Tap "Apply" to try out the settings before they are accepted permanently, then you can easily return to the previous settings, if necessary.
8. Select "OK" if the settings are suitable.

3.5 Setting Up a Network (LAN) Connection

The R&S FSWP 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 firewall configuration is adapted accordingly, the interface can be used, for example:

- To transfer data between a controlling device and the test device, e.g. in order to run a remote control program.

See chapter "Remote Control" in the R&S FSWP User Manual.

- To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool)
- To connect external network devices (e.g. printers)
- To transfer data from a remote computer and back, e.g. using network folders

This section describes how to configure the LAN interface. It includes the following topics:

- [Chapter 3.5.1, "Connecting the Instrument to the Network"](#), on page 27
- [Chapter 3.5.2, "Assigning the IP Address"](#), on page 28



LXI

The R&S FSWP complies with LXI Class C. LXI gives you direct access to the LAN settings described below.

3.5.1 Connecting 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 3.5.2, "Assigning the IP Address"](#), on page 28.

NOTICE

Risk of network failure

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

Setting Up a Network (LAN) Connection

- ▶ 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 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.

3.5.2 Assigning 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.

3.5.3 Using computer names

In a LAN that uses a DNS server (Domain Name System server), each PC or instrument connected in the LAN can be accessed via an unambiguous computer name instead of the IP address. The DNS server translates the host name to the IP address. This is especially useful when a DHCP server is used, as a new IP address may be assigned each time the instrument is restarted.

Each instrument is delivered with an assigned computer name, but this name can be changed.

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

<Type><variant>-<serial_number>

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:



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

For more details on firewall configuration, see the Rohde & Schwarz White Paper [1DC01: Malware Protection](#).

Note that changing firewall settings requires administrator rights.

3.6 Setting the Date and Time

Users with administrator rights can set the date and time for the internal real time clock as follows:

Opening the Date and Time Properties dialog box

1. Press the SETUP key.
2. Press the "Display" softkey.
3. Select the "General" tab in the "Display" dialog box.

Setting the Date and Time

4. Press the "Set Date and Time" button to open the standard Windows "Date and Time Properties" dialog box.
5. If necessary, toggle the "Date and Time Format" between German (DE) and US.

After you have made a change and closed the dialog box, the new date and time is also adopted by the instrument.

4 Instrument Tour

On the instrument tour, you can learn about the different control elements and connectors on the front and back panel of the R&S FSWP.

- [The Front Panel](#)..... 31
- [The Rear Panel](#)..... 46

4.1 The Front Panel

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



Figure 4-1: Front panel of the R&S FSWP

- 1 = Display (touchscreen)
- 2 = Power key
- 3 = System control keys
- 4 = USB 2.0 interfaces
- 5 = Power sensor connector
- 6 = Probe power connector
- 7 = DC power connectors
- 8 = Baseband connectors
- 9 = Signal source output (optional)
- 10 = External mixer ports (optional)
- 11 = Noise source control
- 12 = RF input

- 13 = Trigger in- and output
- 14 = Keypad
- 15 = Navigation control
- 16 = Function keys

NOTICE**Instrument damage caused by cleaning agents**

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

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

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

● Display (Touchscreen).....	32
● Power Key.....	37
● System Control Keys.....	38
● The Function Keys.....	38
● The Keypad.....	40
● Navigation Control.....	41
● RF Input (50 Ω).....	43
● Signal Source Output.....	43
● USB Ports.....	44
● Power Sensors.....	44
● Probe Power Connector (3 Pins).....	44
● Noise Source Control.....	44
● Trigger Input and Output.....	45
● DC Power Supply.....	45

4.1.1 Display (Touchscreen)

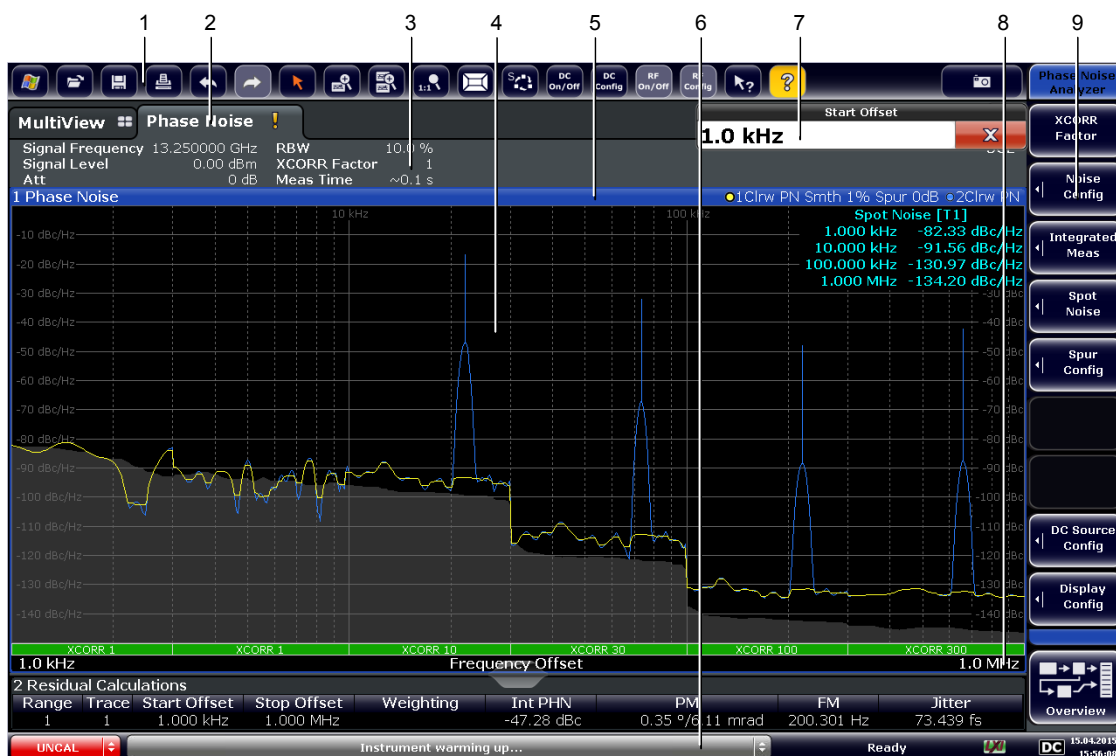
The touchscreen on the front panel of the R&S FSWP displays the measurement results. Additionally, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument.

NOTICE**Risk of touchscreen damage during operation**

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

Observe the following instructions when operating or cleaning the touchscreen:

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



1 = Toolbar: contains general functionality of the firmware (print, save etc.).

2 = Channel tabs: each tab contains a measurement channel.

3 = Channel bar: shows measurement settings and allows you to change those settings easily.

4 = Result display: contains the measurement results.

5 = Window title bar: contains diagram-specific (trace) information.

6 = Status bar: contains system messages, progress bar and date and time.

7 = Input field.

8 = Diagram footer: contains diagram-specific information.

9 = Softkeys: provide access to measurement functions.

A touchscreen is a screen that is touch-sensitive, i.e. it reacts in a specified way when a particular element on the screen is tapped by a finger or a pointing device, for example. Any user interface elements that can be clicked on by a mouse pointer can also be tapped on the screen to trigger the same behavior, and vice versa.

Using the touchscreen, the following tasks (among others) can be performed by the tap of your finger:

- Changing a setting
- Changing the display
- Moving a marker
- Zooming into a diagram
- Selecting a new evaluation method
- Scrolling through a result list
- Saving or printing results and settings

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

4.1.1.1 Toolbar

The icons in the toolbar provide access to general functions.



You can hide the toolbar display, for example when using remote control, in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the R&S FSWP User Manual for details.



Windows: opens the Windows "Start" menu and task bar.



Open: opens a file from the instrument or an external device ("Save/Recall" menu).



Store: stores data on the instrument or an external device ("Save/Recall" menu).



Print: defines print settings ("Print" menu).



Undo: reverts last operation



Redo: repeats previously reverted operation



Select: the cursor can be used to select (and move) elements in the display (markers, lines etc.).



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.



DC Power: turns the DC power output on and off.



DC Configuration: provides quick access to configure the main parameters for DC power supply.



Signal Source: turns the optional signal source output on and off. (Available when the optional signal source output is installed.)



RF Config: provides quick access to configure the main parameters of the signal source. (Available when the optional signal source output is installed.)



Help (+ Select): allows you to select an element for which context-specific help is displayed.



Help: displays context-sensitive help topic for currently selected element.



Print immediately: prints the current display (screenshot) as configured.

In "SmartGrid" mode only:



Close: Exit "SmartGrid" mode.

4.1.1.2 Softkeys

Softkeys are virtual keys provided by the software. Thus, more functions can be provided than those that can be accessed directly via the function keys on the instrument. Softkeys are dynamic: 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.

Recognizing the softkey status by color

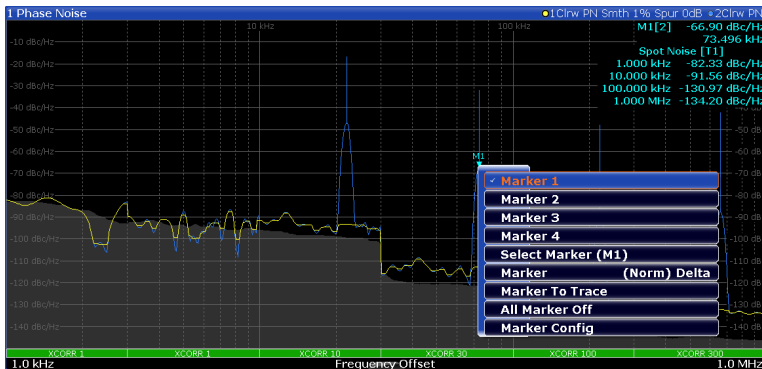
Color	Meaning
orange	associated dialog box is open
blue	associated function is active; for toggle keys: currently active state
gray	instrument function is temporarily not available due to a specific setting or missing option



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

4.1.1.3 Context Menus

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



4.1.1.4 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.

4.1.2 Power Key

The Power key on the front panel turns the instrument on and off.



The color of the LED above the key shows its current state.

- Orange: instrument is in stand-by mode.
- Green: instrument is running.

For more information see [Chapter 3.1.5, "Switching the Instrument On and Off"](#), on page 17.

4.1.3 System Control Keys

System control keys provide access to the basic instrument configuration.

Please refer to the User Manual for an extensive description of the system configuration functionality.



Resets the instrument to its default configuration.



Selects a particular measurement application or operating mode.



Provides functionality to configure basic instrument characteristics, for example:

- the LAN connection
- the date and time
- the display configuration
- the reference frequency
- firmware update and application installation
- service functions



Provides access to the on-screen keyboard.



Turns full screen mode on and off.







Selects a window in split screen mode or browses through active windows in full screen mode.

4.1.4 The Function Keys

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







Please refer to the User Manual for an extensive description of the measurement settings and functions.

FREQ CHANNEL	Provides functionality to define frequency parameters, for example: <ul style="list-style-type: none"> • the measurement range • the signal frequency
SPAN	Provides functionality to configure the measurement range.
AMPT SCALE	Provides functionality to configure amplitude or level characteristics, for example: <ul style="list-style-type: none"> • the attenuation • the input impedance • the scale of the level axis • the preamplifier
AUTO SET	Provides functionality to automatically define various parameters like the level or frequency.
BW	Provides functionality to define various filter bandwidths.
SWEEP	Provides functionality to configure the measurement, for example: <ul style="list-style-type: none"> • the measurement mode (single or continuous measurements) • the number of measurements
TRACE	Provides functionality to configure data acquisition and analyze measured data, for example: <ul style="list-style-type: none"> • the trace mode • the displayed result
TRIG	n/a
MKR	Provides functionality to activate and position absolute and relative markers (markers and delta markers).
PEAK SEARCH	Performs a peak search for active markers. If no marker is active, Marker 1 is activated and the peak search is performed for it.
MKR FUNCT	n/a
MKR →	Provides functionality to position and control markers, for example: <ul style="list-style-type: none"> • to configure the marker search • to configure the peak excursion
MEAS	Provides the measurement functions, for example: <ul style="list-style-type: none"> • the Phase Noise measurement
MEAS CONFIG	Provides functionality to configure the measurement.

	Provides functionality to control display and limit lines.
	Provides functionality to configure inputs and outputs.
	Starts a measurement in single measurement mode.
	Starts a measurement in continuous measurement mode.

4.1.5 The Keypad

The alphanumeric keys allow you to enter alphanumeric characters where necessary (for example in dialog boxes or input fields). The keypad containing the alphanumeric keys also provides keys that select a particular unit.

	Provide access to numbers and (special) characters.
...	
	
	Inserts a decimal point at the cursor position (".").
	Changes the sign of a numeric value or inserts a dash character ("-") in case of alphanumeric input.
	Selects a particular unit for a numeric value. The labels on and next to the key state the units it selects.
...	Pressing one of the unit keys also completes the entry of a numeric value. Note that in case of level entries (dB, dBm etc.) or dimensionless values, all unit keys have the value "1" as multiplying factor and thus work like the ENTER key..
	

ESC

Provides the following functions:

In dialog boxes:

- Closes all kinds of dialog boxes if edit mode is not active.
- Quits edit mode if it is active.
- Selects the "Cancel" button when available.

In "Edit" dialog boxes:

- If data entry has been started, it retains the original value and closes the dialog box.
- If data entry has not been started or has been completed, it closes the dialog box.

BACK-SPACE

Deletes the character to the left of the cursor (if an (alpha)numeric entry has been started already).

ENTER

Provides the following functions:

- Completes the entry of input made with the alphanumeric keys (numeric or alphanumeric) and accepts the input.
If you enter a numeric value that has a unit, the ENTER key works like the HZ/DB key.
- Selects the default or focused element in dialog boxes.

4.1.6 Navigation Control

Navigation control consists of a rotary knob and cursor keys. These keys allow you to navigate within the display or within dialog boxes.

In addition to the rotary knob and the cursor keys, the navigation control also provides undo / redo functionality.

Rotary knob

The rotary knob allows you to do several things:

- It increases or decreases any kind of numeric value. In most cases, the rotary knob changes numeric values with a fixed step size.
Turning it to the right corresponds to an increase, turning it to the left to a decrease of a numeric value.
- It works like a cursor key in dialog boxes or lists (for example dropdown menus). In that case you can navigate to one of the items with the rotary knob. If the dialog box covers more than one screen page, it also scrolls through the dialog box.
Turning it to the right corresponds to a downward movement. Moving it to the left to an upward movement.

- It moves around markers and other graphical elements on the screen. In most cases, the step size is fix.
- Pressing the rotary knob has the same effect as pressing the ENTER key as it confirms an entry or selection.

Cursor keys

The cursor keys allow you to do several things:

- The up and down keys increase or decrease any kind of numeric value if an input field is active.
The cursor keys change numeric values with a fixed step size.
- The cursor keys navigate through dialog boxes or lists (for example dropdown menus).
- The left and right keys move the cursor in an input field in the corresponding direction.
- The up and down keys move markers around.
The step size is fix.
- The cursor keys allow you to navigate to a cell in a table.
- The cursor keys move a scroll bar (vertical or horizontal) in dialog boxes that have one.

Undo and redo functionality

UNDO

Reverts the software to an older state by erasing the last change you have applied.

The undo function is useful, for example, if you are performing a measurement with several markers and a limit line and accidentally select a different measurement. In this case, a lot of settings would be lost. However, if you press UNDO immediately afterwards, the previous status is retrieved.

REDO

Reverses an undo action or repeats the most recently performed action.



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

4.1.7 RF Input (50 Ω)

The RF Input allows you to connect a device under test (or DUT) to the R&S FSWP, usually via cable and an appropriate connector (for example a male N connector).

The supported frequency range depends on the R&S FSWP model you have. Refer to the datasheet for details.

The RF Input also serves as an attenuator in case you are measuring signal with high levels. The supported attenuation range depends on the R&S FSWP model you have. Refer to the datasheet for details..

NOTICE**Risk of instrument damage**

Do not overload the RF input. For maximum allowed values, see the data sheet.

When measuring unknown signals, always apply attenuation to protect the input mixer. Otherwise, the input mixer may be damaged or destroyed.

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.

4.1.8 Signal Source Output

The Signal Source Output allows you to generate a signal that can be fed into the DUT or other external accessories like frequency dividers or amplifiers. You can connect the DUT or accessories with a cable that has a male N connector.

NOTICE**Risk of damage to the R&S FSWP**

The maximum supported reverse power is 30 dBm. Make sure that this value is not exceeded to avoid damage to the R&S FSWP.

The maximum DC output voltage is 0 V.

For details on configuring the signal source output and generating a signal, see the User Manual.

4.1.9 USB Ports

The three USB ports on the front panel (type A) allow you to connect devices like keyboards, mice or memory sticks.



The R&S FSWP provides additional USB ports (including one type B port) on the rear panel.

All USB ports support standard 2.0.

4.1.10 Power Sensors

The female Lemosa connector allows you to connect power sensors of the R&S NRP-Zxy family to the R&S FSWP.

For an extensive list of supported power sensors, refer to the data sheet.

For details on configuring and using power sensors, see the User Manual.

4.1.11 Probe Power Connector (3 Pins)

The Probe Power connector allows you to supply external equipment with power (for example probes or transducers).

The three-pinned probe power connector supports supply voltages from +15 V to -12.6 V and ground. The maximum permissible current is 150 mA. This probe power connector is suitable, for example, for high-impedance probes.

4.1.12 Noise Source Control

The female BNC connector labeled "Noise Source" allows you to connect and control an external noise source, and supplies the required supply voltage.

You can use a noise source, for example, 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.

4.1.13 Trigger Input and Output

The female BNC connector labeled "Trigger Input / Output" allows you to receive an external trigger signal or send a trigger signal to another device.

When you are using the connector as a trigger input, you can apply voltages in the range from 0.5 V to 3.5 V (the default value is 1.4 V). The typical input impedance is 10 k Ω .

When you are using the connector as a trigger output, the TTL compatible signal is transmitted (0 V / 5 V).

Note that you can find another connector for trigger input and output on the rear panel.

For more information about controlling and configuring trigger input and output, refer to the User Manual.

4.1.14 DC Power Supply

The female BNC connectors labeled " V_{Tune} ", " V_{Aux} " and " V_{Supply} " allow you to supply external devices, for example a DUT or an external reference oscillator, with the required voltage.

The V_{Supply} connector provides supply voltage from 0 V to +16 V, for example to provide voltage for an oscillator. The supported maximum current is 2000 mA.

The V_{Tune} connector provides tuning voltage from -10 V to +28 V. The supported maximum current is 20 mA.

The V_{Aux} connector provides DC voltage from -10 V to +10 V. The supported maximum current is 100 mA.

For more information about configuring the DC Power supply, refer to the User Manual.

4.2 The Rear Panel

The rear panel contains various connectors for various purposes.

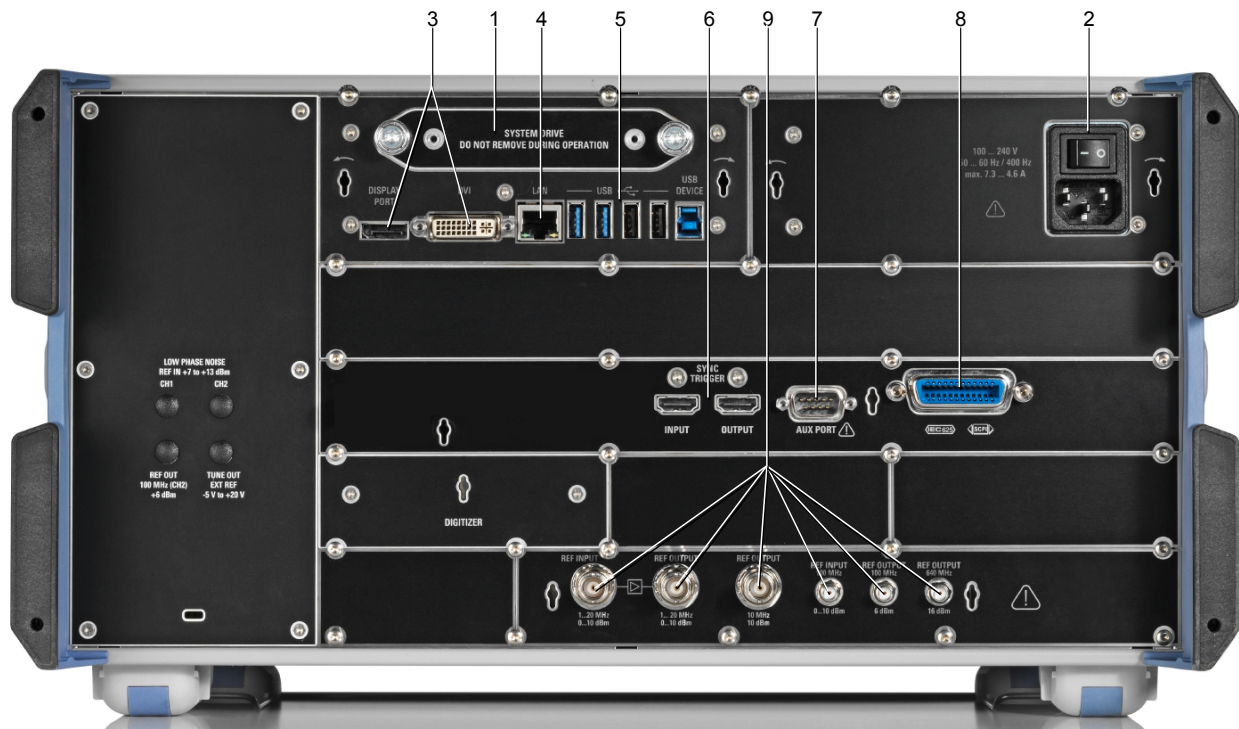


Figure 4-2: Rear panel of the R&S FSWP

- 1 = Removable hard disk
- 2 = AC power connector and power switch
- 3 = DisplayPort and DVI
- 4 = LAN interface
- 5 = USB ports
- 6 = Sync trigger input and output
- 7 = AUX port
- 8 = GPIB interface
- 9 = Ref input and output

• Removable Hard Disk	47
• AC Power Connector and Main Power Switch	47
• DisplayPort and DVI	47
• LAN Connector	47
• USB Ports	48
• Sync Trigger Input and Output	48
• AUX Port	48
• GPIB Interface	49

• External Generator Control (Optional)	49
• OCXO (Optional)	49
• REF INPUT / REF OUTPUT	50

4.2.1 Removable Hard Disk

The removable hard disk is accessible from the rear of the instrument.

In addition to the operating system and the firmware, the R&S FSWP also stores measurement data on that disk. When you remove the hard disk, you can store it and the data on it somewhere secure.

4.2.2 AC Power Connector and Main Power Switch

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

The main power switch has the following states.

- Position "1": The instrument is supplied with power.
- Position "0": The instrument is disconnected from the power supply.

For details refer to [Chapter 3.1.4, "Connecting the AC Power"](#), on page 16.

4.2.3 DisplayPort and DVI

You can connect an external monitor or other display device to the R&S FSWP. Another display device allows you to view the user interface on a bigger screen. Two different types of connectors are provided for this purpose:

- DisplayPort
- DVI (Digital Visual Interface)

For details see [Chapter 3.4, "Connecting an External Monitor"](#), on page 25.

4.2.4 LAN Connector

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

For details see [Chapter 3.5, "Setting Up a Network \(LAN\) Connection"](#), on page 26.

4.2.5 USB Ports

The four USB ports on the rear panel (type A) allow you to connect devices like keyboards, mice or memory sticks.

The male USB connector (type B) allows you to connect the R&S FSWP to a computer and establish a remote control connection, for example.

All USB connectors support standard 2.0.

4.2.6 Sync Trigger Input and Output

The "Sync Trigger Input / Output" connectors allow you to synchronize several devices (for example two R&S FSWPs) with respect to the trigger signal, but also the reference frequency. A 100 MHz signal can be output as a trigger or reference signal to another device, and an external trigger or reference signal can be received at the input connector by the R&S FSWP.

4.2.7 AUX Port

The 9 pole SUB-D male connector provides control signals for controlling external devices. The voltage levels are TTL compatible (max. 5 V).



Pin	Signal	Description
1	+5 V / max. 250 mA	Supply voltage for external circuits
2 to 7	I/O	Control lines for user ports (see User Manual)
8	GND	Ground
9	READY FOR TRIGGER	Signal indicating that the instrument is ready to receive a trigger signal (Low active = 0 V)

NOTICE**Short-circuit hazard**

Always observe the designated pin assignment. A short-circuit may damage the instrument.

4.2.8 GPIB Interface

The GPIB interface is in compliance with IEEE488 and SCPI. A computer for remote control can be connected via this interface. To set up the connection, a shielded cable is recommended. For more details refer to "Setting Up Remote Control" in the User Manual.

4.2.9 External Generator Control (Optional)

The optional "External Generator Control" provides an additional GPIB interface and AUX port.

The GPIB connector can be used to connect an external generator to the R&S FSWP.

The AUX port is required for TTL synchronization, if supported by the generator. It is identical to the standard AUX port (see [Chapter 4.2.7, "AUX Port"](#), on page 48).

For details on connecting an external generator see the "External Generator Control" section of the R&S FSWP User Manual.

4.2.10 OCXO (Optional)

This optional OCXO 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. It can also be used to synchronize other connected devices via the REF OUTPUT 10 MHz connector.

**Warm-up time for OCXO**

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

4.2.11 REF INPUT / REF OUTPUT

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

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

Various connectors are provided for different reference signals:

Connector	Reference signal	Usage
REF INPUT	1...20 MHz 0...10 dBm	To provide an external reference signal on the R&S FSWP.
REF OUTPUT	1...20 MHz 0...10 dBm	To provide the same external reference signal received by the REF INPUT 1...20 MHz connector to another device, when available.
REF OUTPUT	10 MHz 10 dBm	To provide the internal reference signal from the R&S FSWP to another device continuously. Also used to provide OCXO reference signal to another device.
REF INPUT	100 MHz 0...10 dBm	To provide an external reference signal on the R&S FSWP.
REF OUTPUT	100 MHz 6 dBm	To provide a 100 MHz reference signal from the R&S FSWP to another device.
REF OUTPUT	640 MHz 16 dBm	To provide a 640 MHz reference signal from the R&S FSWP to another device.

**SYNC TRIGGER**

The SYNC TRIGGER connector can also be used to synchronize the reference frequency on several devices.

5 Trying Out the Instrument

The following procedures provide an overview on how to use the features available in the Phase Noise measurement application.

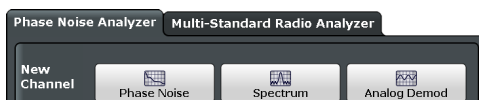
An in-depth description of all features, including remote commands, is available in the R&S FSWP User Manual.

Preparing the R&S FSWP

1. Connect the R&S FSWP to an electrical outlet as described in [Chapter 3.1.4, "Connecting the AC Power"](#), on page 16.
2. Turn on the R&S FSWP as described in [Chapter 3.1.5, "Switching the Instrument On and Off"](#), on page 17.

Selecting the Phase Noise application

1. Select the MODE key.
2. Select the "Phase Noise" item in the "Mode" dialog box.



There's more than one way to skin a cat

In most cases, the firmware of the R&S FSWP provides several ways to change measurement parameters. For example, the measurement range can be defined via the FREQ key, the "MEAS CONFIG" key or the "Overview dialog box."

All procedures in this chapter use the "Overview" dialog box as a starting point (when possible). You can reach this dialog via the "Overview" softkey displayed at the bottom of the softkey bar on the right side of the diagram area.

Performing a preset

Before configuring and starting a new measurement, it is always recommended to perform a preset and restore the default configuration of the instrument or the measurement application.

1. Select the PRESET key on the front panel to restore the default state of the R&S FSWP.
 2. Enter the "Overview" dialog box and select the "Preset Channel" item to restore the default state of the selected measurement channel. All other measurement channels keep their custom configuration.
- [Measuring Noise Characteristics](#)..... 52
 - [Controlling the Displayed Results](#)..... 58
 - [Controlling the Measurement](#)..... 63

5.1 Measuring Noise Characteristics

Measuring the noise characteristics of a DUT requires a simple measurement setup consisting of the R&S FSWP and a DUT.

- For additive noise measurements, the R&S FSWP must be equipped with the optional Signal Source hardware.
- For pulsed noise measurements, the R&S FSWP must be equipped with the optional Pulsed Phase Noise Measurement application.

5.1.1 Measuring the Phase Noise

Test setup

Connect the DUT via cable to the RF input of the R&S FSWP as shown in the illustration.

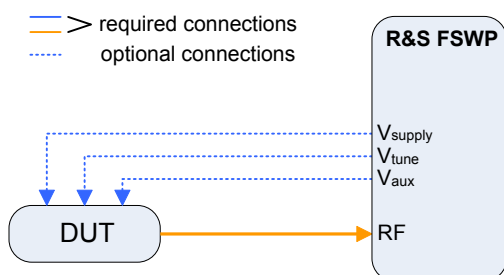


Figure 5-1: Typical test setup for basic noise measurements

1. Perform a PRESET.

The application automatically starts a continuous measurement.

First, it searches for a carrier signal (see [Searching for signals](#)). When one has been found, it measures the noise characteristics of the DUT in the default measurement (or frequency offset) range.

If no carrier could be found, a corresponding error message is displayed in the status bar below the diagram.

2. You can stop the measurement (to analyze the measurement data in detail) with the RUN SGL or RUN CONT key; RUN SGL performs one more measurement, then stops, RUN CONT stops immediately.

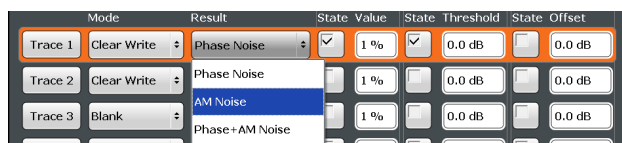
By default, two traces are displayed: the first trace shows the smoothed data without spurs, the second trace the raw data including spurs.

Measuring the amplitude noise

The test setup is the same as shown above.

The default phase noise trace shows the phase noise characteristics of the DUT. In addition, you can also display the amplitude noise characteristics (or both together).

1. Enter the "Overview" dialog box and, from there, enter the "Analysis" dialog box.
2. Select the vertical "Trace" tab, and then the horizontal "Traces" tab.
3. For any trace, select "AM Noise" from the "Result" dropdown menu.



4. Start a new measurement to determine the AM noise of the DUT.

(The "Phase + AM Noise" menu item displays the sum of phase and amplitude noise.)

Tip: If you'd like to view both results separately at the same time, open two Phase Noise diagrams, one that shows the phase noise, the other showing the AM noise and perform a measurement.

In addition to the graphical representation of the phase noise characteristics, the application also provides several tables that show specific phase noise characteristics.

Measuring spurs

In addition to the graphical display of spurs in the diagram (long vertical lines), the application also features a spur table that contains a list of all detected spurs.

- ▶ Open the SmartGrid (☰) and drag the "Spurious List" item from the evaluation bar into the display.



The list contains all detected spurs (including their characteristics) on all traces and all windows.

For more information on the table contents see the R&S FSWP User Manual. A spur is detected if it is above a certain level threshold that you can define in the "Traces" dialog box.

Measuring spot noise

Spot noise is the phase noise or AM noise at a specific offset frequency (for example the phase noise at 500 kHz).

- ▶ Open the SmartGrid (☰) and drag the "Spot Noise" item from the evaluation bar into the display.



The table contains a list of spot noise values for selected frequency offsets (in the default state, these are the decade edges) on each active trace.

For more information on the table contents see the R&S FSWP User Manual.

Tip: You can define custom spot noise frequencies in the "Spot Noise" tab of the "Noise Config" dialog box.

Measuring integrated noise

Integrated measurements show various noise characteristics, like the residual noise, integrated over a certain offset frequency range.

- ▶ Open the SmartGrid (☰) and drag the "Integrated Measurements" item from the evaluation bar into the display.



The table contains a list of integrated measurement results.

For more information on the table contents see the R&S FSWP User Manual.

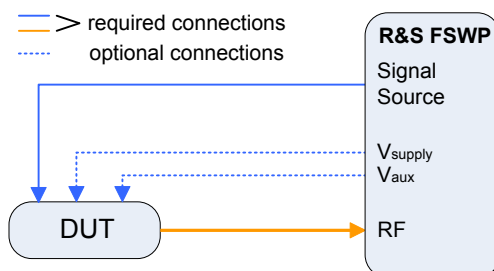
Tip: You can define [custom integration ranges](#) in the "Integration Ranges" tab of the "Noise Config" dialog box.

5.1.2 Measuring Additive Noise

Additive noise measurements require the Signal Source output that is available as an optional hardware component.

Test setup

Connect the DUT via cable to the RF input and the Signal Source output of the R&S FSWP as shown in the illustration.



1. Perform a PRESET.
2. Select the "Additive Noise" measurement via the MEAS key.
3. Configure the signal source output as described in ["Generating a CW signal"](#) on page 66.
4. Start the measurement (RUN SGL or RUN CONT).

The application measures the additive noise on the output frequency of the signal source in the default measurement (or frequency offset) range.

5. You can stop the measurement (to analyze the measurement data in detail) with the RUN SGL or RUN CONT key; RUN SGL performs one more measurement, then stops, RUN CONT stops immediately.
By default, two traces are displayed: the first trace shows the smoothed data without spurs, the second trace the raw data including spurs.

Measuring the noise contribution of the R&S FSWP

If you perform a measurement, and would like to determine the contribution of the R&S FSWP to the overall noise, you can measure the intrinsic noise of the R&S FSWP and display it as a trace.

When you use this feature, leave the DUT connected as it is. The R&S FSWP uses a different signal during the while bypassing the DUT.

(Note that this feature only works for additive noise measurements.)

1. Enter the "Additive Noise" measurement.
2. Enter the "Overview" dialog box, and from there, enter the "Output" dialog box.
3. Select the vertical "Signal Source" tab.
4. Turn on the "DUT Bypass".
5. Perform a measurement.

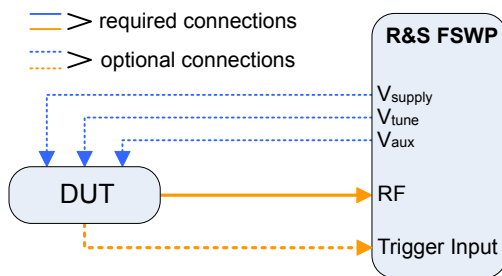
The application draws a trace that represents the noise characteristics of the R&S FSWP.

When the measurement is done, and you have frozen the trace, you can continue with the actual measurement, and use (for example) [trace mathematics](#) to remove the noise contribution of the R&S FSWP from the results.

5.1.3 Measuring the Noise of a Pulse

Noise measurements on pulses are available with the optional Pulsed Phase Noise Measurements firmware application.

Test setup



1. Connect the DUT via cable to the RF input of the R&S FSWP as shown in the illustration.

2. Perform a PRESET.

3. Select the MEAS key and select the "Pulsed Phase Noise" measurement.

The application tries to detect a pulse in the signal you have applied, using two automatic mechanisms:

- search for the pulse frequency
- detection of the pulse characteristics

If successful, it configures a gate based on the pulse characteristics and starts the noise measurement of the pulse.

The results are displayed the same way as in the other measurements (two traces in the diagram and results for the integrated measurements).

If no frequency or pulse could be found, a corresponding error message is displayed in the status bar below the diagram.

If required, you can also define the [frequency](#) and the [pulse characteristics](#) manually.

5.1.4 Adding Another Measurement Channel

Measuring the noise characteristics in two different measurement channels allows you, for example, to capture and analyze two different data streams with different measurement configurations.

1. Select the MODE key.

2. Select the "Phase Noise" item in the "Mode" dialog box.

The firmware adds a second instance of the Phase Noise application which is independent of the first one.

5.2 Controlling the Displayed Results

The Phase Noise application provides several tools to control the data displayed in the various result displays. Some tools have an effect on the graphical result displays, other on the numerical results and still others on both graphical and numerical (for example in use the numerical results are based on the graphical results).

Smoothing the trace (trace averaging)

When you average the trace, the application measures the data several times and builds an average over all measurements when it is done. Averaging measurement data yields a smoother trace.

Trace averaging is applied to all traces.

1. Enter the "Overview" dialog box, and from there, enter the "Noise Config" dialog box.
2. Define the number of measurements to be performed in the "Sweep / Average Count" input field, for example "10".



3. Start the measurement.
 - In case of a single measurement, the application performs x measurements over the frequency range you have defined. An average count of "10", for example, would result in 10 measurements.
 - In case of continuous measurements, the application performs a moving average over the average count.

Smoothing the trace (cross-correlation)

When you apply cross-correlation operations, the application is able to determine the phase noise characteristics at a certain frequency offset more precisely.

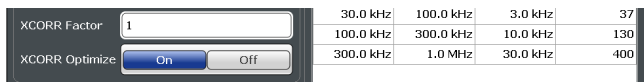
You can improve cross-correlation performance with the corresponding hardware option.

For more information on how cross-correlation works refer to the R&S FSWP User Manual.

The number of cross-correlation operations applied in each half decade depends on a cross-correlation factor that you can define arbitrarily.

Cross-correlation operations are applied to all traces.

1. Enter the "Overview" dialog box, and from there, enter the "Noise Config" dialog box.
2. Define the cross-correlation factor as required in the "XCORR Factor" input field.



The application calculates the number of cross-correlations for each half decade based on this factor. You can see the resulting operations in the table of the "Noise Config" dialog box.

The number of operations calculated for each half decade targets a similar measurement time for all half decades, so that the measurement is done at roughly the same time in each half decade.

You can also see the resulting number of operations in the green bar at the bottom of the diagram area.

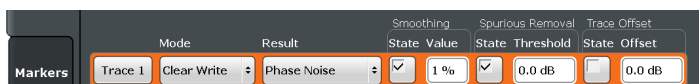
Smoothing the trace (trace smoothing)

When you apply trace smoothing, the application takes the currently available data and smoothes the trace by applying mathematical operations.

For more information on how this is done, refer to the R&S FSWP User Manual.

Trace smoothing is applied to each trace individually.

1. Enter the "Overview" dialog box, and from there, enter the "Analysis" dialog box.
2. Select the vertical "Trace" tab, and then the horizontal "Traces" tab.
3. For any trace, turn on "Smoothing" and define the amount by which the trace should be smoothed (in %) in the corresponding input field.



Trace smoothing is applied immediately after you have applied it to a trace.

Removing spurs from a trace

By default, the application already shows a trace without spurs (the yellow one). However, you can decide for each trace individually whether it shows spurs or not.

Spur removal is done after traces have been smoothed in any way.

1. Enter the "Overview" dialog box, and from there, enter the "Analysis" dialog box.
2. Select the vertical "Trace" tab, and then the horizontal "Traces" tab.
3. For any trace, remove or display spurs individually. You can also enter a threshold that defines a level from which a spur is recognized as a spur.



The application removes all signals that are above the threshold from the trace spur removal is applied to. Signals with levels below the threshold are not regarded as spurs and are still displayed.

For more information about spur removal, refer to the R&S FSWP User Manual.

Note: Note that the threshold is always taken into account in the spur table, regardless of whether spur removal is on or off.

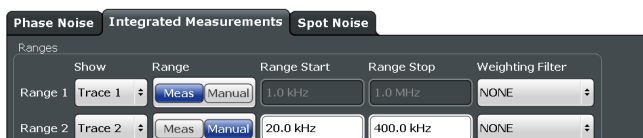
Defining integration ranges

For the integrated measurements (Residual AM, FM and PM and Jitter), you can define custom integration ranges.

By default, the integration range corresponds to the measurement range defined by the frequency offsets. Custom integration ranges can have any range you desire.

Integration is done after traces have been smoothed in any way.

1. Enter the "Overview" dialog box and, from there, enter the "Noise Config" dialog box.
2. Select the "Integrated Measurements" tab.



3. Select the a "Trace" whose data you would like to integrate from the "Show" dropdown menu.

Tip: If you select a trace that is currently not displayed in the diagram, no integrated measurement results will be displayed for the corresponding range.

4. Select "Manual" integration ranges.
5. Define the frequency ranges ("Range Start" and "Range Stop") over which you would like to integrate.

The application calculates the measurement results as defined. Result in the Integrated Measurements result table are adjusted accordingly (see "[Measuring integrated noise](#)" on page 55 for a description on how to view that table).



2 Integrated Measurements	
Wnd 1	Range 1
Trace	2
Start Offset	3.000 kHz
Stop Offset	500.000 kHz
Weighting	
Int Noise	-74.39 dBc
FM	0.02 9269.65 μ rad
FM	64.519 Hz
Jitter	10.729 fs
Wnd 4	Range 1

Figure 5-2: Custom integration range results (frequency range from 3 kHz to 500 kHz, applied to trace 2)

Note that the integration ranges are displayed graphically in the Noise Spectrum diagram.

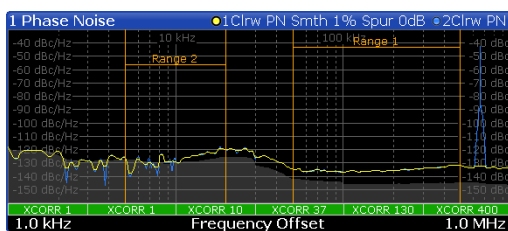


Figure 5-3: Custom integration ranges are represented in the diagram as colored lines

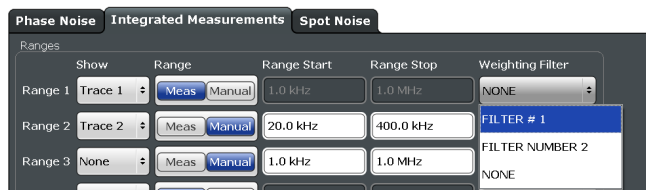
For more information on integrated measurement result calculation refer to the R&S FSWP User Manual.

Correcting integrated measurements

You can use so called weighting filters to compensate external effects that affect the phase noise in certain frequency ranges.

Weighting filters are applied before trace are smoothed and before integration is applied.

1. Enter the "Overview" dialog box, and from there, enter the "Noise Config" dialog box.
2. Select the "Integrated Measurements" tab.
3. Select a weighting filter from the corresponding dropdown menu.



The dropdown menu contains all filters currently available on the harddisk of the R&S FSWP.

When you apply the weighting filter, the results are automatically corrected by the filter characteristics.

If you do not have a filter yet, or want to change filter characteristics for an existing filter, design one or change one.

For more information on weighting filter design and management see the R&S FSWP User Manual.

Controlling the cross-correlation gain indicator (grey area)

The grey trace, or cross-correlation gain indicator, indicates the ideal position of the measurement trace for the current number of cross-correlation operations. Thus, the position of this area depends on the number of cross-correlations that are currently applied in each half decade.

This in turn indicates that measurement traces that are close to the grey area (even if only in places) can be improved by increasing the cross-correlation operations. On the other hand, when the measurement trace lies above the grey area throughout (about 10 dB), it is not possible to improve the results any more.

1. Enter the "Overview" dialog box, and from there, enter the "Noise Config" dialog box.
2. Select the "Noise Config" tab.
3. Change the "XCORR Factor", run a single measurement, and see how the position of the grey area changes.

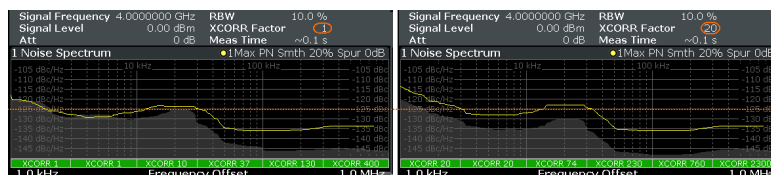


Figure 5-4: Increasing XCORR operations changes shape of grey area

4. If required, you can turn this area on and off as required with the "XCORR Gain Indicator" feature.

Using trace mathematics

Trace mathematics may be useful for certain measurement scenarios, for example if you want to subtract the intrinsic noise of the R&S FSWP from the measurement result and thus determine the noise of the DUT only.

1. Perform a measurement to [determine the noise contribution](#) of the R&S FSWP.
2. Freeze the trace.
 - a) Enter the "Overview" dialog box, and from there, enter the "Analysis" dialog box.
 - b) Select the vertical and horizontal "Traces" tab.
 - c) For the recorded trace, select "Trace Mode: View".
3. Perform an additive noise measurement of the complete setup.
4. Enter the "Traces" dialog box again, and select the "Trace Math" tab.
5. Select the operation that subtracts the first recorded trace (intrinsic noise) from the measurement results.

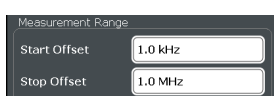
5.3 Controlling the Measurement

The Phase Noise application provides several tools that make the measurement process easier to handle or allow you to customize the measurement configuration according to your needs.

Defining the measurement range

The measurement range defines the carrier frequency offset over which the phase noise measurement takes place.

1. Enter the "Overview" dialog box, and from there, enter the "Noise Config" dialog box.
2. Select the "Noise Config" tab.
3. Define the measurement range with the "Start Offset" and "Stop Offset" properties.



The application adjusts the measurement range. You can see this change, for example, in the Noise diagram result display.

For more information on the measurement range, refer to the R&S FSWP User Manual.

Searching for signals

The application allows you to search for a carrier signal, instead of defining the carrier frequency manually.

1. Enter the "Overview" dialog box, and from there, enter the "Frequency" dialog box.
2. Turn on the "Auto Search" feature (it is on by default).
3. Define the frequency range in which the search should take place ("Start" and "Stop"). By default the search is done in the maximum frequency range supported by the hardware.
4. Define a "Threshold" for the search. Signals below the threshold are ignored during the search.

When the application finds a signal with appropriate characteristics, it starts a phase noise measurement in the [measurement range](#) you have defined.

Defining a carrier frequency manually

When you already know the frequency of the carrier signal, you can define it manually and reduce the measurement time.

1. Enter the "Overview" dialog box, and from there, enter the "Frequency" dialog box.
2. Turn off the "Auto Search" feature.
3. Define the "Signal Frequency".

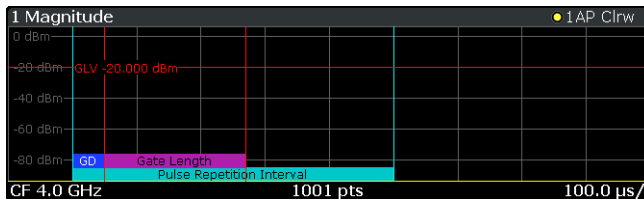
The application performs the measurement on the defined frequency.

Configuring a gate for measurements on pulses

Noise measurements on pulses are available with the optional Pulsed Phase Noise Measurements firmware application.

1. Enter the Pulsed Phase Noise measurement.
2. Select the MEAS CONFIG key and enter the "Pulse" dialog box with the "Pulse Config" softkey.

- In the "Pulse" dialog box, select "Manual" pulse detection.
The input fields for the "Pulse Repetition Interval" and those for the "Gate Characteristics" become available.
- Configure the gate as required.
The shape of the gate is represented by various lines and bars in the "Preview" diagram that is part of the dialog box.



For more information on the gate configuration, refer to the R&S FSWP User Manual.

Tip: You can turn off the gate, if one is not required for the measurement. To do so, select "Gate Type: Off".

Zooming into the results

The zoom tool is useful if you want to see parts of the results in more detail.

- Select the "Zoom" icon in the toolbar (🔍).
- In the diagram, select the area you want to zoom in to (while doing this, the area is marked by a dotted line).
- You can return to the full display any time with the "Unzoom" icon in the toolbar (🔍).

Supplying DUTs with current or voltage

Some measurement setups or DUTs require you to supply them with either voltage or current.

The R&S FSWP can provide both, when you set it up that way.

- Enter the "Overview" dialog box and, from there, enter the "Output" dialog box.
- Select the "DC Config" tab.

There you have the following options:

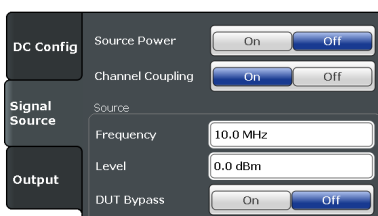
- Turn each of the three DC connectors on or off.
- Define the supplied voltage (or current in case of the first connector).

- Define limits for the connectors. When you define limits, the supplied voltage will not go below or above these.
For more information on configuring DC outputs, refer to the R&S FSWP User Manual.
3. Turn on the output of voltage or current with the "DC Power" feature.
Tip: You can turn the output on and off easily with the "DC On / Off" button in the toolbar. The "DC Config" button provides access to a softkey menu that lets you define the signal characteristics without entering a dialog box.

Generating a CW signal

Available only for additive noise measurements and with the optional Signal Source hardware component.

1. Enter the [Additive Noise](#) measurement.
2. Enter the "Overview" dialog box, and from there, enter the "Output" dialog box.
3. Select the "Signal Source" tab.
4. Define the frequency and level of the CW signal in the corresponding input fields.



5. Turn the signal source on with the "Source Power" feature.
Tip: You can turn the signal source on and off effectively with the "RF On/Off" button in the toolbar. The "RF Config" button provides access to a softkey menu that lets you change the voltages for each connector without entering a dialog box.

Labeling traces

Labeling traces with a short keyword is a good way to distinguish traces and see immediately what the trace actually represents.

1. Enter the "Overview" dialog box and, from there, enter the "Analysis" dialog box.

2. Select the vertical "Traces" tab and the horizontal "Trace Label" tab.
3. Turn on the trace label for a certain trace and define a string of text as a label. The application adds a label to the trace. The color of the label is the same as the trace color.

Tip: You can move trace labels around via drag and drop.

Exporting measurement data

Exporting measurement data to a .dat file allows you to archive that data in external programs like a spreadsheet.

1. Enter the "Overview" dialog box and, from there, enter the "Analysis" dialog box.
2. Select the vertical "Traces" tab and the horizontal "Trace / Data Export" tab.
3. Select the data types as required (trace data only or together with numerical results and / or measurement settings).
4. Select the "Export to ASCII File" button and select the destination where you want to save that data.
5. View the .dat file that has been created with your preferred program.

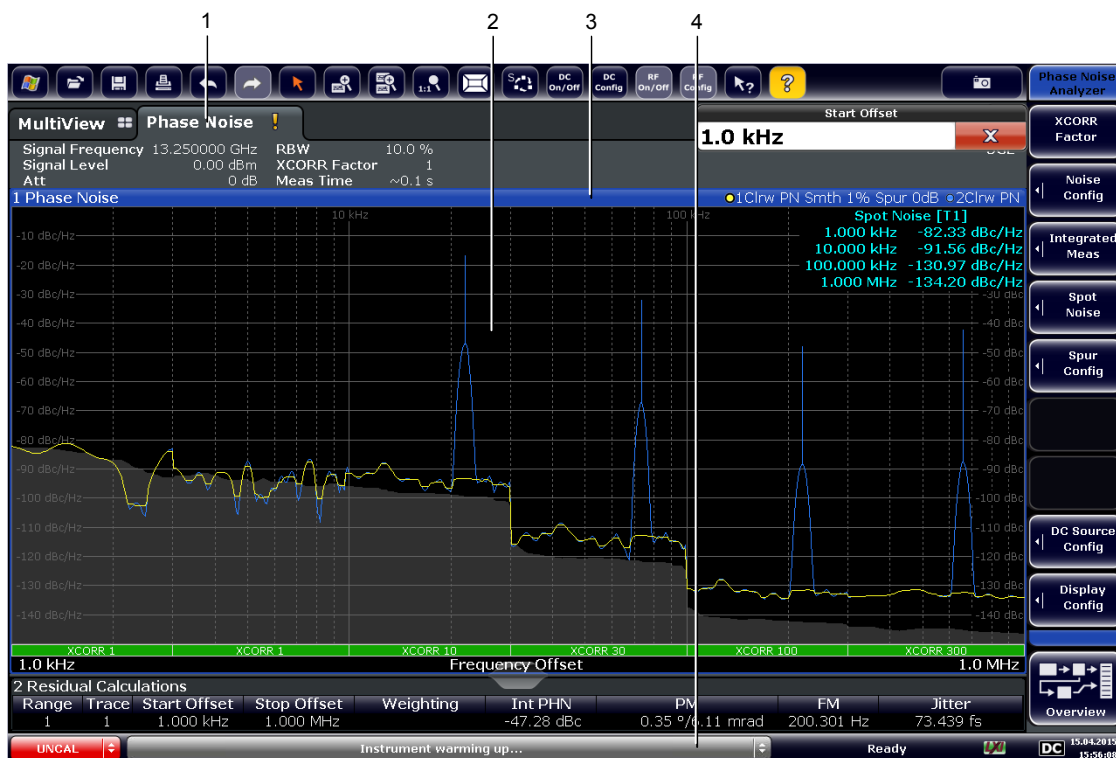
6 Operating the Instrument

The following topics provide an overview on how to work with the R&S FSWP. They describe what kind of information is displayed in the diagram area, how to operate the R&S FSWP via the front panel keys and other interaction methods, and how to use the Online Help.

- [Understanding the Display Information](#)..... 68
- [Accessing the Functionality](#)..... 77
- [Changing the Focus](#)..... 78
- [Entering Data](#)..... 78
- [Displaying Results](#)..... 81
- [Remote Control](#)..... 89

6.1 Understanding the Display Information

The following figure shows a measurement diagram in the Spectrum application. All different information areas are labeled. They are explained in more detail in the following sections.



Understanding the Display Information

- 1 = Channel bar for firmware and measurement settings
- 2 = Window title bar with diagram-specific (trace) information
- 3 = Diagram area with marker information
- 4 = Instrument status bar with, for example, error messages and progress bar.



Hiding elements in the display

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

For details see the R&S FSWP User Manual.

● Channel Bar.....	69
● Window Title Bar.....	71
● Marker Information.....	72
● Spot Noise Information.....	73
● Measurement Progress Information.....	74
● Frequency Information in Diagram Footer.....	75
● Instrument and Status Information.....	75
● Error Information.....	76

6.1.1 Channel Bar

Using the R&S FSWP 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.

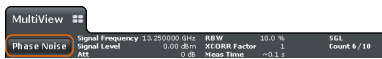


Alternatively, if many tabs are displayed, select the tab selection list icon at the right end of the channel bar and select the channel you want to switch to from the list.



MultiView tab

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



Icons in the channel bar

The star 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.

The exclamation mark ("!" or ⚠) icon indicates that an error or warning is available for that measurement channel. This is particularly useful if the MultiView tab is displayed.

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

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

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 only when applicable for the current measurement.

The following table contains all labels that might be displayed in the Spectrum and Receiver applications.

Table 6-1: Channel settings displayed in the channel bar

Label	Information
Signal Frequency	Current carrier frequency of the applied signal.
Signal Level	Currently level measured on the carrier frequency.
Att	Current RF attenuation.
RBW	Current Resolution bandwidth (RBW). The RBW is a function of the start offset frequency of each half decade included in the measurement.

Label	Information
XCORR Factor	Current cross-correlation factor. The cross-correlation factor defines the number of cross-correlations are done in each half decade included in the measurement.
Meas Time (estimated)	Current estimated measurement time. The measurement time depends, among other things, on the offset frequency, the resolution bandwidth or the number of averages / cross-correlations that you have defined.
SGL	Current number of measurements performed in a single sweep. Only displayed if you are in single sweep measurement mode.
Count	The current signal count for measurement tasks that involve a specific number of subsequent sweeps.
Meas	Currently selected measurement (Phase Noise, Additive Phase Noise etc.).

Icons for individual settings

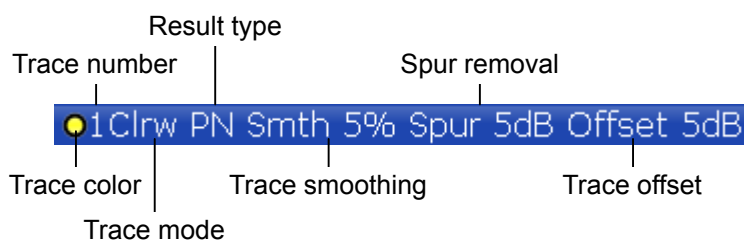
A bullet next to the setting indicates that user-defined settings are used, not automatic settings. A green bullet indicates this setting is valid and the measurement is correct. A red bullet indicates an invalid setting that does not provide useful results.

6.1.2 Window Title Bar

Each channel in the R&S FSWP display may contain several windows. Each window can display either a graph or a table as a result of the channel measurement. Which type of result evaluation is displayed in which window is defined in the display configuration (see [Chapter 6.5, "Displaying Results"](#), on page 81). The window's title bar indicates which type of evaluation is displayed.

Trace Information in Window Title Bar

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



Trace color	Color of trace display in diagram
Trace number	Number of the trace (1 to 6)
Trace Mode	Abbreviation of the trace mode: <ul style="list-style-type: none"> • Clrw Clear Write trace • Max Max Hold trace • Min Min Hold trace • Avg Average trace • View Frozen trace • WrH Write Hold trace
Result type	Type of result the trace represents. <ul style="list-style-type: none"> • PN • AM • PN + AM
Trace smoothing	Trace smoothing characteristics. Only displayed if trace smoothing has been turned on for a trace.
Spur removal	Spur removal characteristics. Only displayed if spur removal has been turned on for a trace.
Trace offset	Trace offset characteristics. Only displayed if an offset has been defined for a trace.

6.1.3 Marker Information

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

Marker information in diagram grid

Within the diagram, the x-axis and y-axis positions of the last 2 markers or delta markers that were set are displayed, if available, as well as their index. The value in the square brackets after the index indicates the trace to which the marker is assigned. (Example: M2[1] defines marker 2 on trace 1.) For more than 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, separate marker tables may be added to the display. These tables provide the following information for all active markers:

Table 6-2: Regular marker table

Label	Information
Wnd	Window type the marker is positioned in. (Only if there is more than one window containing a phase noise diagram.)
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

6.1.4 Spot Noise Information

Spot noise information in diagram grid

The diagram contains information about all spot noise positions [T<x>]. Spot noise information is made up out of the position of the spot noise measurement on the x-axis and the y-axis. The value in the square brackets after the index indicates the trace to which the spot noise calculation is assigned (Example: [T1] indicates trace 1). Note that you can also display spot noise information in a separate table.

Spot noise information in spot noise table

The R&S FSWP also provides a numerical result table for the spot noise measurement. The spot noise table has to be added deliberately. Note that the spot noise table only contains information when the calculation of spot noise has been turned on.

Table 6-3: Spot noise information result table

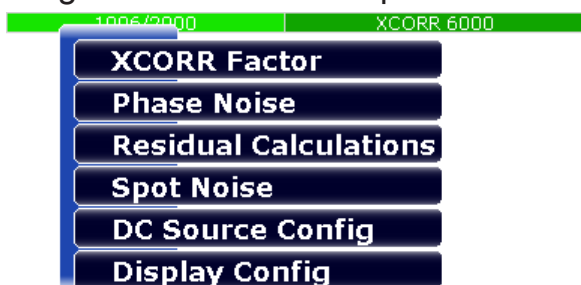
Label	Information
Wnd	Measurement window that the spot noise has been calculated for. (Only if there is more than one window containing a phase noise diagram.)
Offset	Offset frequency or spot noise position on the x-axis of the Phase Noise diagram.
Noise [T<x>]	Measured noise on the spot noise position for each active trace.

6.1.5 Measurement Progress Information

The Phase Noise result display shows the progress of the measurement in a series of green bars at the bottom of the diagram area. For each half decade in the measurement, the R&S FSWP adds a bar that spans the frequency range of the corresponding half decade.

The bar has several features.

- Measurement times less than 1 s
The numbers within the green bar indicate the number of cross-correlation operations applied to the corresponding half decade.
- Measurement times greater than 1 s
The numbers within the green bar show the progress of the cross-correlation operations in the half decade the application currently works on. The first number is the current, the second number the total count of cross-correlations for that half decade. The bars of half decades in which a measurement is still running has a lighter tone of green than bars of half decades in which the measurement has already finished (see image below).
- A double-click on the bar opens the "Noise Config" dialog box to define the cross-correlation factor for that half decade.
- A right-click on the bar opens a context menu.



The context menu provides easy access to various parameters to set up the measurement.

6.1.6 Frequency Information in Diagram Footer

Graphical result displays contain information in the diagram footer. The information (beneath the diagram) depends on the result display.

The contents depend on the application and the result display.

Label	Information
Start offset	Start offset frequency
Stop offset	Stop offset frequency

6.1.7 Instrument and Status Information

Global instrument settings and functions (such as LXI configuration mode), the instrument status and any irregularities are indicated in the status bar beneath the diagram.



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

The following information is displayed:

Instrument status



The state of the DC Power features.

- white label = DC Power has been turned off
- green label = DC Power has been turned on and is within the defined limits
- red label = DC Power has been turned on and violates the defined limits



The R&S FSWP is configured for operation with an external reference.



The status of an LXI connection (green label = connection established, red label = connection not established).

Progress

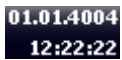
The status of the current operation is displayed in the status bar.



In the MultiView tab, the progress bar indicates the status of the currently selected measurement, not the measurement currently being performed by a Sequencer, for example.

Date and time

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



Error messages and warnings

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

6.1.8 Error Information

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



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

Table 6-4: Status bar information - color coding

Color	Type	Description
red	Error	An error occurred at the start or during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be started or completed correctly.
orange	Warning	An irregular situation occurred during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
gray	Information	Information on the status of individual processing steps.
no color	No errors	No message displayed - normal operation.
green	Measurement successful	Some applications visualize that the measurement was successful by showing a message.



If any error information is available for a measurement channel, an exclamation mark 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.

Table 6-5: Keywords in the status bar

Message	Meaning
IF OVLD	Overload of the IF signal path in the A/D converter or in the digital IF. Increase attenuation or remove the signal from the RF 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	The optional OCXO reference frequency has not yet reached its operating temperature. The message usually disappears a few minutes after power has been switched on.
UNCAL	One of the following conditions applies: <ul style="list-style-type: none"> • 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 FSWP User Manual).

6.2 Accessing the Functionality

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

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

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

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

- System and function keys on the front panel of the instrument
- Softkeys on the touchscreen
- Context menus for specific elements on the touchscreen
- Icons on the tool bar in the touchscreen
- Displayed setting on the touchscreen

6.3 Changing the Focus

Any selected function is always performed on the currently focused element in the display, e.g. a dialog field, diagram, or table row. Which element is focused is indicated by a blue frame (diagram, window, table) or is otherwise highlighted (softkey, marker etc.). Moving the focus is most easily done by tapping on the element on the touchscreen. Alternatively, use the "Tab" key on the on-screen keyboard or the rotary knob 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, press the "Change focus" key on the front panel. 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.

In fullscreen mode, where a single window is displayed in full size on the screen, this key switches the focus (and the display) from one active window to the next.

6.4 Entering Data

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

- Using the touchscreen, via the online keyboard
- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or navigation keys
The rotary knob acts like the ENTER key when it is pressed.
- Using a connected external keyboard



Particularities in Windows dialog boxes

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

6.4.1 Entering Numeric Parameters

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

1. Enter the parameter value using the keypad, or change the currently used parameter value by using the rotary knob (small steps) or the UP or DOWN keys (large steps).
2. After entering the numeric value via keypad, press the corresponding unit key. The unit is added to the entry.
3. If the parameter does not require a unit, confirm the entered value by pressing the ENTER key or any of the unit keys.
The editing line is highlighted in order to confirm the entry.

6.4.2 Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see [Chapter 4.1.1.4, "On-screen Keyboard"](#), on page 37).

Alternatively, you can use the keypad. Every alphanumeric key represents several characters and one number. The decimal point key (.) represents special characters, and the sign key (-) toggles between capital and small letters. For the assignment refer to [Table 6-6](#).

Entering numbers and (special) characters via the keypad

1. Press the key once to enter the first possible value.
2. All characters available via this key are displayed.
3. To choose another value provided by this key, press the key again, until your desired value is displayed.

4. With every key stroke the next possible value of this key is displayed. If all possible values have been displayed, the series starts with the first value again. For information on the series refer to [Table 6-6](#).
5. To change from capital to small letters and vice versa, press the sign key (-).
6. When you have chosen the desired value, wait for 2 seconds (to use the same key again), or start the next entry by pressing another key.

Entering a blank

- ▶ Press the "Space" bar, or press the "0" key and wait 2 seconds.

Correcting an entry:

1. Using the arrow keys, move the cursor to the right of the entry you want to delete.
2. Press the BACKSPACE key.
The entry to the left of the cursor is deleted.
3. Enter your correction.

Completing the entry

- ▶ Press the ENTER key or the rotary knob.

Aborting the entry

- ▶ Press the ESC key.
The dialog box is closed without changing the settings.

Table 6-6: 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

Key name (upper inscription)	Series of (special) characters and number provided
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>

6.5 Displaying Results

The R&S FSWP provides several instrument applications for different analysis tasks and different types of signals, for example the Phase Noise application, the optional Spectrum application or the optional I/Q Analyzer. 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 FSWP allows you to configure the display to suit your specific requirements and optimize analysis.

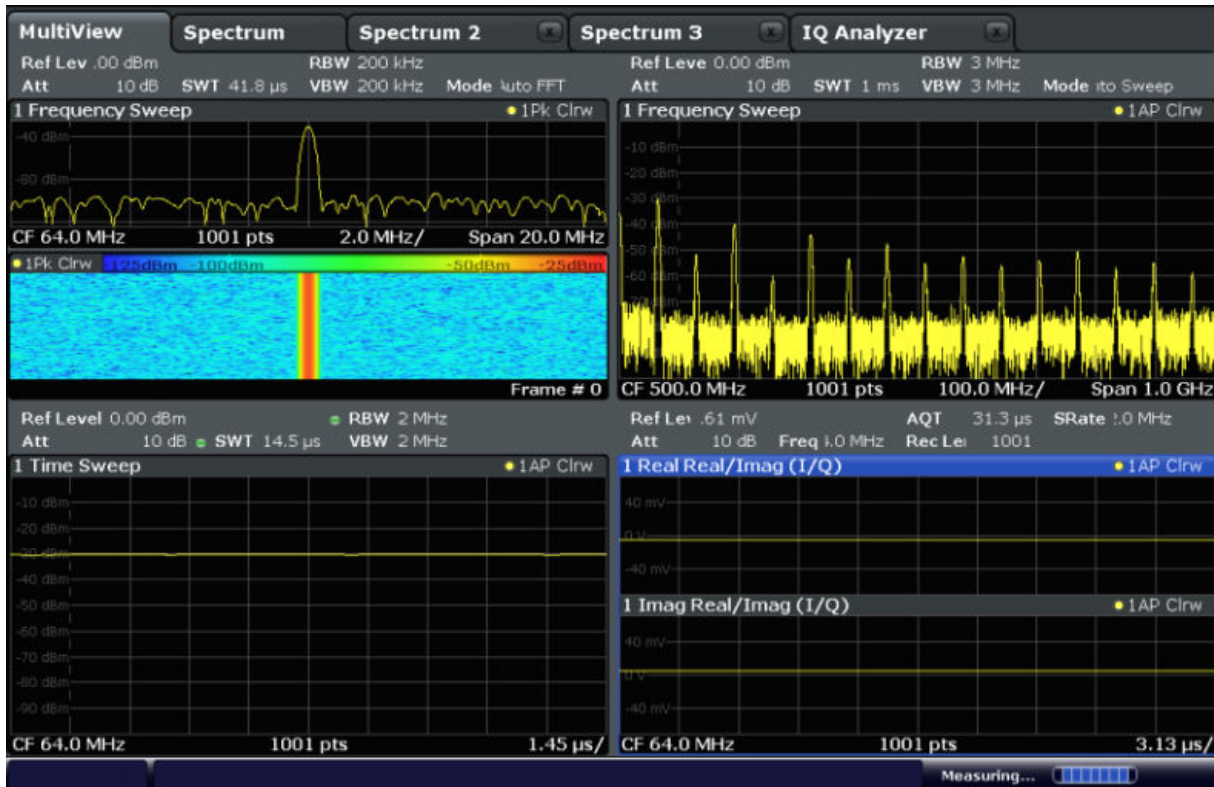
6.5.1 Activating and Deactivating Channels

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.

Displaying Results

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.
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.

To close a measurement channel



Select the "Close" icon on the tab of the measurement channel.

The tab is closed, any running measurements are aborted, and all results for that channel are deleted.

6.5.2 Laying out the Result Display with the SmartGrid

Measurement results can be evaluated in many different ways, for example graphically, as summary tables, statistical evaluations etc. Each type of evaluation is displayed in a separate window in the channel tab. Up to 16 individual windows can be displayed per measurement channel (i.e. per tab). To arrange the diagrams and tables on the screen, the Rohde & Schwarz SmartGrid function helps you find the target position simply and quickly.

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

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

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

- [Background Information: The SmartGrid Principle](#)..... 84
- [How to Activate SmartGrid Mode](#)..... 85
- [How to Add a New Result Window](#)..... 86
- [How to Close a Result Window](#)..... 86
- [How to Arrange the Result Windows](#)..... 87

6.5.2.1 Background Information: The SmartGrid Principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the SmartGrid where you drop the window determines its position on the screen.



Figure 6-1: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows: above/below, right/left or replacement (as illustrated in [Figure 6-2](#)). 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).

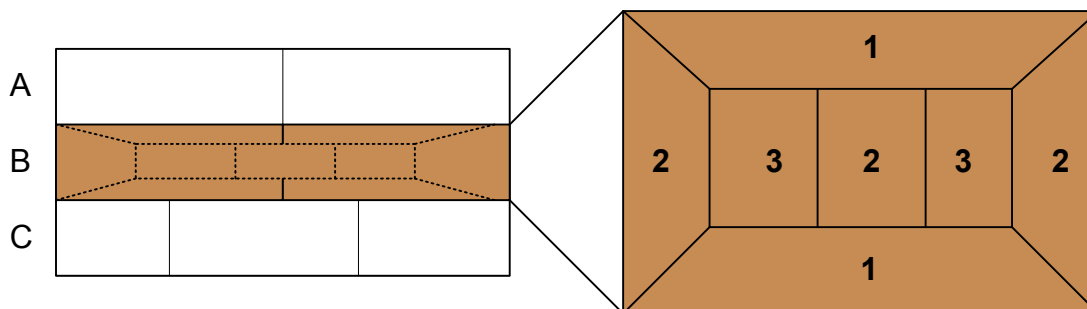


Figure 6-2: SmartGrid window positions

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

SmartGrid functions

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



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



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

6.5.2.2 How to Activate SmartGrid Mode

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

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



Select the "SmartGrid" icon from the toolbar.

- Select the "Display Config" button in the configuration "Overview".
- Select the "Display Config" softkey from the MEAS CONFIG menu.

The SmartGrid functions and the evaluation bar are displayed.



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

6.5.2.3 How to Add a New Result Window

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

1. Activate SmartGrid mode.

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

2. Select the icon for the required evaluation method from the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. Touch the evaluation bar between the icons and move it up or down until the required icon appears.
3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See [Chapter 6.5.2.5, "How to Arrange the Result Windows"](#), on page 87 for more information on positioning the window).

6.5.2.4 How to Close a Result Window

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



6.5.2.5 How to Arrange the Result Windows

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

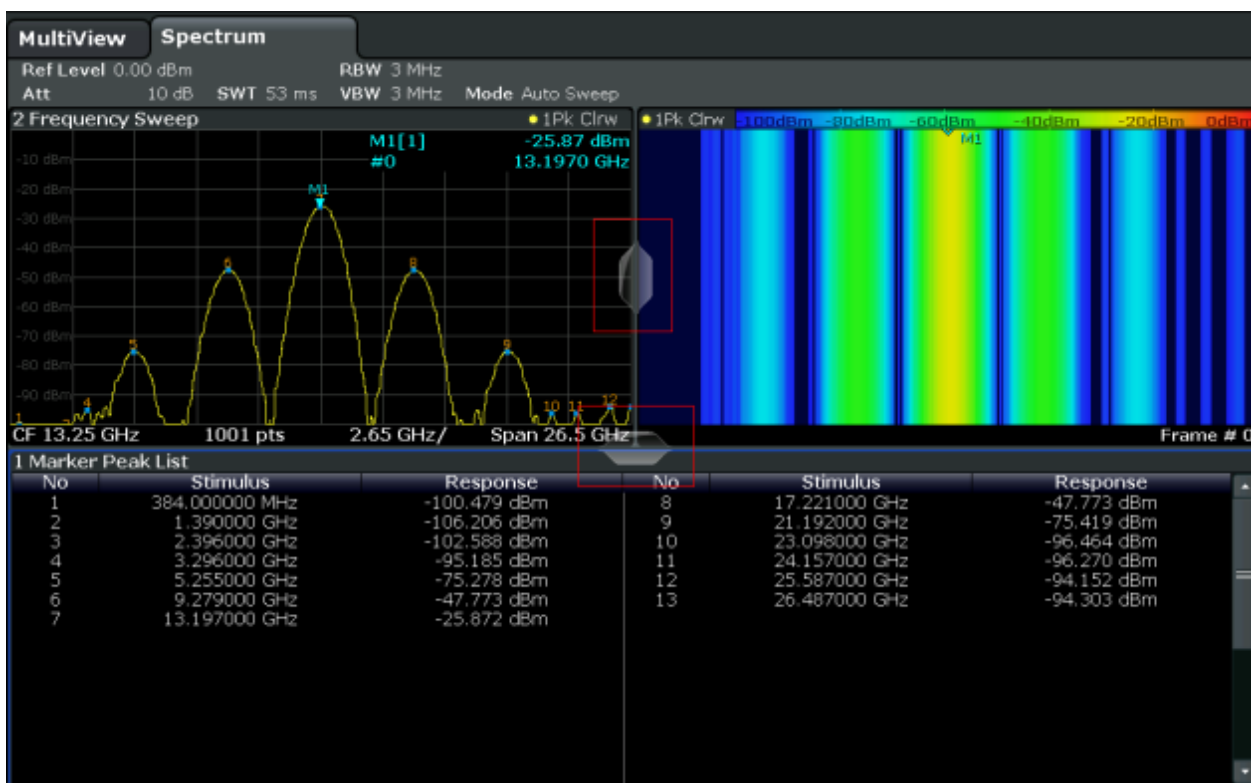


2. Drag the evaluation over the SmartGrid.
A blue area shows where the window will be placed.
3. Move the window until a suitable area is indicated in blue.
4. Drop the window in the target area.
The windows are rearranged to the selected layout, and "Delete" and "Move" icons are displayed in each window.
5. To close a window, select the corresponding "Delete" icon.



6.5.3 Changing the Size of Windows

Each channel tab may contain several windows to evaluate the measurement results using different methods. A "splitter" allows you to change the size of neighboring windows.



The splitters are not available in SmartGrid mode.

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

6.5.4 Switching Between a Split and Maximized Window Display

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



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

6.5.5 Changing the Display

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

- Displaying a simulation of the entire front panel of the instrument on the screen ("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
- Activating or deactivating the touch-sensitivity of the screen
- Zooming into the diagram

6.6 Remote Control

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

- Connecting the instrument to a (LAN) network (see [Chapter 3.5, "Setting Up a Network \(LAN\) Connection"](#), on page 26)
- Using the LXI browser interface in a LAN network
- Using the Windows Remote Desktop application in a LAN network
- Connecting a PC via the GPIB interface

How to configure the remote control interfaces is described in the User Manual.



The R&S FSWP is delivered with *IECWIN* installed, the auxiliary remote control tool provided free of charge by R&S.

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

6.6.1 Using the LXI Browser Interface in a LAN

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 FSWP without additional installation requirements.



Restrictions

Only user accounts with administrator rights can make use of the LXI functionality. For details see [Chapter 3.2.3, "Login"](#), on page 21.

6.6.2 Remote Desktop Connection

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 screen contents 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 operation of the instrument 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.

6.6.3 Connecting a PC via the GPIB Interface

A GPIB interface is integrated on the rear panel of the instrument. You can set the GPIB address and the ID response string. The GPIB language is set as SCPI by default but can be changed to emulate other instruments. By connecting a PC to the R&S FSWP via the GPIB connection you can send remote commands to control and operate the instrument.

7 Obtaining Technical Support

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

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

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

- **System Configuration:** The "System Configuration" dialog box (in the "Setup" menu) 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 91).

- **Error Log:** The `RSError.log` file (in the `log` directory of the main installation directory) contains a chronological record of errors.
- **Support file:** a *.zip file with important support information can be created automatically (in the `user` directory of the main installation directory). The *.zip file contains the system configuration information ("device footprint"), the current eeprom data and a screenshot of the screen display.

To collect the support information

1. Press the SETUP key.
2. Select "Service > R&S Support" and then "Create R&S Support Information".

The file is stored as

```
<installation_directory>\user\  
<inst_model>_<serial-no>_<date_and_time>.zip
```

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

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



Packing and transporting the instrument

If the instrument needs to be transported or shipped, e.g. due to damage during delivery, observe the notes described in [Chapter 3.1.1, "Unpacking and Checking the Instrument"](#), on page 13.

Index

- A**
- Alphanumeric keys 40
 - Alphanumeric parameters 79
 - AM (trace information) 72
 - Arranging
 - Windows 87
 - Att (channel bar) 70
 - AUX PORT
 - Connector 48
 - AVG (trace information) 72
- C**
- Channel bar
 - Information 69
 - Channel settings
 - Display 69
 - Channels
 - see also Measurement channels 81
 - Switching 69
 - Closing
 - Channels 83
 - Windows 86
 - CLRW (trace information) 72
 - Computer name
 - Changing 28
 - Connector
 - AC power supply 47
 - AUX PORT 48
 - Display Port 47
 - DVI 47
 - GPIB interface 49
 - LAN 47
 - Noise source 44
 - Power sensor 44
 - Probe power 44
 - REF INPUT 50
 - USB 48
 - Connectors
 - External generators 49
 - OCXO 49
 - Probe Power 44
 - RF INPUT 43
 - Signal source output 43
 - SYNC TRIGGER 48
 - Trigger Input 45
 - Trigger Output 45
 - USB 44
 - Context-sensitive menus 36
 - Count (channel bar) 71
 - Cursor keys 41, 42
- D**
- Date
 - Setting 29
 - DHCP 28
 - DHCP server
 - LAN configuration 28
 - Diagram area
 - Status display 75
 - Trace information 72
 - Diagram footer 75
 - Display
 - Changing - see User Manual 89
 - Deactivating - see User Manual 89
 - Evaluation bar 86
 - Information 68
 - SmartGrid 83
 - Display colors
 - Changing - see User Manual 89
 - Display Port
 - Connector 47
 - Display theme
 - Selecting - see User Manual 89
 - DNS server
 - LAN configuration 28
 - DVI
 - Connector 47
- E**
- Electrostatic discharge 12
 - Entering data 78
 - Error log 91
 - Error messages
 - Status bar 76
 - Errors
 - IF OVLD 77
 - LOUNL 77
 - NO REF 77
 - UNCAL 77
 - WRONG_FW 77
 - ESD 12

Evaluation		Keypad	79
Modes, adding	86	Key layout	80
Evaluation bar		Overview	40
Using	86	L	
EXT REF		LAN	
Status message	75	Configuration	26
External generators	49	Configuration - see user Manual	11
External monitor		Connector	47
Connectors	47	Level (channel bar)	70
External reference		Login	
Status message	75	Operating system	21
F		LOUNL	
Firmware updates		Error	77
see User Manual	11	LXI	
Focus		Remote control	90
Changing	78	see user Manual	90
Frequency (channel bar)	70	M	
Front Panel		Marker	
Displaying - see User Manual	89	Information	72
Full screen mode	38	Marker table	
Function keys		Information	73
Details - see User Manual	38	MAX (trace information)	72
Overview	38	Maximize	
G		Window	88
GPIB interface		Meas Time (channel bar)	71
Configuring - see User Manual	49	Measurement channels	
Connector	49	Activating	81
Remote control	90	Closing	83
see User Manual	90	Menus	
H		Context-sensitive	36
Hard drive	47	Microsoft Windows	
Hiding		Access	23
Screen elements - see User Manual ..	89	MIN (trace information)	72
I		Mini Front Panel	
IF OVLD		Displaying - see User Manual	89
Error	77	MultiView	
IP address		Status display	75
Changing	28	N	
K		Navigation control	41
Key		NCoR (enhancement label)	71
Power	37	NO REF	
Redo	42	Error	77
Undo	42	Noise source	
Keyboard		Connector	44
On-screen	37	Numeric parameters	79

- O**
- OCCO 49
 - On-screen keyboard 37, 79
 - Online keyboard 38
 - Operating system 19
 - Login 21
 - service packs 21
 - OVEN (status display) 77
- P**
- Parameters
 - Entering 79
 - PN (trace information) 72
 - PN + AM (trace information) 72
 - Power key 37
 - Power sensors 44
 - Power supply
 - Connector 47
 - Power-save mode
 - Activating - see User Manual 89
 - Print colors
 - Changing - see User Manual 89
 - Printer configuration
 - see user Manual 11
 - Probe power 44
- R**
- Rackmounting 16
 - RBW (channel bar) 70
 - Redo 41, 42
 - REF INPUT
 - Connector 50
 - Remote control 90
 - Configuration - see user Manual 89
 - Introduction - see user Manual 89
 - Remote Desktop
 - see User Manual 90
 - Removable hard drive 47
 - Results
 - Displaying 81
 - RF input 43
 - Rotary knob 41
- S**
- Sequencer 70
 - Service packs 21
 - SGL (channel bar) 71
 - Signal frequency (channel bar) 70
 - Signal level (channel bar) 70
 - Signal source output 43
 - SmartGrid
 - Activating 85
 - Arranging windows 87
 - Display 83
 - Evaluation bar 86
 - Features 83
 - Mode 85
 - Softkeys
 - Status 36
 - Split
 - Window 88
 - Split screen mode 38
 - Splitters
 - Window size 87
 - Spur removal 72
 - Status bar
 - Color coding 76
 - Error messages 76
 - Status display 75
 - Support 91
 - SYNC TRIGGER
 - Connector 48
 - System keys 38
- T**
- Tabs
 - All 81
 - MultiTab 70
 - Switching 69
 - Time
 - Setting 29
 - Toolbar
 - Overview 34
 - Touch-sensitivity
 - De-/activating - see User Manual 89
 - Touchscreen
 - Overview 32
 - Trace information 72
 - Trace number 72
 - Window title bar 71
 - Trace offset 72
 - Trace smoothing 72
 - Trigger
 - Input 45
 - Output 45
- U**
- UNCAL
 - Error 77

Undo	41, 42
USB	
Connector	48
USB port	44
User manuals	7
V	
VIEW (trace information)	72
Virus protection	20
W	
Window title bar	71
Windows	
Adding	86
Arranging	87
Closing	86
Dialog boxes	79
Size	87
Windows 7	19
WRH (trace information)	72
WRONG_FW	
Error	77
X	
XCORR Factor (channel bar)	71
Z	
Zooming	
see User Manual	89