

R&S[®] SMW200A

Vector Signal Generator

Getting Started



1412.9220.02 – 10

This document describes the R&S®SMW200A, stock no. 1412.0000.02 and its options.

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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The following abbreviations are used throughout this manual: R&S®SMW200A is abbreviated as R&S SMW, R&S®SMU200A is abbreviated as R&S SMU, R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2, R&S®VISA is abbreviated as R&S VISA.

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.








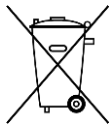



Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety 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

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1 Preface

The R&S SMW is a new high-performance signal generator developed to meet demanding customer requirements. Offering excellent signal characteristics, wide signal bandwidth and straightforward and intuitive operation, the signal generator makes signal generation fast and easy.

1.1 Key Features

Outstanding key features of the R&S SMW are:

- Frequency range from 100 kHz to 3/6/12.75/20/31.8/40 GHz
- Optional second RF path with 100 kHz up to 3/6/12.75/20 GHz
- Up to 160 MHz I/Q modulation bandwidth (in RF) with internal baseband
- Options for all important digital communications standards
- Versatile configuration: from single-path vector signal generator to multichannel MIMO receiver tester
- Optional integrated fading simulator with up to 160 MHz bandwidth
- Ideal for MIMO, multistandard radio, or LTE-Advanced applications thanks to up to eight signal sources and up to 16 fading channels
- Implementation of all key MIMO fading scenarios such as 2x2, 3x3, 4x4, 8x2, and 2x(2x2) using a single instrument
- Internal digital adding of baseband signals, even with frequency and level offset
- Excellent signal quality for high accuracy in spectral and modulation measurements
- Intuitive operation via touchscreen with block diagram as key element
- Graphical signal monitoring at practically every point in the signal flow
- SCPI macro recorder and code generator for generating executable remote control code from manual operating steps (for MATLAB®, CVI, etc.)

For a detailed specification, refer to the data sheet.

1.2 Documentation Overview

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

- Getting started, printed manual
- Online help system on the instrument, incl. tutorials
- User manuals and online manual, see the product page
- Service manual, provided on the internet for registered users
- Instrument security procedures, see the product page
- General safety instructions, printed brochure
- Release notes, see the product page (download > firmware)
- Data sheet and brochures, see the product page (download > brochures and data sheets)
- Application notes, provided on the internet



You find the user documentation on the R&S SMW product page mainly at:
<http://www.rohde-schwarz.com/product/SMW200A.html> > "Downloads" > "Manuals"

Additional download paths are stated directly in the following abstracts of the documentation types.

Getting Started

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

Online Help and Tutorials

The **online help** offers quick, context-sensitive access to the information needed for operation and programming. It contains the description for the base unit and the software options.

The **tutorials** offer guided examples and demonstrations on operating the R&S SMW.

User Manual and Online Manual

Separate manuals are provided for the base unit and the software options:

- **Base unit** manual
Contains the description of the graphical user interface, an introduction to remote control, the description of all SCPI remote control commands, programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.
- **Software option** manuals
Describe the specific functions of an option. Basic information on operating the R&S SMW is not included.

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

Service Manual

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

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

Instrument Security Procedures

Deals with security issues when working with the R&S SMW in secure areas.

Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S SMW. Brochures provide an overview of the instrument and deal with the specific characteristics, see <http://www.rohde-schwarz.com/product/SMW200A.html> > "Download" > "Brochures and Data Sheets".

General Safety Instructions

Contains basic safety instructions in English, Spanish, German and French.

Release Notes

Describes the firmware installation, new and modified features and fixed issues according to the current firmware version. You find the latest version at:

<http://www.rohde-schwarz.com/product/SMW200A.html> > "Downloads" > "Firmware"

Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics, see <http://www.rohde-schwarz.com/appnotes>.

1.3 Conventions Used in the Documentation

1.3.1 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.

1.3.2 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.

Conventions Used in the Documentation

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.

1.3.3 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 shown values may not represent realistic test situations.

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.

2 Preparing for Use

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- [Linux Operating System](#)..... 24
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- [Setting Up a Network \(LAN\) Connection](#)..... 26
- [Configuring the Initial Instrument Settings](#)..... 31

2.1 Putting into Operation

This section describes the basic steps to be taken when setting up the R&S SMW 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, 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 basic safety instructions included at the front of the manual.

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.

2.1.1 EMI Suppression

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.

Note: USB cables are of varying and often poor quality. Therefore, check the quality of each individual USB cable as described in the service manual.

- Always terminate open cable ends.
- Use the cable R&S SMU-Z6 for connection to the DIG I/Q interfaces of the instrument. The required cable is available under part number 1415.0201.02.
- Note the EMC classification in the data sheet

2.1.2 Unpacking and Checking the Instrument

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



Packing material

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

NOTICE

Risk of damage during transportation and shipment

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

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

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.

2.1.3 Accessory List

The instrument comes with the following accessories:

- Power cable
- Getting Started printed manual

2.1.4 Placing or Mounting the Instrument

The R&S SMW is designed for use under laboratory conditions, either on a bench top or in a rack using the standard rack mount kit.

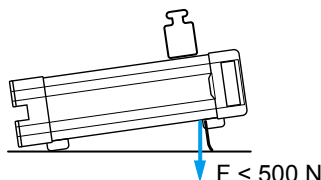
Bench Top Operation

If the R&S SMW 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 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.

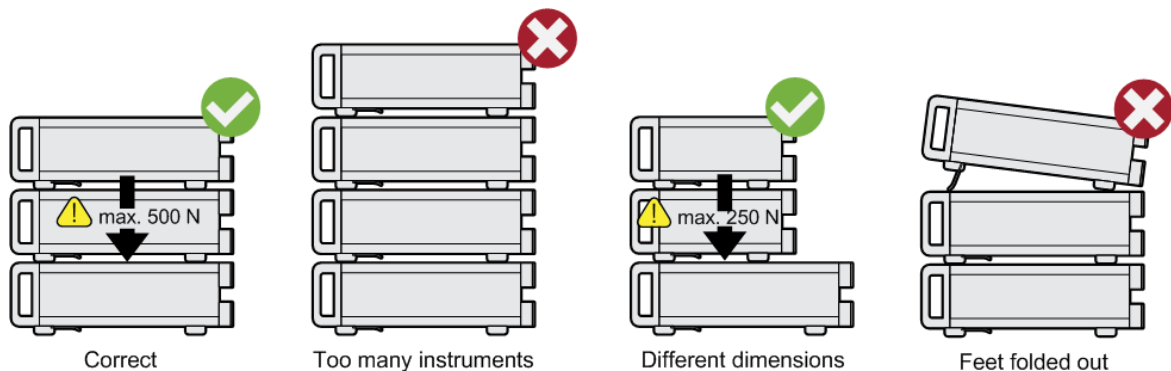


⚠ CAUTION**Risk of injury and instrument damage if stacking instruments**

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 with the same dimensions (width and length). 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 should have the same dimensions (width and length). If you need to stack smaller instruments on the top, the overall load imposed on the lowest instrument must not exceed 250 N.
- If the instruments have foldable feet, fold them in completely.

**Rackmounting**

The R&S SMW 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.

2.1.5 Switching the Instrument On and Off



You can leave the AC power on permanently. Switching off is required only if the instrument must be disconnected from all power supplies.

The R&S SMW is equipped with an AC power supply connector, that can be operated with different AC power voltages. Once it is connected, the instrument automatically adjusts to the given voltage. Refer to the data sheet for the requirements of voltage and frequency. There is no need to set the voltage manually or change fuses. The **AC SUPPLY AND POWER SWITCH** is at the rear of the unit.

To connect the AC supply

- ▶ Connect the R&S SMW to the AC power source using the supplied power cable.

Note: The instrument is assembled in compliance with the specifications for safety class EN61010. It may only be connected to an outlet that has a ground contact.

To start up the instrument

1. **Connect the instrument to the AC supply.**



2. To turn on the power, press the main power switch to position I (On).
The instrument is supplied with AC power.

After booting, the instrument is in standby or ready state. The state depends on the state of the POWER ON/STANDBY key at the front panel of the instrument when the instrument was switched off for the last time.



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.

To switch between standby and ready state

- ▶ Press the POWER ON/STANDBY key briefly.

In ready state, the LED is green. All modules are power-supplied and the R&S SMW initiates its startup procedure. The instrument is ready for operation.

In standby state, the LED is orange. The standby power mode keeps the power switch circuits and the oven-controlled crystal oscillator OCXO active. In this state, it is safe to switch off the AC power and disconnect the instrument from the power supply.

Start-up and booting

The instrument boots the operating system and starts the instrument firmware. If the previous session was terminated regularly, the instrument uses the last setup with the relevant instrument settings.

Once the start-up procedure has been terminated, the instrument is ready for operation.



Press the PRESET key to return the instrument to its defined reset/preset state, if the current setup is no longer relevant.

To customize the start settings, like to recall previously stored settings, use the SAVE/RCL function or define the USER key for recalling a user preset file.

To shut down the Instrument

To shut down the R&S SMW, proceed as follows.

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 ON/STANDBY key first to shut down the application properly.

1. Press the POWER ON/STANDBY key.

The current setup is saved, the operating system shuts down and the instrument set to standby state

The POWER ON/STANDBY LED must be orange.

2. To turn the power off, press the main power switch to position 0 (Off).

None of the front-panel LEDs should be on.

**Switching off the AC power**

You can leave the AC power on permanently. Switching off is required only if the instrument must be disconnected from all power supplies.

2.1.6 Function Check

When the instrument is switched on, it automatically monitors the main functions.

A detected fault is indicated by an "Error" message displayed in the "Info" line of the instrument together with a brief error description. For an in-depth identification of the error, press the "Info" button. In response, a description of the errors is displayed. For more information, refer to the "Troubleshooting and Error Messages" section in the user manual.

In addition to the automatic monitoring, the R&S SMW offers the following capabilities to assure correct functioning:

- Internal Adjustments
Select the "System Config > Setup > General > Internal Adjustments" to access the dialog for performing and configuring the adjustments settings.
- Selftest
A selftest is provided for service purposes ("System Config > Setup > Maintenance > Self Test").

- Test points
If required for service purposes, internal test points can be queried. These tests are protected test procedures, which can be accessed if protection level 2 is disabled. The corresponding procedure is described in the Service Manual.

2.1.7 Default Settings

When the instrument is switched on, it is not the preset state that is active, but the state that was set before the instrument was switched off. It is recommended that you use the PRESET function to return the instrument to its defined preset state every time a new configuration is required or the current setup is no longer relevant.

The R&S SMW offers a four-stage preset concept:

- Preset of one individual parameter
The selective preset on a parameter basis is triggered over the "Preset this parameter" function in the context menu
- Preset of the settings belonging to a digital standard or associated with one dialog
Most of the dialog boxes provide a special "Set to Default" function that resets the settings associated to the corresponding dialog. This function is available for all digital modulation settings and in the "Custom Digital Mod" dialog. These settings are identical to the settings called up using the PRESET key.
- Preset of the instrument to a predefined state
The PRESET key calls up a defined instrument setup. All parameters and switching states are preset (also the states of inactive operating modes). The default instrument settings provide a reproducible initial basis for all other settings. However, functions that concern the integration of the instrument into a measurement setup are not changed, for example reference oscillator source settings.
- Preset of the instrument to its factory settings
The instrument can also be forced to load its default factory settings, except that the security settings are not affected. To access the corresponding dialog box, select the "Taskbar > System Config > Setup > Settings > Factory Preset" function.



For more information and an overview of the settings affected by the preset and factory preset function, see section "Restoring the (Default) Instrument Configuration" in the user manual.



User-defined instrument states can be stored and called up using the "Setup > Save/Recall" function or the SAVE/RCL key.

2.1.8 Checking the Supplied Options and Licenses

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

1. Press the SETUP key.
2. Select "Instrument Assembly > Hardware Config" and "Software / Options".
A list with hardware and firmware information is displayed.
3. Check the availability of the hardware options as indicated in the delivery note.
For an overview of the available options, refer to the instrument specifications provided on the <http://www.rohde-schwarz.com/product/SMW200A.html>.

2.2 Linux Operating System

The instrument uses an embedded Linux operating system, optimally adapted to the signal generator.



Accessing the Operating System

No access to the operating system is required for normal operation.
All necessary system settings can be made in the "Setup" dialog.

The R&S SMW provides an internal hard disk drive. The hard disk holds the operating system, the firmware, and the stored data. The folder `/var/user` and all subfolders can be used to store user data.

Accessing the File System

Data transfer is possible via a memory stick connected to a USB interface. The memory stick and the hard disk are accessed via the "SAVE/RCL > File Manager" function.

The instrument also supports two standard methods to access the file system from a remote client:

- FTP (file transfer protocol)
- File sharing according to the SAMBA/SMB (server message block) protocol.

Both methods allow you the access to the folder `/var/user/share`.



Default password

The FTP and SAMBA file access use the user "instrument" with default password "instrument".

It is highly recommended that you change this password in the "Setup > Security > Password Management > Change User Password" dialog before connecting the instrument to the network!

2.3 Connecting USB Devices

The USB interfaces on the front and rear panels of the R&S SMW 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 SMW.

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

- Memory stick for easy transfer of data to/from a computer (for example firmware updates)
- Keyboard or mouse to simplify the entry of data, comments, file names, etc.
- Power sensors of the NRP-Zxx family

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

Connecting a USB storage device

When a USB storage device like a memory stick, a CD-ROM drive, or a hard disk is connected, it is detected automatically. The device is made available as a new drive (`/usb`). The name of the drive is manufacturer-dependent.

Connecting a keyboard

A keyboard is detected automatically when it is connected. The default keyboard layout is English – US.

Use the "Setup > User Interface > Keyboard Settings" dialog to configure the keyboard properties, see [Chapter 2.5.2, "Setting the Keyboard Language"](#), on page 32.

Connecting a mouse

A mouse is detected automatically when it is connected.

2.4 Setting Up a Network (LAN) Connection

The R&S SMW 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, the interface can be used, for example:

- To transfer data between a controller and the instrument, for example to run a remote control program.
- To access or operate the instrument from a remote computer using the Ultr@VNC program (or a similar tool, like another VNC client or any Web browser supporting Java)
- To transfer data from a remote computer and back, for example using network folders

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

- [Chapter 2.4.1, "Connecting the Instrument to the Network"](#), on page 27
- [Chapter 2.4.3, "Assigning the IP Address"](#), on page 29
- [Chapter 2.4.2, "Using Computer Names \(Hostnames\)"](#), on page 28



Accessing Operating System

No access to the operating system is required for normal operation. All necessary system settings can be made in the "Setup" dialog.

2.4.1 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
- A dedicated network connection (Point-to-point connection) between the instrument and a single computer

In both cases, a computer name or an IP address has to be assigned to the instrument and the computer, see [Chapter 2.4.3, "Assigning the IP Address"](#), on page 29.

To set up a network (LAN) connection

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.

- ▶ Connect the instrument to the network or to a single PC.

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

By default, the instrument is configured to use dynamic TCP/IP configuration and to obtain the whole address information automatically.

NOTICE**Risk of network connection failure**

Network cables and cable connectors of poor quality may cause network connection failures.

If the network connection to the instrument fails, check the network infrastructure and contact your network administrator.

For details, see section "Troubleshooting and Error Messages" in the R&S SMW user manual.

2.4.2 Using Computer Names (Hostnames)

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 (*hostname*) instead of the IP address. The DNS server translates the hostname 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.



Changes in Hostname Syntax

From FW version 3.20.200.xxx and later the syntax of the computer name slightly changes, according to recent conventions of Rohde & Schwarz. For comparison, the following explanation shows the previous syntax in parentheses.

Note also, that a *Factory Preset* resets the computer name. Depending on the installed firmware version, the computer name may change compared to the past.

Each instrument is delivered with an assigned computer name, that remains permanent as long as it is not explicitly changed.

The default computer name follows the syntax `SMW200A-<serial number>` (previous syntax: `rssmw200a<serial number>`), where:

- `SMW200A` is the short name of your instrument, as stated on the front panel.
- `<serial number>` is the individual serial number of the instrument.

You can find the serial number at the rear panel of instrument, see [Figure 3-3](#). It is the third part of the device ID printed on the bar code sticker .

**Example:**

The default hostname of an R&S SMW with a serial number 100007 is SMW200A-100007 (previous name `rssmw200a100007`).

To query and change a computer name

1. Press the SETUP key and select "Remote Access > Network".
The "Network Settings" dialog opens.
The computer name is displayed under "Hostname".
2. Press the SETUP key, select "Security > Protection", and enable the "Protection Level 1".
The default password is `123456`.
The parameter "Hostname" in the "Network Settings" dialog is now enabled for configuration.
3. Change the "Hostname".

2.4.3 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), the whole address information can be assigned automatically.
- If the network does not support DHCP, the instrument tries to obtain the IP address via Zeroconf (APIPA) protocol. If this attempt does not succeed 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 to obtain the whole 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.

To assign the IP address manually on the instrument**Use computer names to identify the instrument**

In networks using a DHCP server, it is recommended that you address the instrument by its unambiguous computer name, see [Chapter 2.4.2, "Using Computer Names \(Hostnames\)"](#), on page 28.

1. Press the SETUP key and select "Remote Access > Network".
The "Network Settings" dialog opens.
2. Select "Address Mode > Static".
3. Select the "IP Address" and enter the IP address, for example *192.168.0.1*.
The IP address consists of four number blocks separated by dots. Every block contains 3 numbers in maximum.
4. Select the "Subnet Mask" and enter the subnet mask, for example *255.255.255.0*.
The subnet mask consists of four number blocks separated by dots. Every block contains 3 numbers in maximum.

To assign the IP address manually on the computer

- ▶ Obtain the necessary information from your network administrator. If you use more than one LAN connector, you need separate address information for each connector.
For information on how to perform the configurations, refer to the documentation of the operating system the computer uses.

2.5 Configuring the Initial Instrument Settings

This section describes how to set up the R&S SMW initially.

For further basic instrument settings, see the R&S SMW user manual.

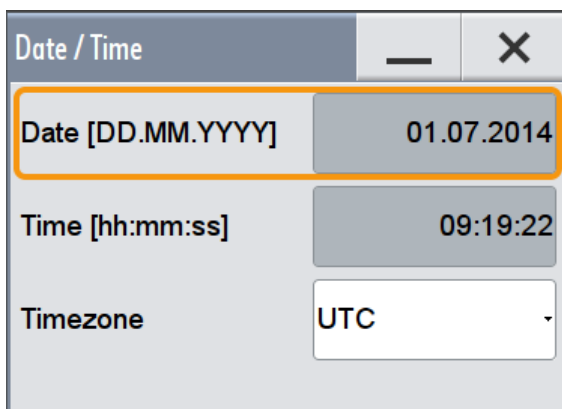
2.5.1 Setting the Date and Time

The R&S SMW uses an internal real time clock to determine the date and time. The instrument records the time whenever you create or modify files on your instrument or you use timed licenses. By default, the instrument is set to the UTC timezone, but you can select the timezone according to your location.

You can get the current date and time as follows:

To open the "Date and Time" dialog box

1. Press the SETUP key.
2. Select "Maintenance > Date / Time".



Date / Time	
Date [DD.MM.YYYY]	01.07.2014
Time [hh:mm:ss]	09:19:22
Timezone	UTC

The date and time are protected settings. Disable protection level 1 to access them.

To change the date and time

1. Press the SETUP key, select "Security > Protection", and enable the "Protection Level 1".
The default password is 123456.
2. Select "Setup > Maintenance > Date / Time" and adjust the settings.

3. Close the dialogs.

The instrument adopts the new date and time.

To select the timezone

1. Press the SETUP key.
2. Select "Setup > Maintenance > Timezone".
3. Select continent and city of your location.

Tip: By typing the first letter, you can quickly navigate through the lists to find the desired destination.

4. Close the dialogs.

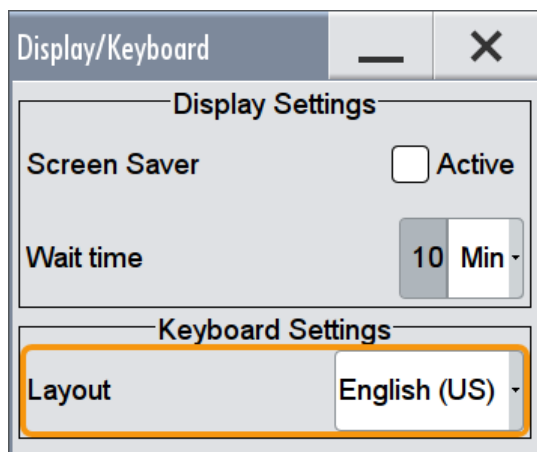
The instrument adjusts the time according to the selected location.

2.5.2 Setting the Keyboard Language

You can select the language of the external keyboard connected to the instrument.

To adjust the keyboard settings

1. Press the SETUP key.
2. Select "User Interface > Keyboard".



3. If necessary, toggle the "Keyboard Layout".

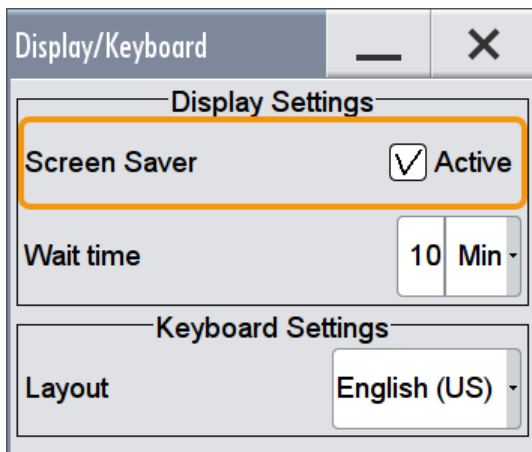
The dialog closes and the changes take effect immediately.

2.5.3 Setting the Screen Saver

The R&S SMW provides a feature to automatically activate a screen saver after a user-defined period of time. The screen saver is activated if no entries are made from the front panel after the selected response time (key and rotary knob).

To activate the screen saver

1. Press the SETUP key.
2. Select "User Interface > Display"
3. In the "Display Settings" area, set the "Screen Saver" to "Active".



4. Define the "Wait Time" in minutes.

The screen saver is activated after the defined period of time.

To reactivate the display, simply tap the screen or press a key on the front panel.

To deactivate the screen saver

- ▶ In the "Display Settings" area of the "Display/Keyboard Settings" dialog box, disable the "Screen Saver" state.

2.5.4 Adjusting User Interface Appearance

You can adjust the transparency of the opened dialogs.

1. Select "System Config > Setup > User Interface > Appearance".

Configuring the Initial Instrument Settings

- If required, enable "Alpha Settings (inactive dialogs)"

The dialog closes and the changes take effect immediately.

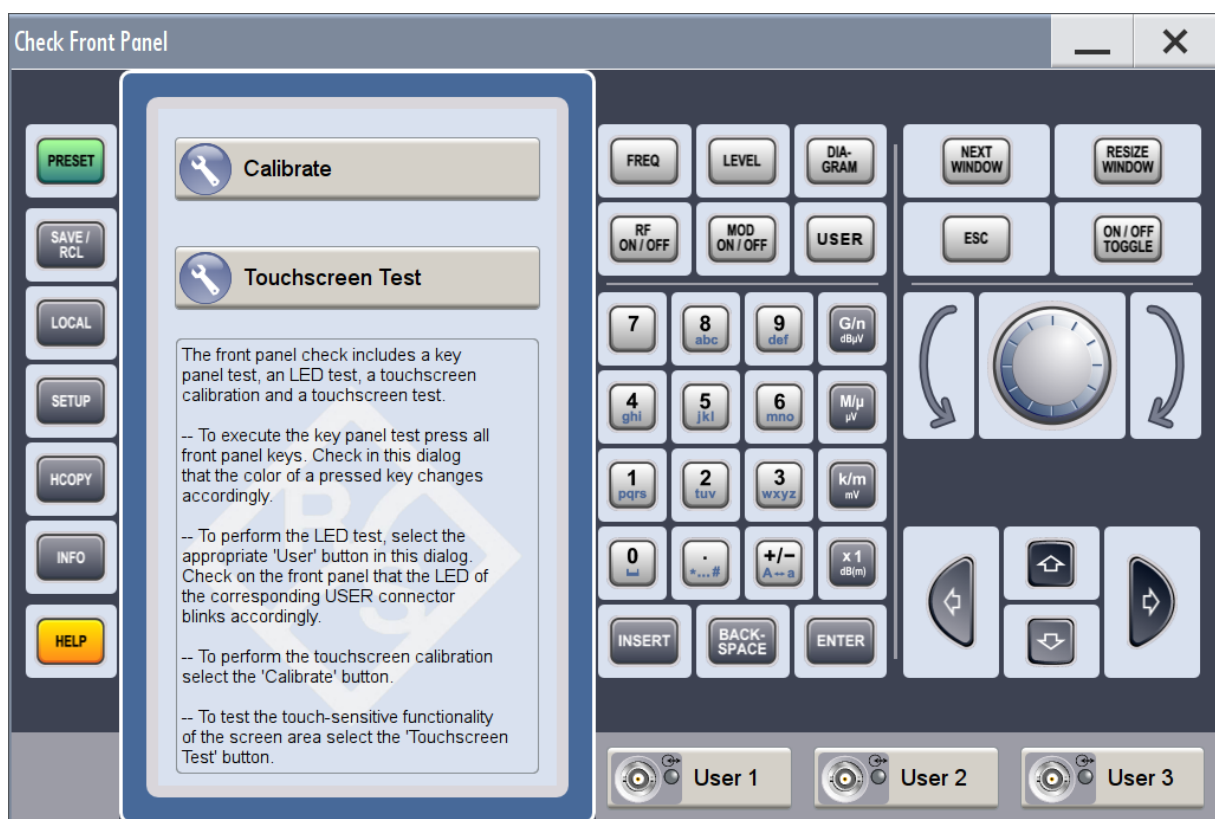
2.5.5 Calibrating the Touchscreen

When the instrument is delivered, the touchscreen is initially calibrated. However, if an instrument is mounted on the topmost or on the bottommost shell in a rack, a parallax error may occur. See also "[Rackmounting](#)" on page 19.

To calibrate the touchscreen for preventing a parallax error

- Press the SETUP key.
- Select the "Maintenance > Check Front Panel"

The "Check Front Panel" opens.



- Select "Calibrate".

The instrument performs the calibration process.

4. Do not abort the calibration.

The instrument completes the calibration process automatically and returns to the "Check Front Panel" dialog.

3 Instrument Tour

The following topics will help you get familiar with the instrument and perform the first steps:

- [Front Panel Tour](#)
- [Rear Panel Tour](#)

This section explains the control elements and the connectors of the R&S SMW with the aid of the front and rear views. Specifications of interfaces can be found in the data sheet.

3.1 Front Panel Tour

This section provides an overview of the control elements on the front panel of the R&S SMW. Most of the connectors are placed on the rear panel and are described in [Chapter 3.2, "Rear Panel Tour"](#), on page 46. The user interface can be displayed on a remote PC station used to manually remote control the instrument.

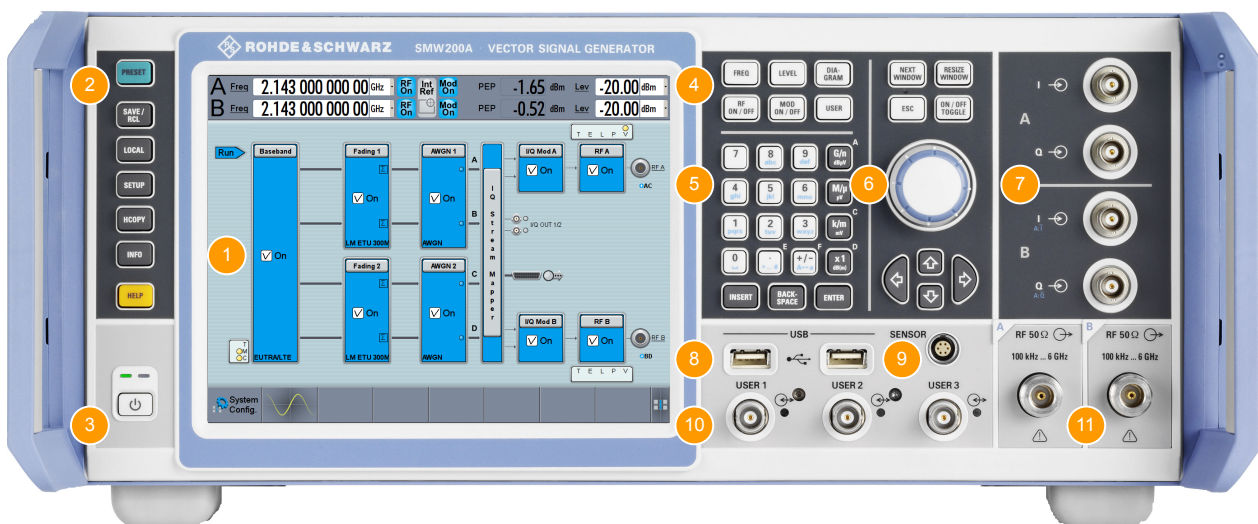


Figure 3-1: Front panel view

- 1 = Touchscreen
- 2 = Utility keys
- 3 = POWER ON/STANDBY
- 4 = Function keys
- 5 = Keypad
- 6 = Navigation controls

- 7 = I/Q input connectors
- 8 = USB connectors
- 9 = SENSOR connector
- 10 = USER input/output connectors
- 11 = RF A/RF B output connectors

NOTICE**Instrument damage caused by cleaning agents**

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

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

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

3.1.1 Touchscreen

The block diagram and the most important settings are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to quickly reconfigure the signal flow. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument.

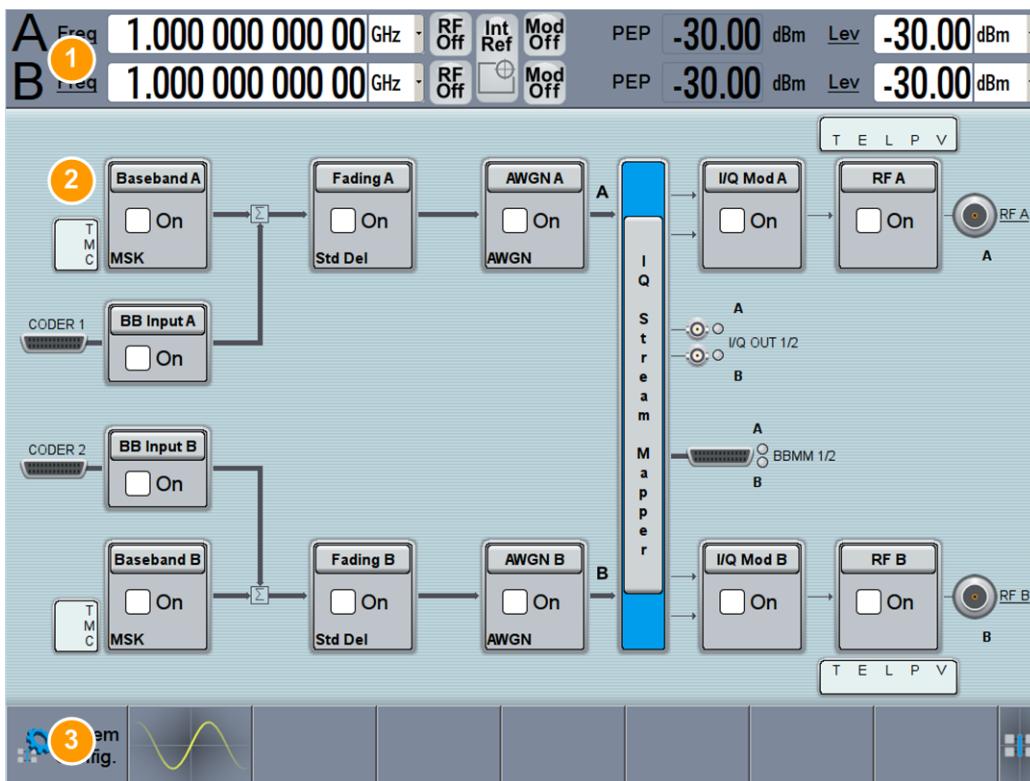


Figure 3-2: Touchscreen elements

- 1 = Status bar (frequency and level display)
- 2 = Block diagram
- 3 = Taskbar/softkey bar

A touchscreen is a screen that is touch-sensitive. It reacts in a specified way when a particular element on the screen is tapped by a finger. Any user interface element that can be clicked on by a mouse pointer can also be tapped on the screen to trigger the same behavior. Using the touchscreen, the following tasks (among others) can be performed by the tap of your finger (see also [Chapter 4, "Trying Out the Instrument"](#), on page 53):

- Changing a setting
- Selecting new settings
- Scrolling through the list of parameters
- Saving or recalling settings
- Routing the signal flow
- Opening and closing dialogs



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

3.1.2 Keys

3.1.2.1 Utility Keys

The utility keys cause the R&S SMW to return to a defined instrument state and provide information on the instrument and assistance.

For more information, refer to chapter "General Instrument Functions" in the user manual.

Table 3-1: Utility Keys

Utility Key	Assigned functions
PRESET	Sets the instrument to a defined state
SAVE/RCL	Saves and loads instrument setting Accesses the file manager
LOCAL	Switches from remote control to local (manual) control
SETUP	Accesses the general instrument settings
HCOPY	Opens the "Hardcopy" dialog for storing the current display in a file
INFO	Displays status messages, error messages, and warnings
HELP	Displays context-sensitive help text

3.1.2.2 POWER ON/STANDBY

The POWER ON/STANDBY key switches the instrument from the standby to the ready state or vice versa.

- In the ready state, the LED is green. The instrument is ready for operation.
- In the standby state, the LED is orange. The standby power mode keeps the power switch circuits and the oven-controlled crystal oscillator OCXO active. In this state, it is safe to switch off the AC power and disconnect the instrument from the power supply.

3.1.2.3 Function Keys

Function keys provide access to most common generator settings and functions. A detailed description of the corresponding functions is provided in the user manual.

Table 3-2: Function keys

Function key	Assigned functions
FREQ	Activates frequency entry. ¹⁾
LEVEL	Activates level entry. ¹⁾
DIAGRAM	Brings the block diagram to the foreground. Active dialogs are minimized.
RF ON/OFF	Switches the RF output on and off. ²⁾
MOD ON/OFF	Switches the modulations on and off. ²⁾
USER	Key with a customizable function. You can define the action to be executed.
Function execution (in navigation controls area)	
ON/OFF TOGGLE	<ul style="list-style-type: none"> • Switches highlighted elements or a function block on and off. • Switches between two or more settings, e.g. items of selection lists. At the end of a list, the cursor is set on the first entry again.

¹⁾ The entry field that was active last is activated. Press the key again to activate the entry field of the other path.

²⁾ Current status is displayed in the "Status bar". The key switches all RF signals/modulations off; Press the key again to restore the last active status.

3.1.2.4 Keypad

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

Table 3-3: Keys on the keypad

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.

Type of key	Description
Sign key	Changes the sign of a numeric parameter. In the case of an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (G/n dB μ V, M/ μ μ V, k/m mV and x1 dB(m))	These keys add the selected unit to the entered numeric value and complete the entry. In the case of level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they have the same function as an ENTER key.
INSERT key	Toggles between insert and overwrite mode
ESC key	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button. For "Edit" dialog boxes the following mechanism is used: <ul style="list-style-type: none"> • If data entry has been started, it retains the original value and closes the dialog box. • If data entry has not been started or has been completed, it closes the dialog box.
BACKSPACE key	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor.
ENTER key	Has the same effect as pressing the rotary knob <ul style="list-style-type: none"> • Concludes the entry of dimensionless entries. The new value is accepted. • With other entries, this key can be used instead of the default unit key. • In a dialog box, selects the default or focused element. • Calls the next dialog level. • Confirms and closes open input windows.

3.1.2.5 Navigation Controls

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

Rotary Knob

The rotary knob has several functions:

- Increments (clockwise direction) or decrements (counter-clockwise direction) the instrument parameter at a defined step width in the case of a numeric entry.
- Moves the selection, e.g. to a function block in the block diagram
- Shifts the selection bar within focused areas (e.g. lists).

- Acts like the ENTER key, when it is pressed.

Navigation Keys

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

Table 3-4: Navigation Keys

Type of key	Description
UP/DOWN Key	The UP and the DOWN key does the following: <ul style="list-style-type: none"> • In a numeric edit dialog box, increase or decrease the instrument parameter. • In a list, scroll forward and backward through the list entries. • In a table, move the selection bar vertically. • In windows or dialog boxes with vertical scroll bar, move the scroll bar.
LEFT/RIGHT Key	The LEFT and the RIGHT key does the following: <ul style="list-style-type: none"> • In an alphanumeric edit dialog box, move the cursor. • In a list, scroll forward and backward through the list entries. • In a table, move the selection bar horizontally. • In windows or dialog boxes with horizontal scroll bar, move the scroll bar.

Display Keys

The display keys arrange different windows on the display.

Table 3-5: Display keys

Display key	Assigned functions
NEXT WINDOW	Toggles between the active dialogs
RESIZE WINDOW	Adjusts the size of the active dialog to use the whole height of the display.
ESC	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button. For "Edit" dialog boxes the following mechanism is used: <ul style="list-style-type: none"> • 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.

3.1.3 Connectors

The RF and I/Q connectors and various others interface connectors are located on the front panel.

I, Q

I and Q inputs for external analog modulation signal directly fed into the I/Q modulator. One pair of I and Q inputs are available per installed RF path.

For more information, see chapter "Overview of the Input and Output Signals and Connectors" in the user manual.

USB

USB (universal serial bus) interfaces of type A (host USB).

- Connection of peripherals such as mouse or keyboard
- Connection of memory stick for file transmission
- Firmware update

Note: Further USB interface type A (host USB) and a USB interface type B (device USB for data transmission) are available on the rear panel.

See also [Chapter 2.3, "Connecting USB Devices"](#), on page 25.

SENSOR

Connector for R&S NRP-Zxx sensors.

The R&S SMW supports the use of R&S NRP-Zxx power sensors in various ways including as a simple power viewer.

A power sensor is connected by inserting the male connector. To disconnect, pull the connector by its sleeve. You cannot disconnect the sensor simply by pulling at the cable or the rear part of the connector.

USER 1, 2, 3

Multipurpose connectors. The input/output signal has to be defined, for example "Global Trigger", "Global Clock", etc.

The [Table 3-6](#) lists the signals assigned to the USER 1, 2, 3 connectors in the default instrument state.

Table 3-6: Default configuration of the USER 1, 2, 3 connectors

Connector	Direction	Default assigned signal
USER 1	Output	Baseband A Marker 1
USER 2	Output	Baseband A Marker 2
USER 3	Input	Global Trigger 1

A dedicated LED indicates the connector status:

- Green: an input connector
- Yellow: an output connector
- No light: the connector is not active

See also chapter "Local and Global Connectors" in the user manual.

RF A, RF B

Outputs for RF signal of path A and path B.

NOTICE! Maximum Input Levels. Do not overload the RF output. The maximum permissible back-feed is specified in the data sheet.

The connector type depends on the installed frequency option, see [Table 3-7](#).

Table 3-7: Overview of RF connector types depending on the frequency range

Required option	Connector type
RF A: R&S SMW-B103/-B106 RF B: R&S SMW-B203/-B206	N female
RF A: R&S SMW-B112 RF B: R&S SMW-B212	Test port adapter, PC 3.5 mm female
RF A: R&S SMW-B120 RF B: R&S SMW-B220	Test port adapter, PC 3.5 mm female
RF A: R&S SMW-B131/-B140/-B140N	Test port adapter, PC 2.92 mm female

NOTICE! Risk of RF connector and cable damage. Excessive tightening of the connectors can damage the cables and connectors. Too weak tightening leads to inaccurate results.

Always use an appropriate torque wrench suitable for this type of connector and apply the torque specified in the application note [1MA99](#).

If your instrument is equipped with a test port adapter, refer also to [1MA100](#).

The application notes are available on the Internet and provide additional information on care and handling of RF connectors.

Rohde & Schwarz offers appropriate torque wrenches for various connectors. For ordering information see the R&S SMW data sheet or product brochure.

3.2 Rear Panel Tour

This section provides an overview of the connectors on the rear panel of the instrument. For technical data of the connectors, refer to the data sheet.

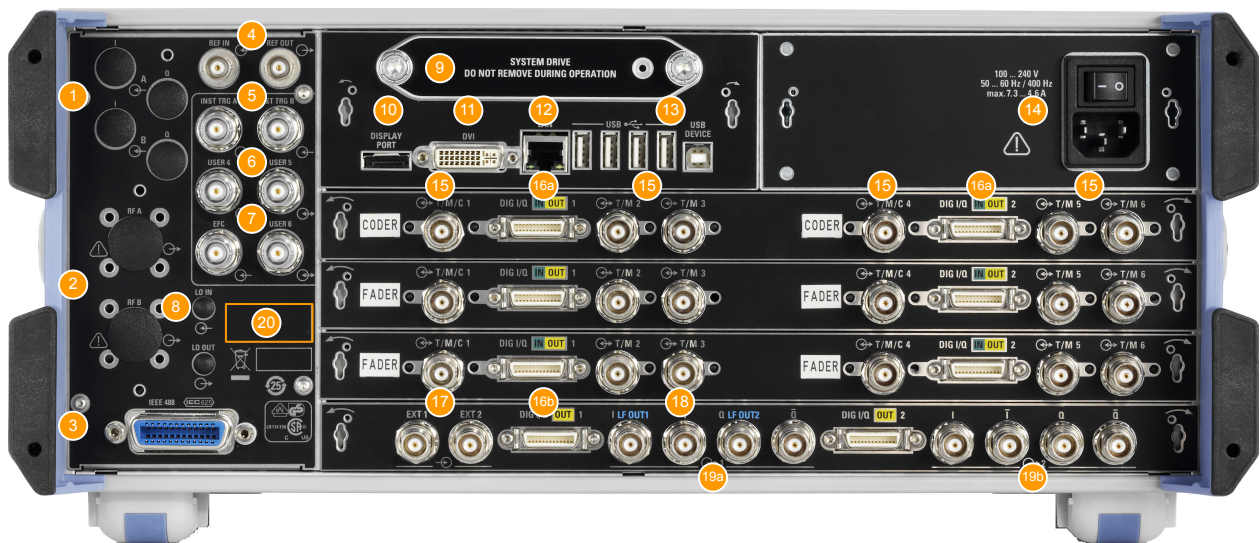


Figure 3-3: Rear panel view

- 1, 2 = Connectors for use in a rack
- 3 = IEC 625/IEEE 488 connector
- 4 = REF IN/ REF OUT connectors
- 5 = INST TRIG A/B connectors
- 6 = USER 4, 5, 6 connectors
- 7 = EFC connectors
- 8 = LO IN, LO OUT connectors
- 9 = SYSTEM DRIVE
- 10, 11 = DISPLAY PORT/DVI connectors
- 12 = LAN connectors
- 13 = USB connectors
- 14 = AC power supply connection and main power switch
- 15 = T/M/C1,4 and T/M2,3,5,6 connectors on each CODER and FADER boards
- 16, 16a = DIG IQ IN/OUT connectors on each CODER and FADER boards; DIG IQ OUT connectors on BBMM board
- 17 = EXT 1, 2 connectors
- 18 = LF OUT 1, 2 connectors
- 19a, b = I/Q OUT, I/Q BAR OUT connectors
- 20 = Serial number (last 6 digits in the string 1412.0000.02-<serial number>)

3.2.1 Connectors

I, Q

Rear panel connectors, recommended for use of the instrument in a 19" rack.
See also "[Rackmounting](#)" on page 19.

RF A / RF B

Rear panel connectors for the 1st RF path (option R&S SMW-B81/-B83) and the 2nd RF path (option R&S SMW-B82/-B84). These options are recommended for use of the instrument in a 19" rack.

See also "[Rackmounting](#)" on page 19.

IEC 625/IEEE 488

GPIO-bus interface for remote control of the instrument.

The IEC 625 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.

Note: To avoid electromagnetic interference (EMI) caused by open lines, always terminate any connected IEC-bus cable with an instrument or a controller.

See also "Annex: Hardware Interfaces" and chapter "Network and Remote Control" in the user manual.

REF IN/ REF OUT

Input/output for external reference signal. The external reference is used for both paths.

INST TRIG A/B

Input for external trigger of sweeps and list mode.

USER 4, 5, 6

Multipurpose connectors. The input/output signal has to be defined, for example "Pulse In/Gen A/B", "Signal Valid A/B", "Sync A/B", or "Video A/B".

The [Table 3-8](#) lists the signals assigned to the USER 4, 5, 6 connectors in the default instrument state.

Table 3-8: Default configuration of the USER 4, 5, 6 connectors

Connector	Direction	Default assigned signal
USER 4	Input	Global Trigger 2
USER 5	Output	No Signal (Blank) A
USER 6	Not used	None

A dedicated LED indicates the connector status:

- Green: an input connector
- Yellow: an output connector
- No light: the connector is not active

See also chapter "Local and Global Connectors" in the user manual.

EFC

Input connector for an EFC signal (external frequency control).

LO IN, LO OUT

Local oscillator input and output for phase-coherent RF signal; require option R&S SMW-B90.

- LO IN: Input of phase coherence signal
- LO OUT: Output of phase coherence signal

NOTICE! Protection of mechanical components. To avoid damage of the SMA connectors it is essential to limit the tightening torque to 60 Ncm. Use an adequate 8 mm torque wrench and not an ordinary open-end wrench.

SYSTEM DRIVE

Hard disk drive (HDD) or solid-state drive (SSD); the SSD requires option R&S SMW-B93.

With respect to security concerns the hard disk can be removed from the instrument, but it is bound to the specific R&S SMW. Therefore, it cannot be exchanged between different instruments.

NOTICE! Risk of instrument damage and data loss. During operation the instrument is accessing the hard disk. Removing the hard disk while operating leads to data loss or even instrument damage.

Do not remove the hard disk during operation.

DISPLAY PORT/DVI

Provided for future use.

LAN

The LAN interface can be used to connect the R&S SMW to a local network for remote control, remote operation, and data transfer.

For details, see [Chapter 2.4, "Setting Up a Network \(LAN\) Connection"](#), on page 26.

USB

The rear panel provides 4 more female USB Type A connectors to connect devices like a keyboard, a mouse, a memory stick, or a power sensor R&S NRP-Zxx, connected with an appropriate cable R&S NRP-Z3/Z4.

Furthermore, a female USB DEVICE connector (USB Type B) is provided, for example for remote control.

See also [Chapter 2.3, "Connecting USB Devices"](#), on page 25.

AC SUPPLY AND POWER SWITCH

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

Main power switch function:

- Position 1: The instrument is in operation.
- Position 0: The entire instrument is disconnected from the AC power supply.

For details, refer to [Chapter 2.1.5, "Switching the Instrument On and Off"](#), on page 20.

T/M/(C)

Multipurpose input/output connectors. Each coder and fader board is equipped with one TRIGGER/MARKER/CLOCK and two TRIGGER/MARKER connectors. The input/output signal has to be defined, for example "Trigger", "Clock", etc.

The [Table 3-9](#) lists the configuration of the local connectors in the default instrument state.

Table 3-9: Default configuration of the T/M/(C) connectors on the CODER boards

Connector	Direction	Default assigned signal	Remark
T/M/C 1	Output	Clock	Local clock signal for the particular baseband
T/M 2	Input	Trigger	Local trigger signal for the particular baseband
T/M 3	Output	Marker 3	Marker output signal from the particular baseband

A dedicated LED indicates the connector status:

- Green: an input connector
- Yellow: an output connector
- No light: the connector is not active

See also chapters "Data, Clock and Control Signals and Sources in the Baseband" and "Local and Global Connectors" in the user manual.

DIGITAL IQ IN/OUT

Connectors for the input/output of a digital I/Q signal from and to an R&S instrument, like a signal generator, signal analyzer, the R&S EX-IQ-BOX, or the R&S®CMW500 Radio Communication Tester in fading applications.

Each fader board is equipped with one bidirectional interface. The coder boards are equipped with one DIG IQ IN interface each and the BBMM (Baseband main module) board - with one or two DIG IQ OUT interfaces.

The interfaces require the options listed in [Table 3-10](#) (for details see the data sheet).

Table 3-10: Overview of the required options

Location of the interface	Designation	Required option
DIG IQ IN on the coder boards	CODER 1/2 IN/OUT	R&S SMW-B10
DIG IQ IN/OUT on the fader boards	FADER 1/2/3/4 IN/OUT	R&S SMW-B14, Fading Simulator
DIG IQ OUT on the BBMM board	BBMM 1/2 OUT	R&S SMW-B13/-B13T and R&S SMW-K18, Digital Baseband Output

A dedicated LED indicates the connector status:

- Green: an input connector
- Yellow: an output connector
- No light: the connector is not active

EXT 1, 2

Input for external analog modulation signals. The instrument is equipped with two separate inputs, which both can be used for path A and path B.

LF OUT 1/2

Output for internal LF generator signal.

Note: The output of the internal LF signal and the analog I/Q signal use the same physical connectors (LF OUT 1/2 and I/Q OUT 1). These signals cannot be output at the same time.

See also data sheet and user manual, section "LF Generator and LF Output".

I/Q OUT, I/Q BAR OUT 1,2 LF OUT 1/2

Direct output or differential output for the analog I/Q signal. Output of differential signal requires option R&S SMW-K16.

Note:

Throughout the user documentation, the notations DIFF I OUT and I OUT BAR are used interchangeably.

See also "Analog I/Q Output Settings" in the user manual.

4 Trying Out the Instrument

This chapter introduces the most important functions and settings of the R&S SMW step by step. The complete description of the functionality and its usage is given in the R&S SMW user manual. Basic instrument operation is described in [Chapter 6, "Instrument Control"](#), on page 103.

See also:

- ["To start a tutorial in an interactive step-by-step mode"](#) on page 117

Prerequisites

- The instrument is set up, connected to the power supply, and started up as described in [Chapter 2, "Preparing for Use"](#), on page 15.
- Throughout this description, the term base unit describes a R&S SMW equipped with the options R&S SMW-B10, R&S SMW-B13, and R&S SMW-B103.

For the first signal generation tasks, you use the internal baseband and reference signal, so you do not need any additional signal source. More complex signal generation tasks, however, require an instrument equipped with additional options and/or external signals. Each task description lists its prerequisites.



The screenshots in this description show a fully equipped instrument. Consider that, the block diagram displayed on your particular instrument may differ from the one used in the example.

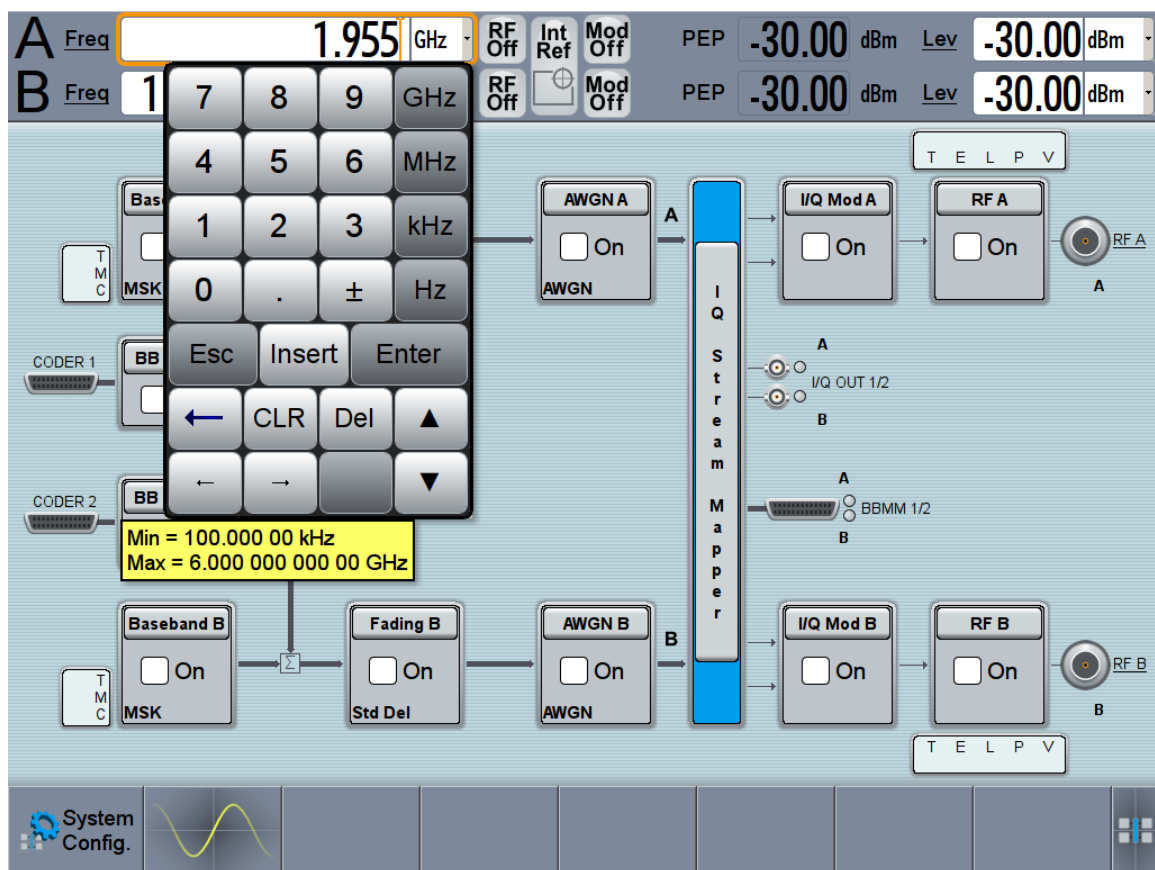
The instrument is manually operated via the touchscreen. Try out the following:

- [Generating an Unmodulated Carrier](#)..... 54
- [Generating a Digitally Modulated Signal](#)..... 57
- [Triggering the Instrument with an External Signal](#)..... 59
- [Enabling and Configuring a Marker Signal](#)..... 66
- [Routing the Signal through the Instrument and Defining the Output Connectors](#)..... 67
- [Verifying the Generated Signal with the Graphics Display](#)..... 72
- [Saving and Recalling Settings](#)..... 76
- [Generating an EUTRA/LTE Signal](#)..... 79
- [Using the System Configuration Capabilities for MIMO Setups](#)..... 83

4.1 Generating an Unmodulated Carrier

We start out by generating a simple unmodulated signal. The R&S SMW in this example can be a base unit in its minimal configuration.

1. On the R&S SMW front panel, press the PRESET key to start out in a defined instrument configuration.
2. Set the frequency:
 - a) On the "Status Bar", tap the "A Freq" field.
 - b) On the on-screen keypad, enter 1.955 and press the "GHz" key.



The on-screen key pad closes and the frequency value is displayed.

3. On the "Status Bar", tap the "Lev" field and enter the level in the same way.



4. Select "Block Diagram > RF A Block > On" to enable the output of the generated unmodulated signal.

Generating an Unmodulated Carrier

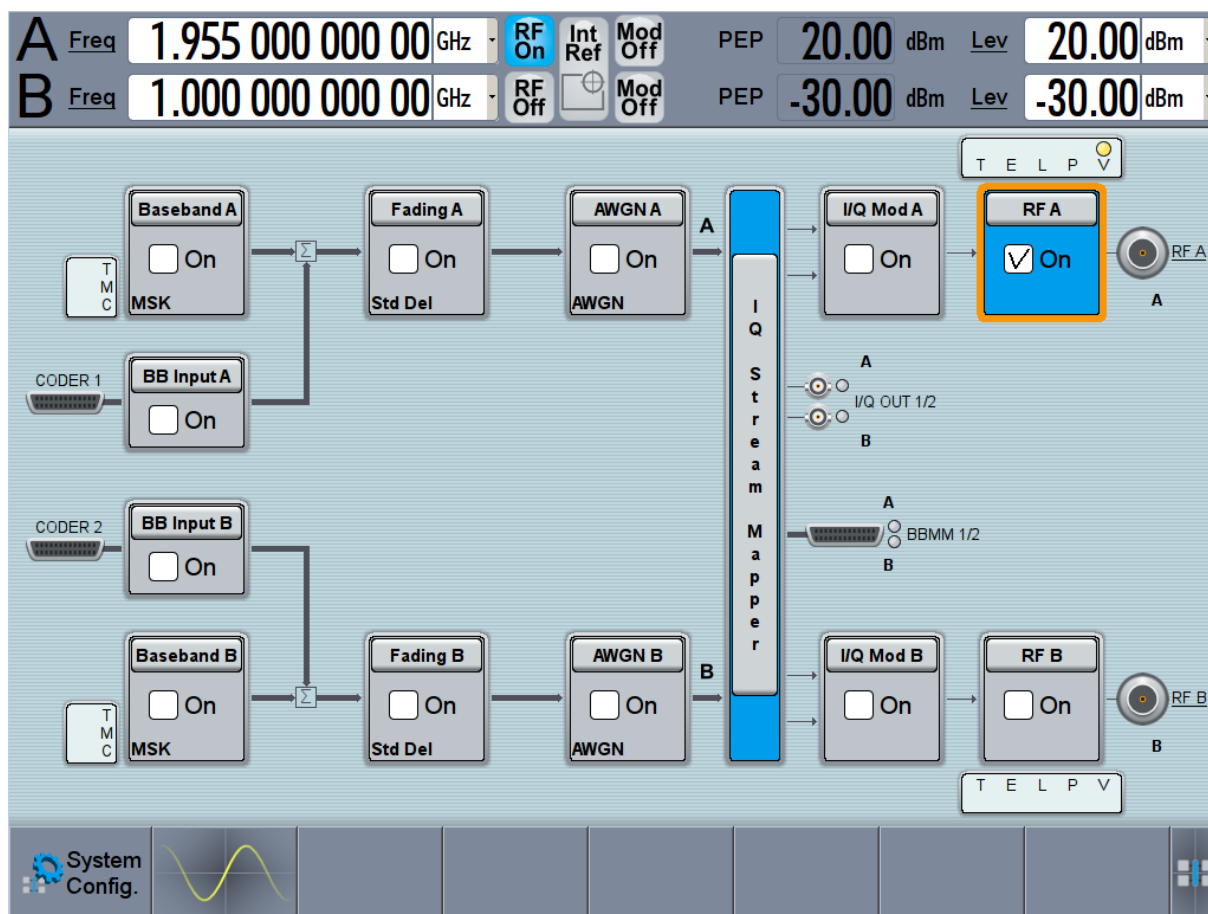


Figure 4-1: Block diagram: Generating an unmodulated signal

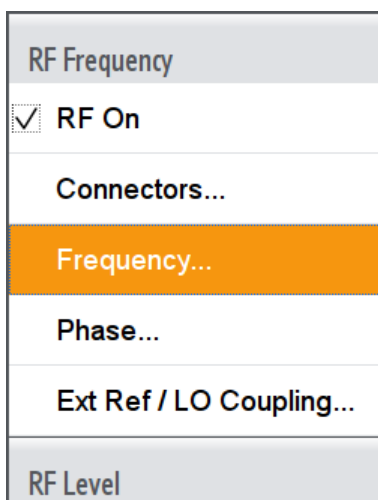
Tip: Alternative way to access the instrument functions. To fulfill the same task, you can use other hot spots in the block diagram, the provided functions under the "RF" block or the function front panel keys.

Try out the following:

- on the "Status Bar" and in the block diagram, tap the underlined labels Freq, Lev and RF A.

Or:

- select "Block Diagram > RF A" block, navigate through the context menu, and use the settings provided in the "Frequency" and "Level" dialog.



To enable signal generation, enable the "RF On".

Or:

- use the **FREQ**, **LEVEL**, and **RF ON/OFF** key on the front panel.

See also [Chapter 6, "Instrument Control"](#), on page 103.

The 1.95 GHz signal is output at the RF A connector at the front panel of the R&S SMW.



Connect RF A of the R&S SMW to a signal analyzer, for example R&S®FSW, to display the generated signal.

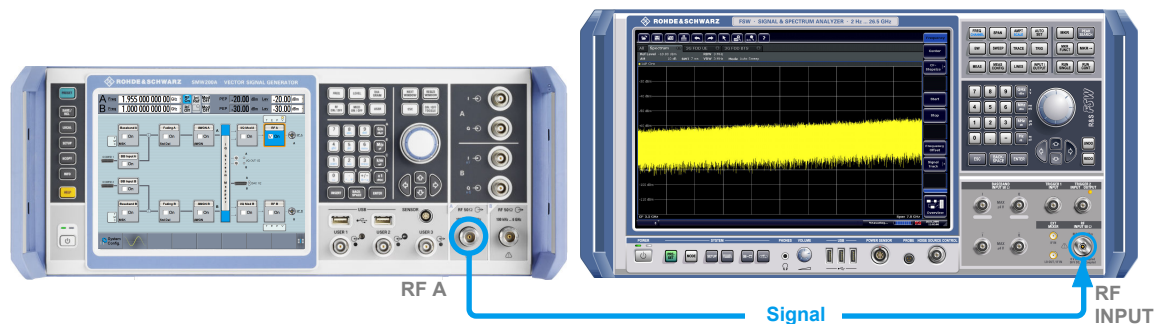


Figure 4-2: Simplified test setup

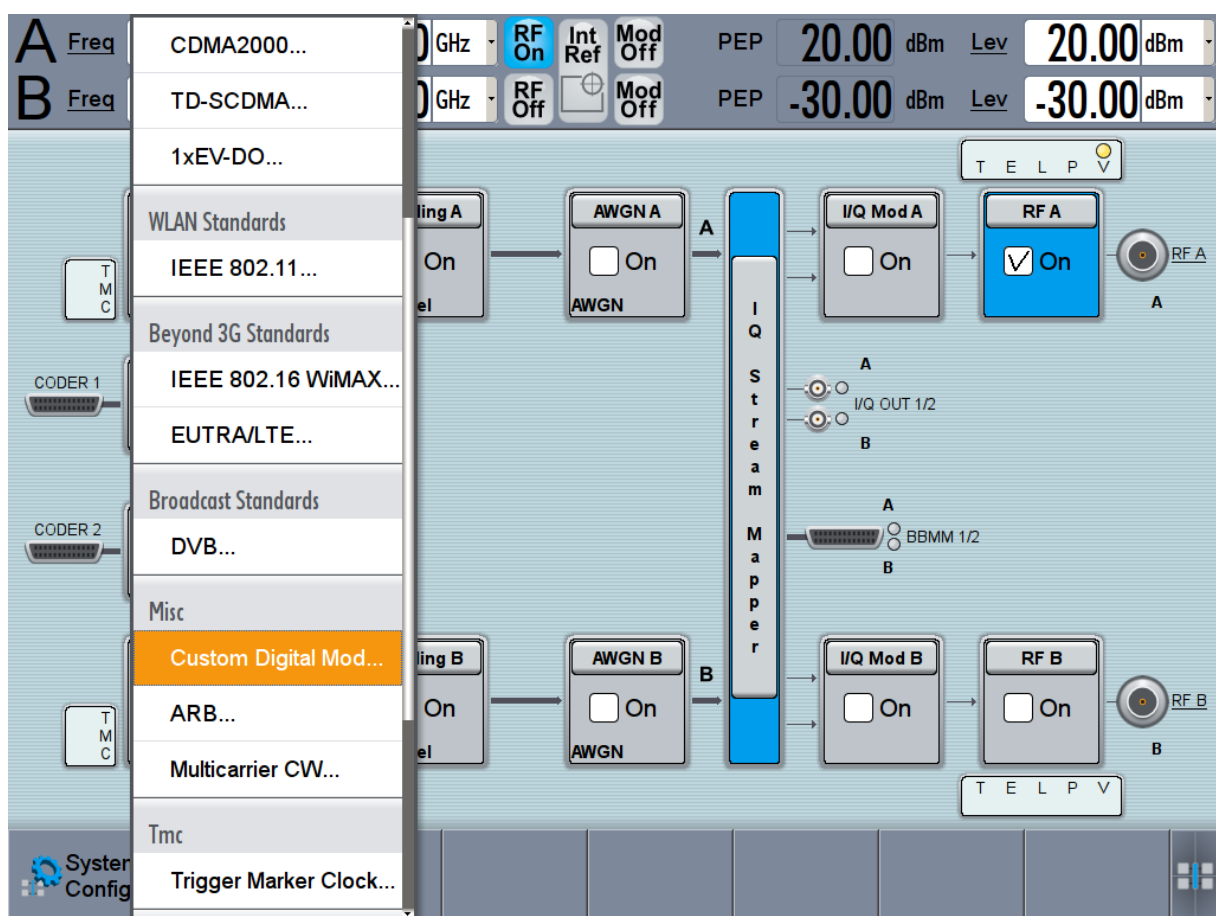
For the required settings of the signal analyzer, refer to its user manual or its online help.

4.2 Generating a Digitally Modulated Signal

This example shows you how to generate a simple WCDMA-3GPP (QPSK 45° Offset) signal with the help of the "Custom Digital Modulation" functionality. The minimum requirement for R&S SMW in this example is a base unit.

The initial situation is not the instrument's preset state but rather the configuration described in [Chapter 4.1, "Generating an Unmodulated Carrier"](#), on page 54.

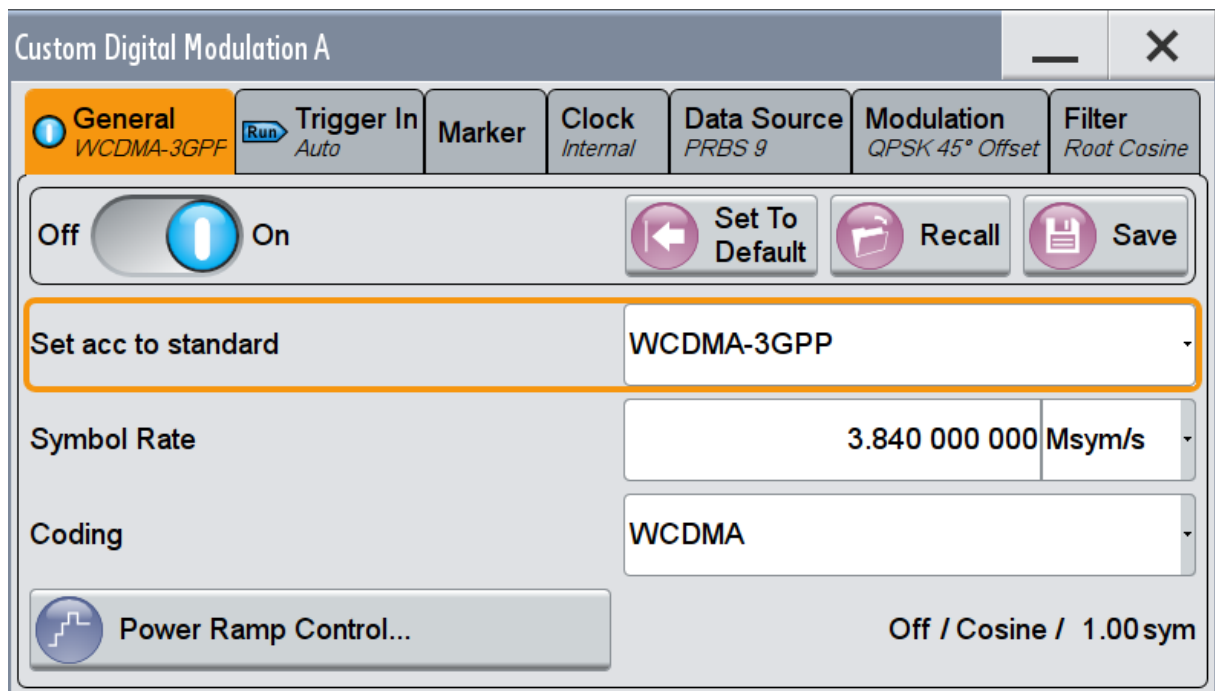
1. In the block diagram, select "Baseband A" and navigate to the section "Misc > Custom Digital Mod...".



The "Custom Digital Modulation" dialog opens.

2. In the "Custom Digital Modulation" dialog, select "General > Set acc to standard > WCDMA-3GPP".
3. Select "General > State > On" to enable signal generation.

Generating a Digitally Modulated Signal



4. Select the "Modulation" tab and observe the used "Modulation Type".

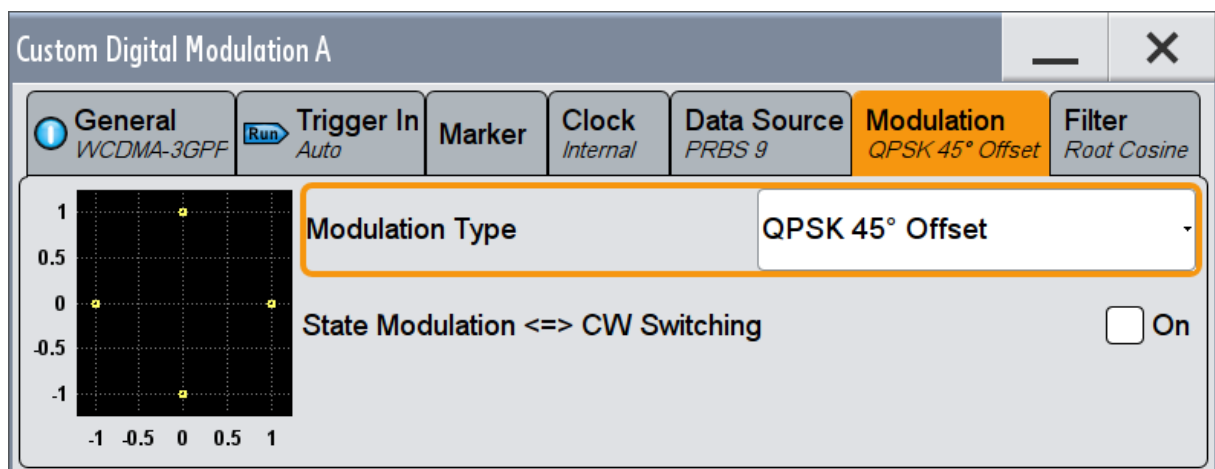


Figure 4-3: Display of the used modulation type

The instrument activates automatically "I/Q Mod A", uses the internal trigger and clock signals, and generates a WCDMA-3GPP signal, modulated with a QPSK 45° Offset modulation.

Triggering the Instrument with an External Signal

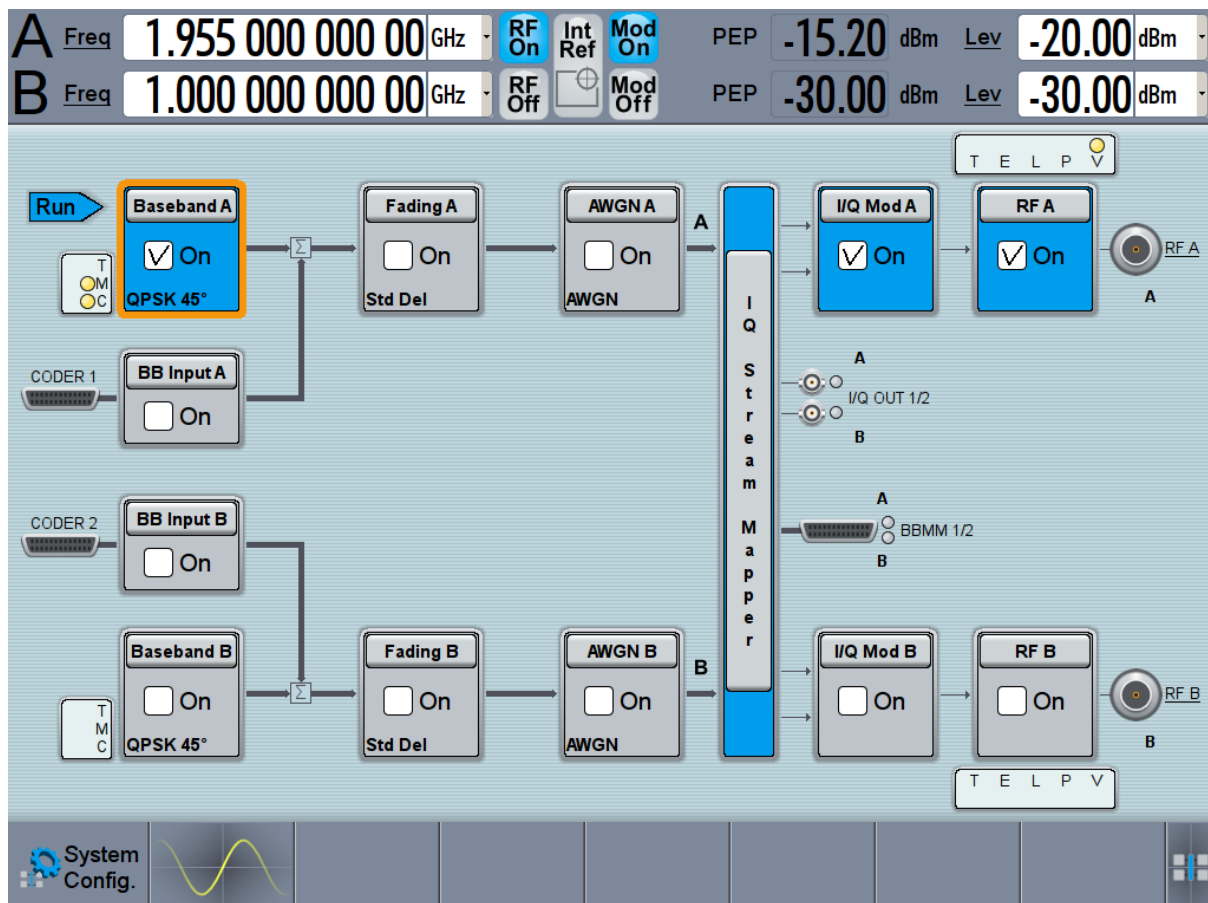


Figure 4-4: Block diagram: Generating a digitally modulated signal

4.3 Triggering the Instrument with an External Signal

The example configurations are rather theoretical cases, because you rarely use the R&S SMW as a stand-alone instrument. Usually, the instrument would be connected to a device under test (DUT) and/or other measurement equipment. As a rule, whenever a test setup requires two or more devices, provide them with a common reference frequency. Some test setups require control of the signal generation start and an exact generation start time, determined by a defined trigger event, e.g. by triggering the instrument internally or externally from the DUT.

This example illustrates the general principle of external triggering and extends the configuration performed in [Chapter 4.2, "Generating a Digitally Modulated](#)

Triggering the Instrument with an External Signal

[Signal](#)", on page 57 by the configuration of the required trigger signal and connector settings.



In this example, we use the global USER connectors. Alternatively, you can achieve the same configuration goal with the local [T/M/\(C\)](#) connectors.

This test setup requires one signal analyzer, like the R&S®FSW, as additional equipment.

To start the signal generation in Baseband A synchronous to an external global trigger signal

The configuration requires three main steps with the following goals:

1. Observe the current connector configuration and define an input connector for the external global trigger signal.
See ["To verify the current connector configuration"](#) on page 60
2. Configure Baseband A to use this external global trigger signal as trigger source.
See ["To \(re\)configure the trigger settings"](#) on page 63
3. Connect the instrument and the external trigger source.
See ["To connect the instrument and the external trigger source"](#) on page 64

To verify the current connector configuration

The R&S SMW is equipped with multi purpose bi-directional local T/M/(C) connectors and global USER connectors. Because the signal direction, input or output, and the signal mapping are configurable, it is recommended that you check the current configuration before cabling or further instrument's configurations.

1. To display *an overview* of the current mapping of the logical signals to the connectors, perform one of the following:
 - In the block diagram, select the Trigger/Marker/Clock status LEDs on the left side of the "Baseband" block.



- Select "Baseband > Trigger Marker Clock".

Triggering the Instrument with an External Signal

The screenshot shows the 'Trigger Marker Clock' window for Baseband A. It features a table with columns for Logical Signal, Connector, and Find. Below the table is a 'Diagram Legend' and two buttons for connector settings.

	Logical Signal	Connector	Find
Trigger Source	Internal		
Clock Source	Internal		
Clock Output		T/M/C 1	...
Marker 1	On/Off Ratio	User 1, T/M 2	...
Marker 2	On/Off Ratio	User 2, T/M 3	...
Marker 3	On/Off Ratio		

Diagram Legend
 T = Trigger = Common to all Basebands
 M = Marker
 C = Clock
 = Signal is available at Output Connector
 = Signal Source is external

Buttons:
 Local Connector Settings...
 Global Connector Settings...

The instrument uses its internal trigger and clock signals, and the default mapping of the marker signals to the connectors.

2. To access the related connector settings, perform one of the following:
 - select "Global Connector Settings"
 - tap the connector name, for example select the connector "User 1, T/M 2"

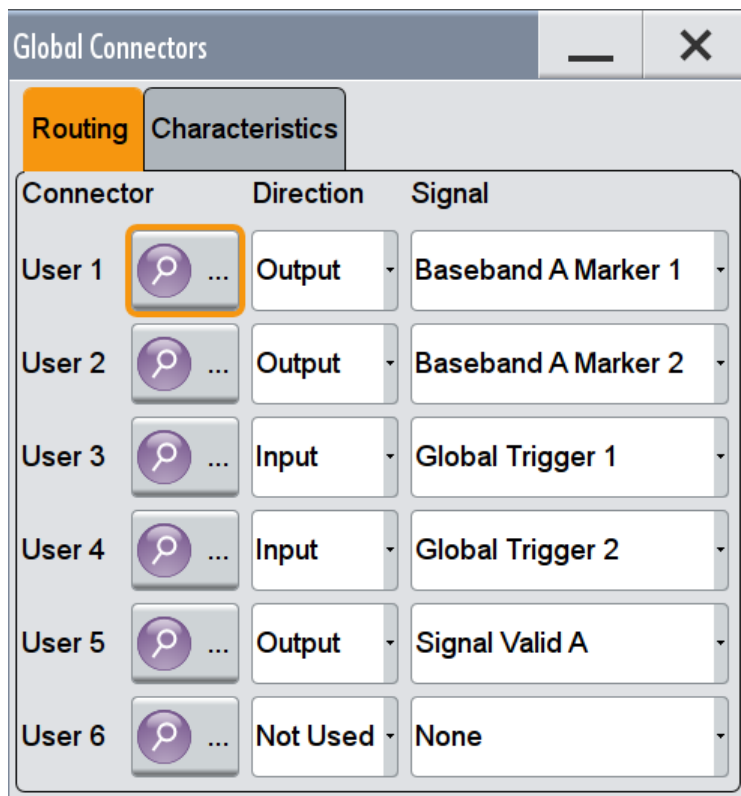


Figure 4-5: Signal mapping to the global connectors

The "Global Connectors" dialog displays the current connectors configuration. The settings are configurable, but in this example we use the default mapping.

- Alternatively, select "Block Diagram > Baseband > Misc > Custom Digital Mod", select the "> Trigger In" tab and select "Local Connector Settings" or "Global Connector Settings".

In the current mapping, the three global connectors **USER 1, 2, 3** on the front panel are configured as follows:

- "Marker 1/2" are output at the USER 1/2 connectors
- the USER 3 connector is an input for the "Global Trigger 1" signal.

Check the front panel of the R&S SMW. The USER 1/2 LEDs are yellow; the USER 3 LED is green.



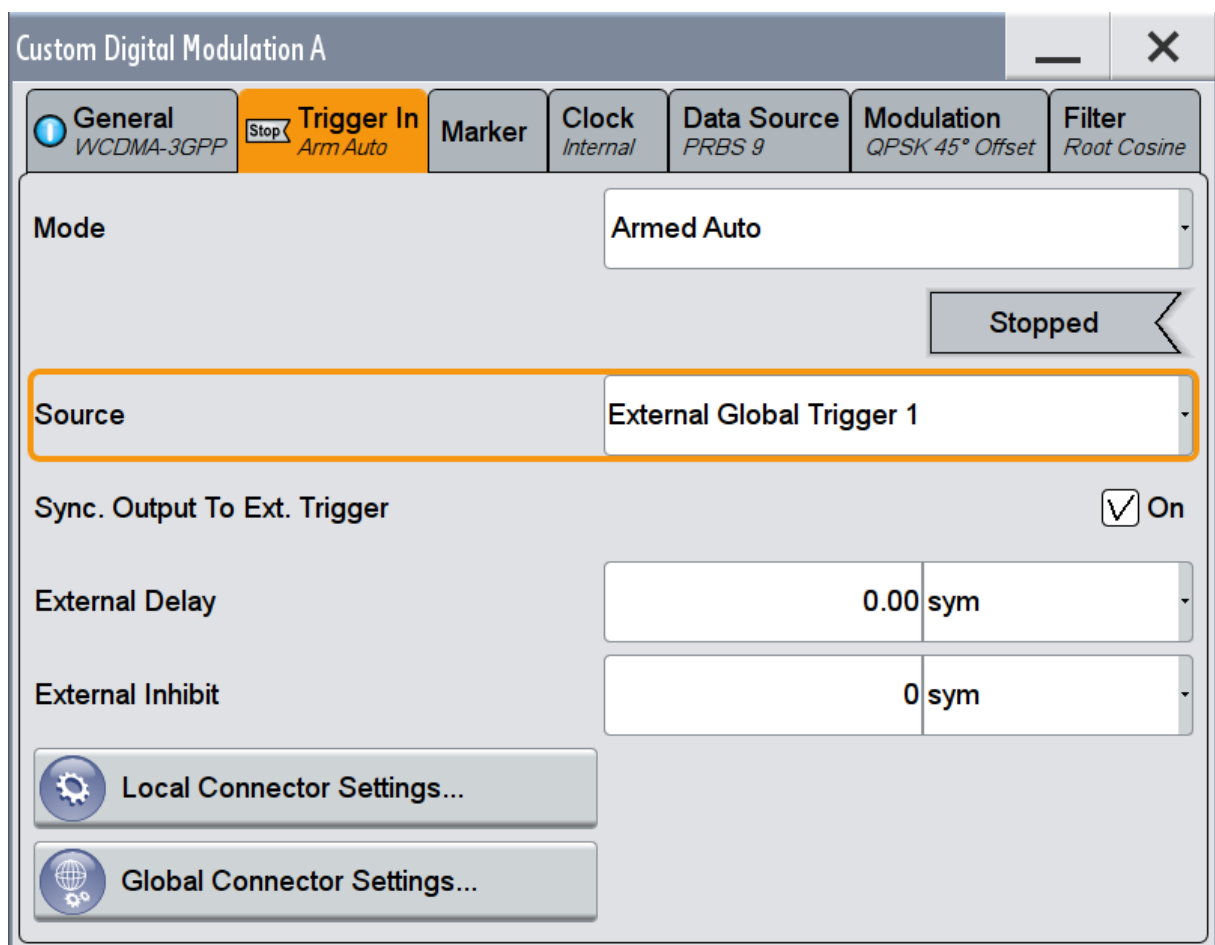
Find the physical location of each connector

Use the built-in "Trigger Marker Clock > Find" function to display the location of the selected connector. A blinking LED on the front/rear panel also indicates the selected connector.

To (re)configure the trigger settings

We assume that the instrument is configured as described in [Chapter 4.2, "Generating a Digitally Modulated Signal"](#), on page 57 and the default connector mapping is maintained (see [Figure 4-5](#)).

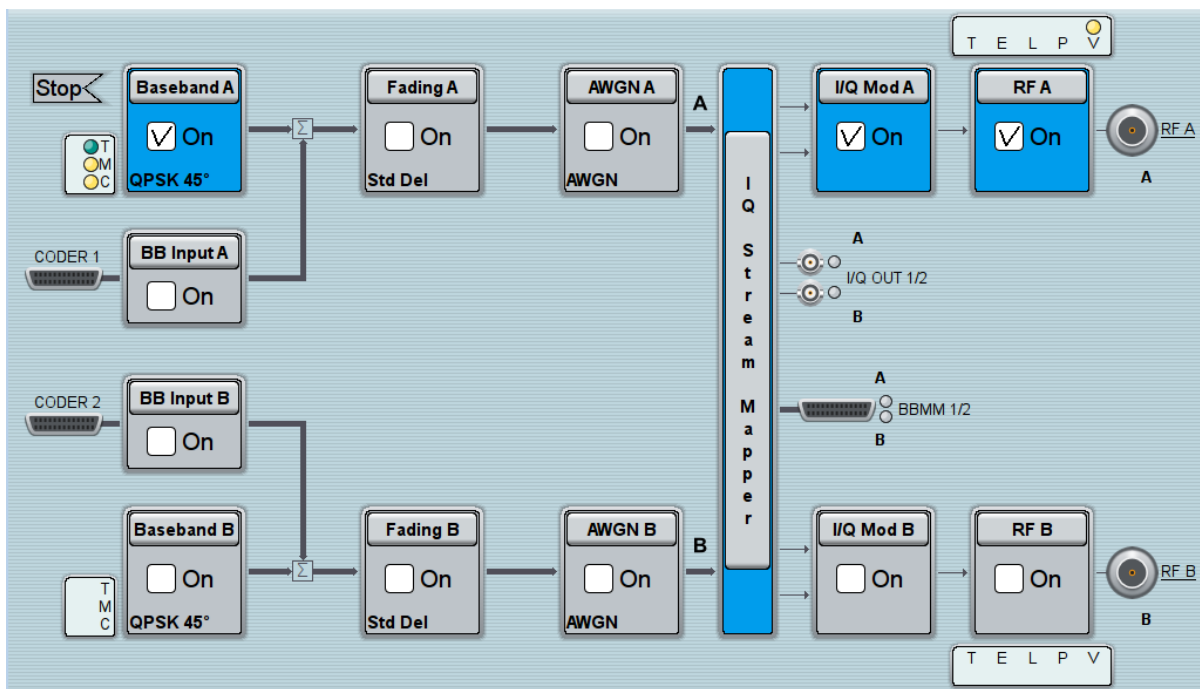
1. In the block diagram, select "Baseband > Misc > Custom Digital Mod > Trigger In".
2. Select the following settings:
 - a) "Mode > Armed Auto"
 - b) "Source > External Global Trigger 1".



The instrument expects an external global trigger event. In this current configuration (see [Figure 4-5](#)), the "Global Trigger 1" signal has to be supplied at the input connector USER 3.

The Trigger/Marker/Clock status LEDs in the block diagram confirm that an external trigger signal is selected; the signal generation is however stopped.

Triggering the Instrument with an External Signal



To connect the instrument and the external trigger source

1. Use a suitable cable to connect the external trigger source to the USER 3 connector of the R&S SMW, see Figure 4-6.

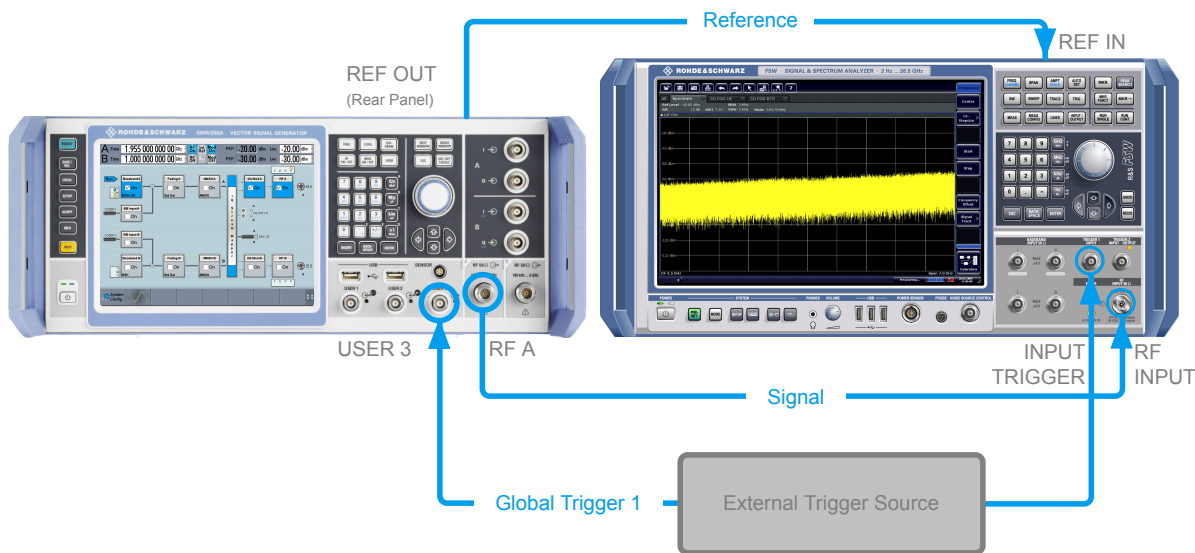
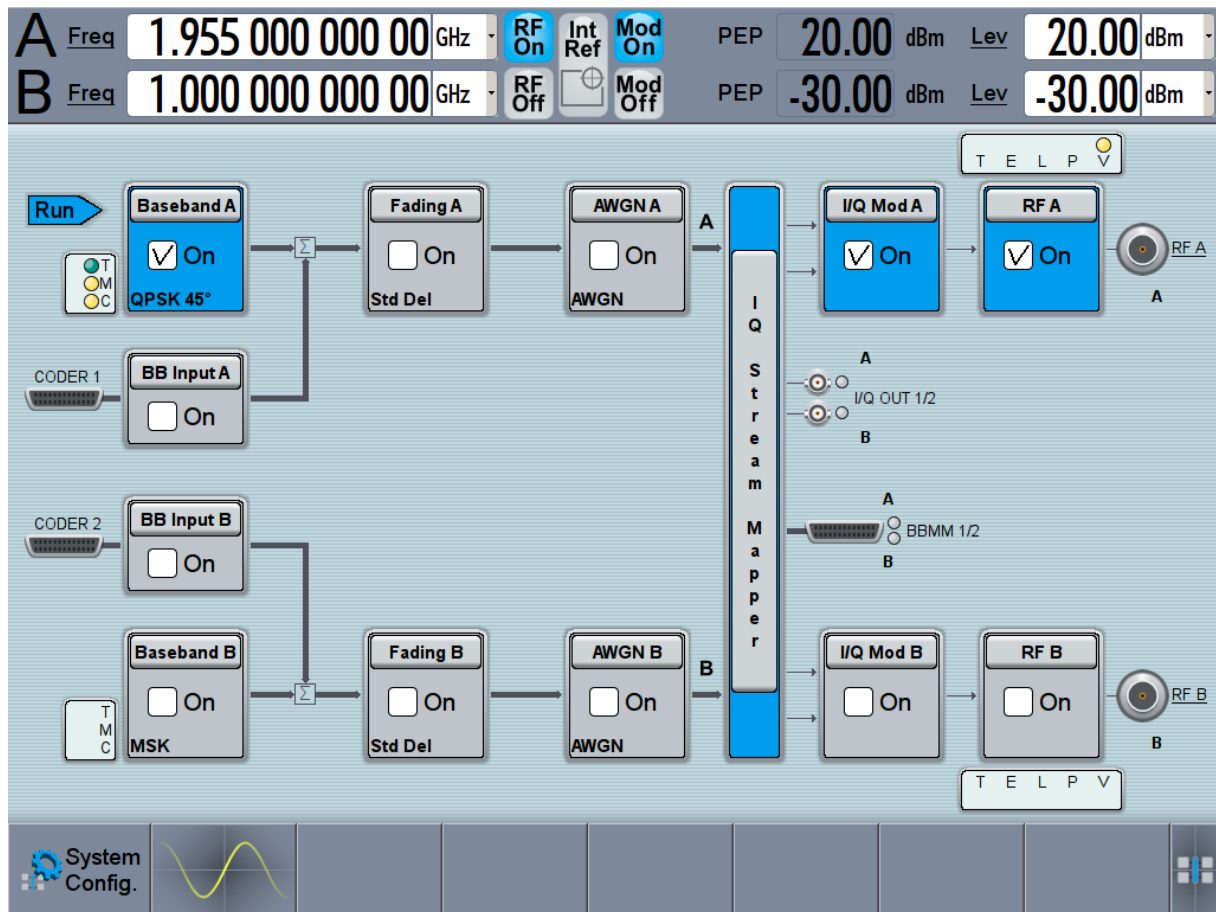


Figure 4-6: Simplified representation of a test setup**

** = the figure depicts the cabling as a general principle; in a particular test setup not all connections are required at the same time

Triggering the Instrument with an External Signal

The Figure 4-6 depicts the location of the connectors and explains the connection as principle. In practice, you would rather "substitute" the analyzer by a DUT, like a base station (BS). The DUT is the source for the reference signal and sends for example a frame trigger signal to the R&S SMW, the R&S SMW acts still as the signal source.



- Use suitable cables to connect the **RF A/B** and **REF OUT** connectors of the R&S SMW to the signal analyzer or the DUT.

Upon the receiving of an external trigger event, the R&S SMW starts the signal generation and then generates a continuous signal. An "Arm" stops the signal generation. A subsequent trigger event causes a restart of the signal generation.



To learn more about this topic, refer to:

- Chapter "Local and Global Connectors" in the user manual
- Chapter "Regular Trigger Signals" in the user manual

4.4 Enabling and Configuring a Marker Signal

Test setups often require that an external device is synchronized to the generated data stream. For this purpose, the R&S SMW can output marker signals (or markers) additionally to the generated signal. The R&S SMW provides several regular marker signals and marker signals specific to the firmware option. With suitable marker settings for instance, you can mark slot or frame boundaries or mark the start of a particular modulation symbol.

This example extends further the configurations performed in [Chapter 4.2, "Generating a Digitally Modulated Signal"](#), on page 57. We assume a default connector mapping (see [Figure 4-5](#)).



In this example, we use the global USER connectors. Alternatively, you can achieve the same configuration goal with the local [T/M/\(C\)](#) connectors.

This test setup requires one oscilloscope, like the R&S®RTO, as additional equipment.

1. In the block diagram, select "Block Diagram > Baseband > Misc > Custom Digital Mod > Marker" tab.
2. Select "Marker Mode > Marker 1 > Pulse" and "Divider = 2".
Generated is a periodic marker with marker frequency of 1.92 MHz. The signal is output at the USER 1 connector of the R&S SMW (see [Figure 4-5](#)).
3. Use a suitable cable to connect the USER 1 connector of the R&S SMW to the monitoring instrument, for example oscilloscope like R&S®RTO, see [Figure 4-7](#).

Routing the Signal through the Instrument and Defining the Output Connectors



Figure 4-7: Simplified representation of a test setup for signal monitoring**

** = the figure depicts the cabling as a general principle

4. Use a suitable cable to connect the **I OUT** connector of the R&S SMW to the monitoring instrument.



To learn more about this topic, refer to chapter "Regular Marker Output Signals" in the user manual.

4.5 Routing the Signal through the Instrument and Defining the Output Connectors

This section emphasizes on the signal routing capabilities in the default state of the instrument (standard system configuration mode). The R&S SMW provides the "I/Q Stream Mapper" function to route and distribute each of the generated I/Q signals (streams) to any of the available output connectors.

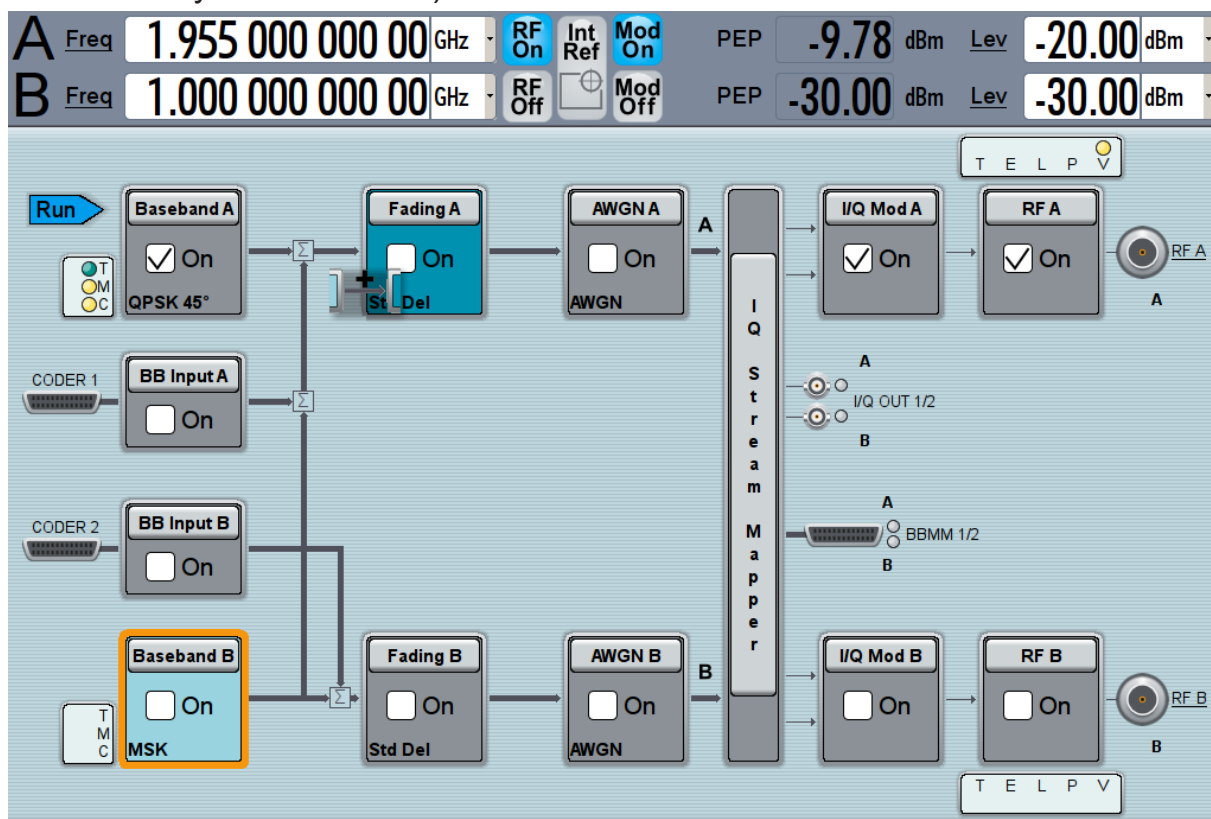
In the provided example, you use the R&S SMW to generate two baseband signals, apply a baseband frequency shift, weight them and add them. You then route the generated stream and define the output connector. The initial situation is the configuration described in [Chapter 4.3, "Triggering the Instrument with an External Signal"](#), on page 59.

The minimum requirement for the instrument in this example is an R&S SMW equipped with the options 2xR&S SMW-B10, R&S SMW-B13T, and 2xR&S SMW-B103.

Routing the Signal through the Instrument and Defining the Output Connectors

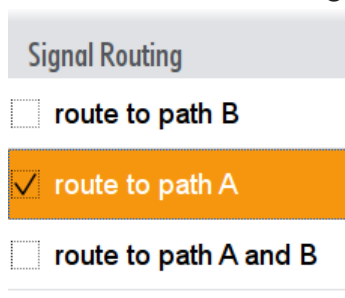
To configure a composed baseband signal

1. In the first baseband, generate a WCDMA-3GPP signal as described in [Chapter 4.2, "Generating a Digitally Modulated Signal"](#), on page 57.
2. To route the signal from "Baseband B" block to the first signal path, use one of the alternatives:
 - In the block diagram, select "Baseband B" block and drag&drop it to the first path ("Fading A" block or "AWGN A" block depending on the options installed on your instrument).



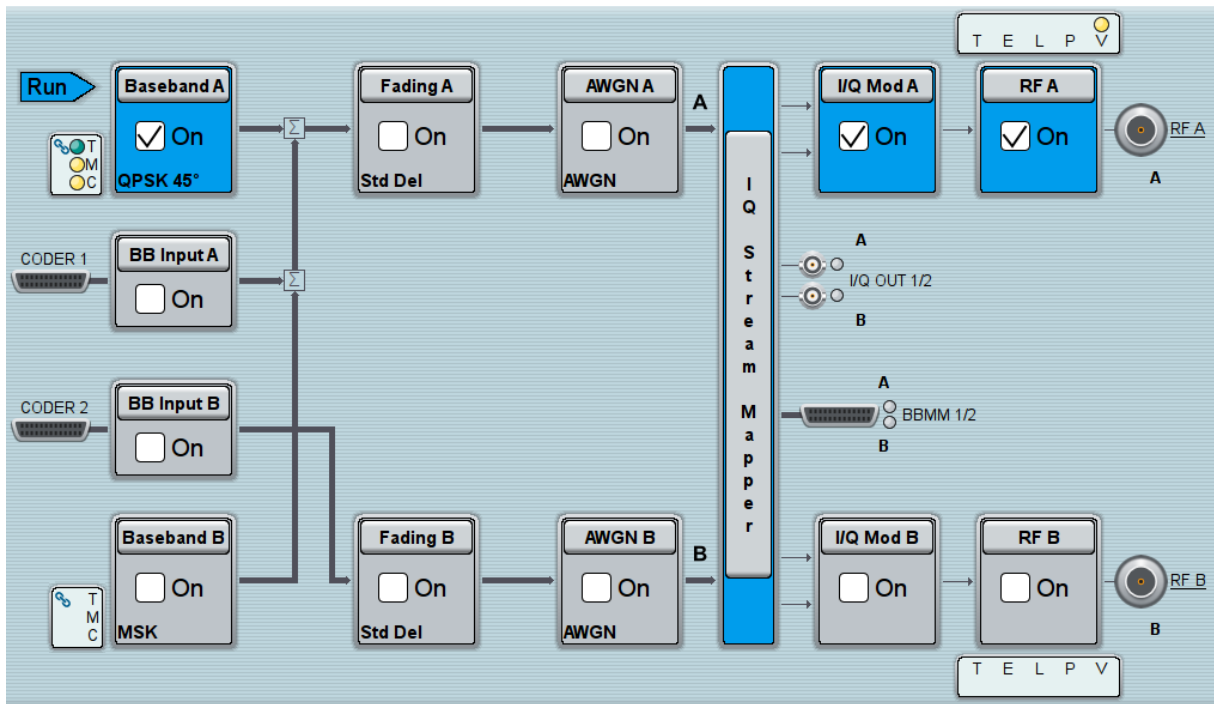
Select the "Fading B" block and drag&drop it to the "Baseband B" block.

- In the block diagram, select "Baseband B" block, navigate in the context menu, and select "Signal Routing > route to path A".

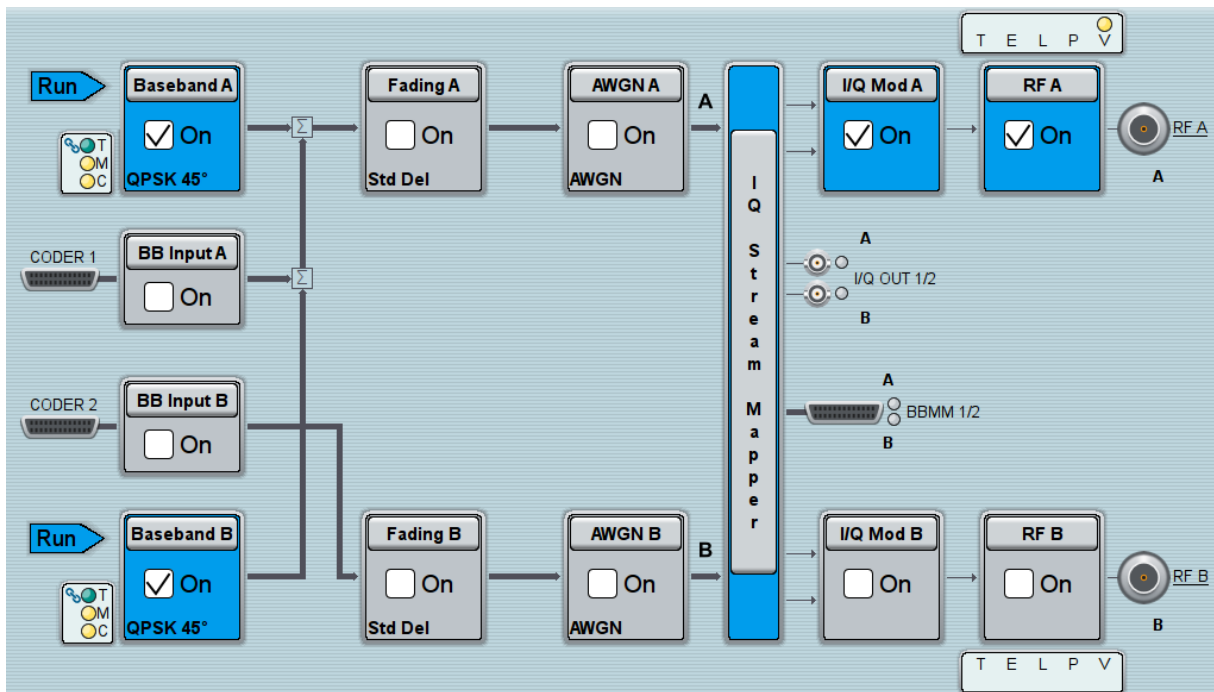


The block diagram displays the routing.

Routing the Signal through the Instrument and Defining the Output Connectors



3. In the block diagram, select "Baseband B > Misc > Custom Digital Mod...", select "Set acc. to standard > 3GPP FDD" and enable "Custom Digital Modulation > State > On".



4. To apply frequency and power offsets to the signals, select "Baseband B > Baseband Offsets".
 - a) Enter "Baseband A > Frequency Offset > 5 MHz".

Routing the Signal through the Instrument and Defining the Output Connectors

- b) Enter "Baseband B > Frequency Offset > -5 MHz".
- c) Enter "Baseband B > Path Gain > -30 dB".
- d) Close the "Baseband Offsets" dialog.

Baseband Offsets			
	Frequency Offset /Hz	Phase Offset /°	Gain /dB
Baseband A	-5 000 000.00	0.00	0.000
BB Input A	0.00		0.000
BB Input B	0.00		0.000
Baseband B	5 000 000.00	0.00	-30.000

The symbols Δf and Δ in the block diagram confirm that the signals are added weighted with a frequency offset on both paths and a path gain on path B.

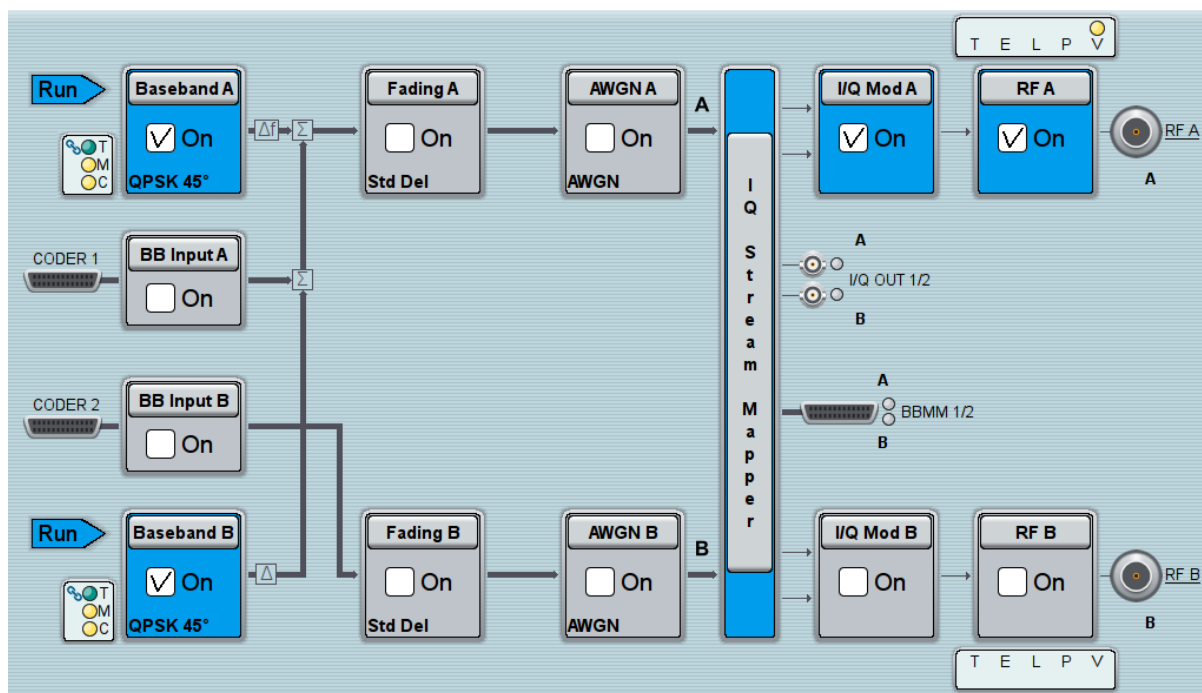


Figure 4-8: Block diagram: Generating a composed signal (Stream A)

To enable simultaneous signal generation in both basebands, the R&S SMW couples the trigger settings in the available basebands. The trigger settings enabled in "Baseband A" apply automatically to the "Baseband B". The symbol ⚙ confirms that common trigger settings are applied.

To map the I/Q stream and define the output connector

The term stream describes the signal at the input of the "I/Q Stream Mapper" up to the output connectors of the instrument.

1. In the block diagram, select the "I/Q Stream Mapper" block.

The "System Configuration > I/Q Stream Mapper" dialog displays the current (default) distribution and mapping of the I/Q streams to the output connectors as a mapping matrix.

	Frequency Offs /Hz	Phase Offs /°	RF A	RF B	I/Q OUT 1	I/Q OUT 2	BBMM 1	BBMM 2
Stream A	0.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Stream B	0.00	0.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Combination			Single	Single	Single	Single	Single	Single

Stream A is routed to all the available output connectors: the analog RF A and I/Q OUT 1 connectors, and the digital I/Q output connectors DIG I/Q OUT ("BBMM 1").

2. To reconfigure the mapping, tap a matrix entry, for example disable the output of Stream A on the BBMM 1 interface.

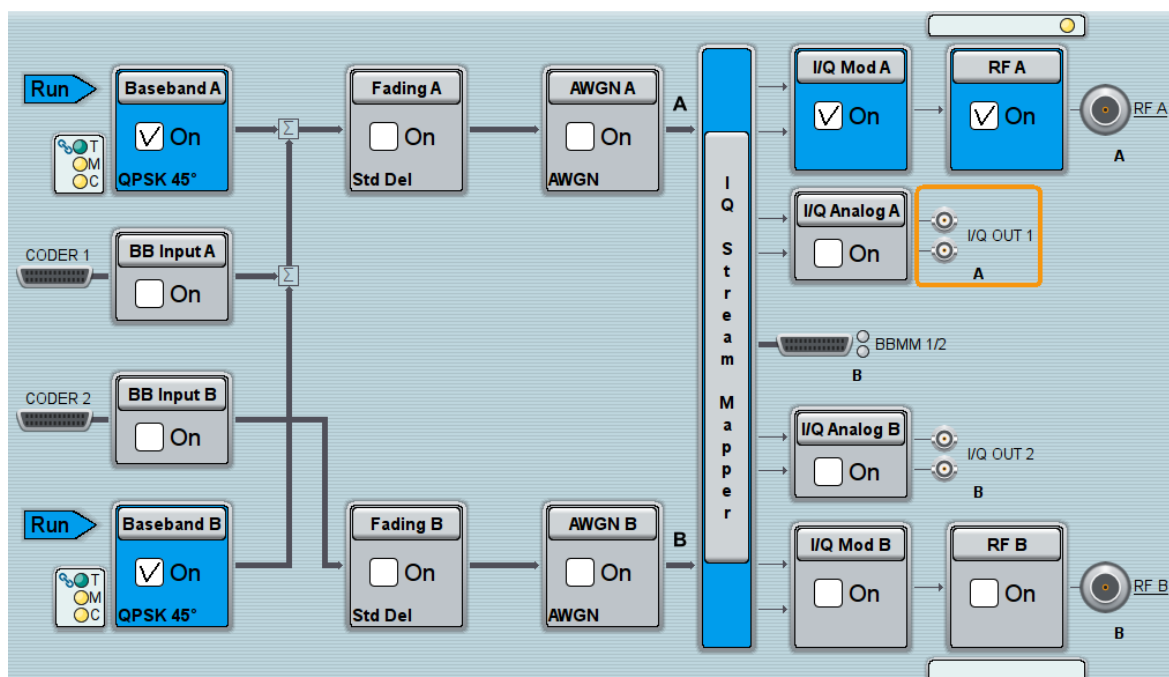
With the "I/Q Stream Mapper" you route the streams; the outputs are, however, not necessarily activated.

Tip: How to access the settings of the input and output interfaces.

In the block diagram, the blocks related to the input and output interfaces can be folded for a better overview.

If the block diagram does not show the "I/Q Analog" block, tap the corresponding connector icon, i.e. "I/Q Out 1/2", to unfold the settings.

Verifying the Generated Signal with the Graphics Display



The generated composed signal (Stream A) is output at the analog RF A connector and routed to the I/Q OUT 1 connector. The block diagram confirms this routing and displays the letter "A" next to the symbols of the output connectors.

Consider however that the I/Q OUT 1/2 connectors are disabled.



To learn more and to explore the whole range of the routing capability, refer to chapter "Signal Routing and System Configuration" in the User Manual.

4.6 Verifying the Generated Signal with the Graphics Display

It is often useful to check the spectra of the configured signals, before you enable the RF output of the instrument.

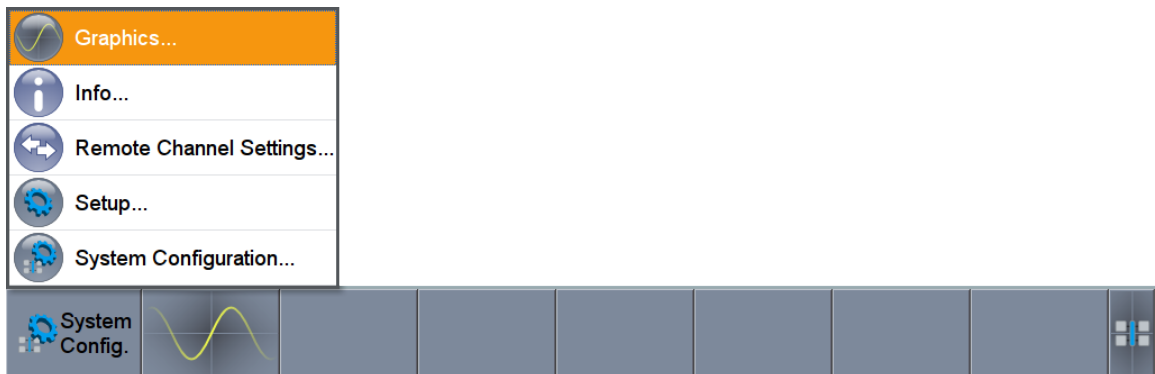
The R&S SMW provides a build-in function to represent the generated signal on a graphical signal display. We demonstrate this feature by showing the characteristics at one particular point of the signal processing chain. You can, however, display the signal characteristics at other different stages.

Verifying the Generated Signal with the Graphics Display

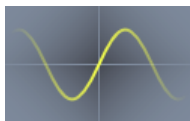
This example shows you how to use this graphical display to verify the generated signal. Use the signal generated in [Chapter 4.5, "Routing the Signal through the Instrument and Defining the Output Connectors"](#), on page 67.

To access the graphical signal display functionality

- ▶ Perform one of the following:
 - a) select "Taskbar > System Configuration > Graphics"



- b) on the "Taskbar", tap the wave icon.

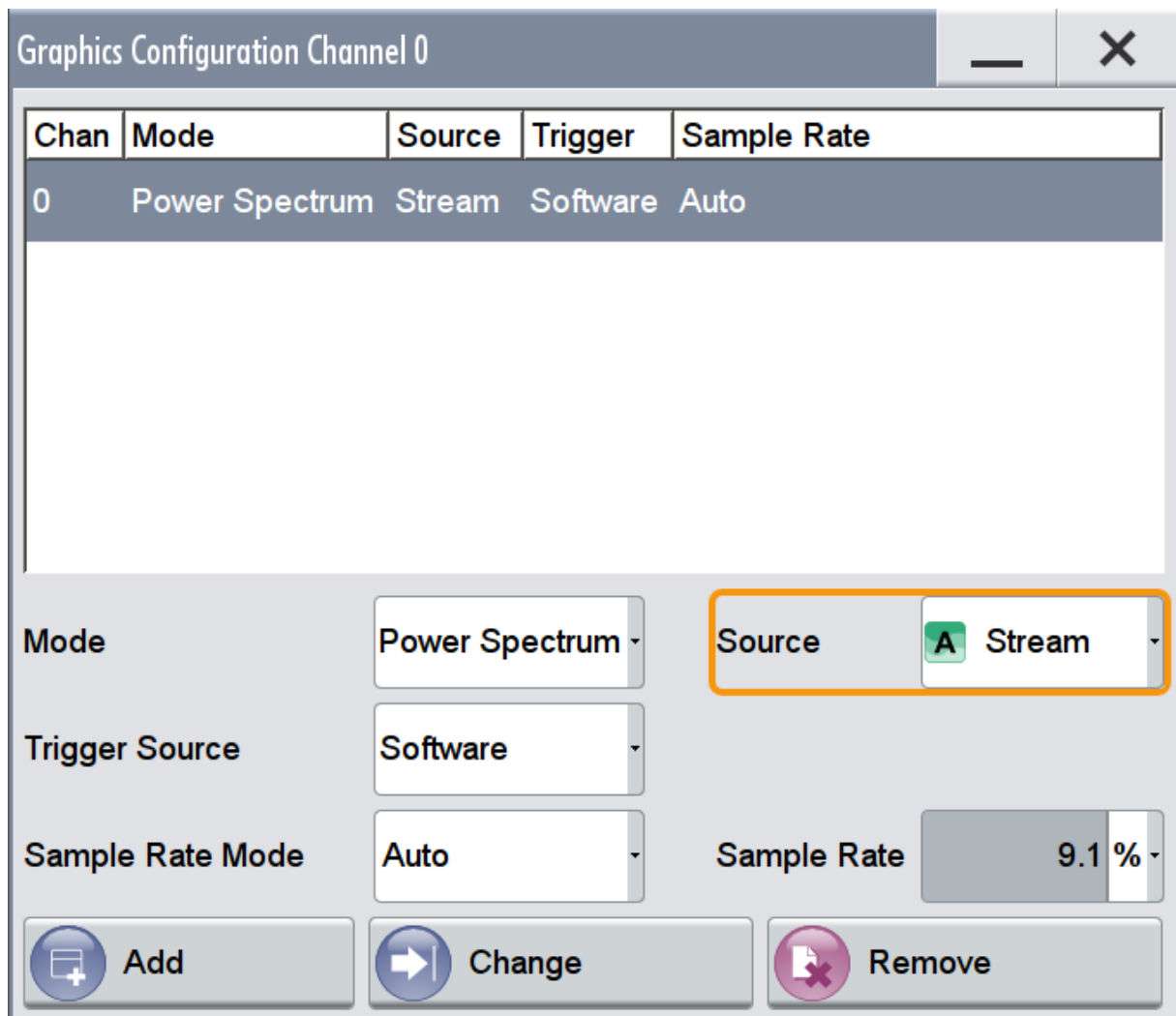


The "Graphics Configuration" dialog opens.

To visualize the sum signal

1. In the "Graphics Configuration" dialog, select "Mode > Power Spectrum".
2. Select "Source > A Stream".
3. Select "Add" to enable signal display.

Verifying the Generated Signal with the Graphics Display



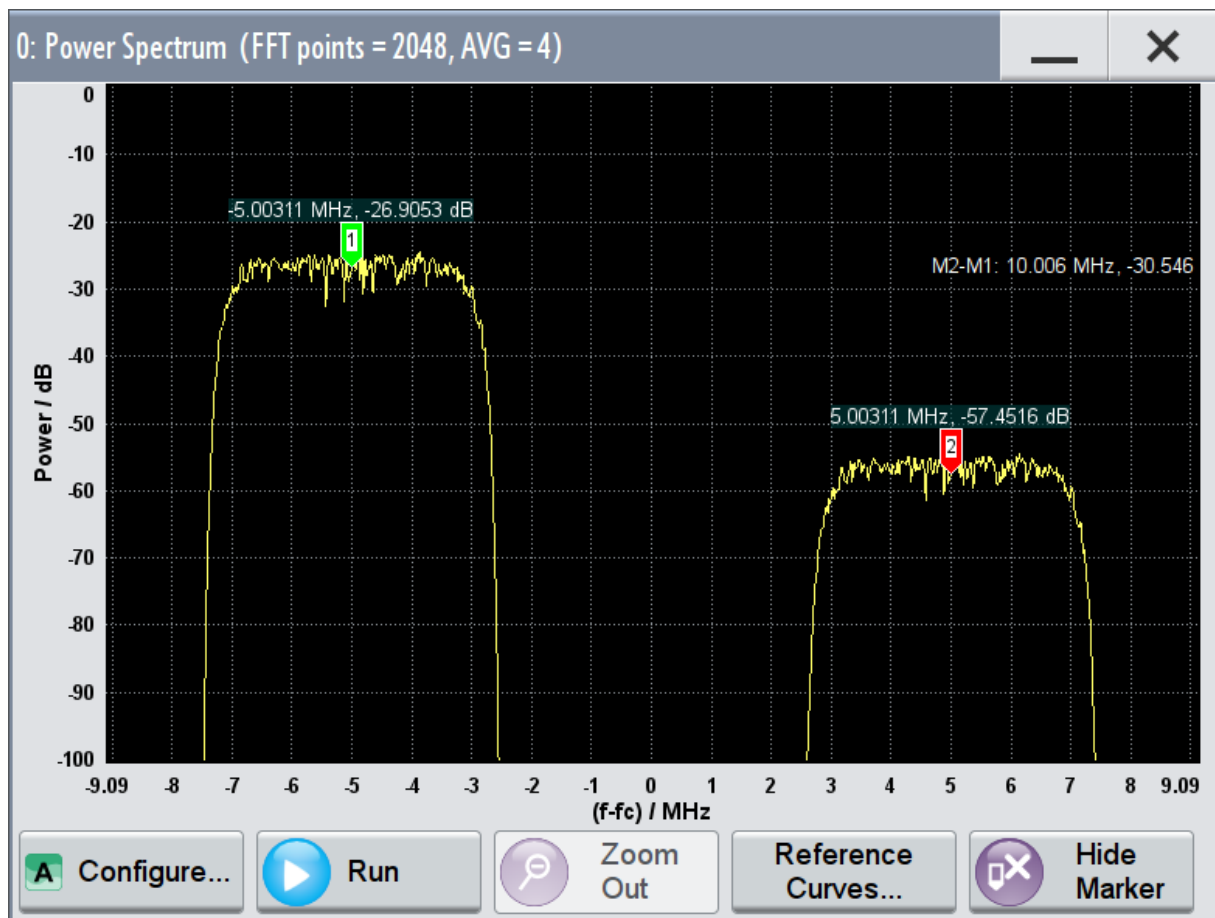
A new thumbnail (minimized view) indicating the active diagram appears in the "Taskbar".



4. Press the thumbnail graphic.

The graphic enlarges and the diagram is displayed in a normal size

Verifying the Generated Signal with the Graphics Display

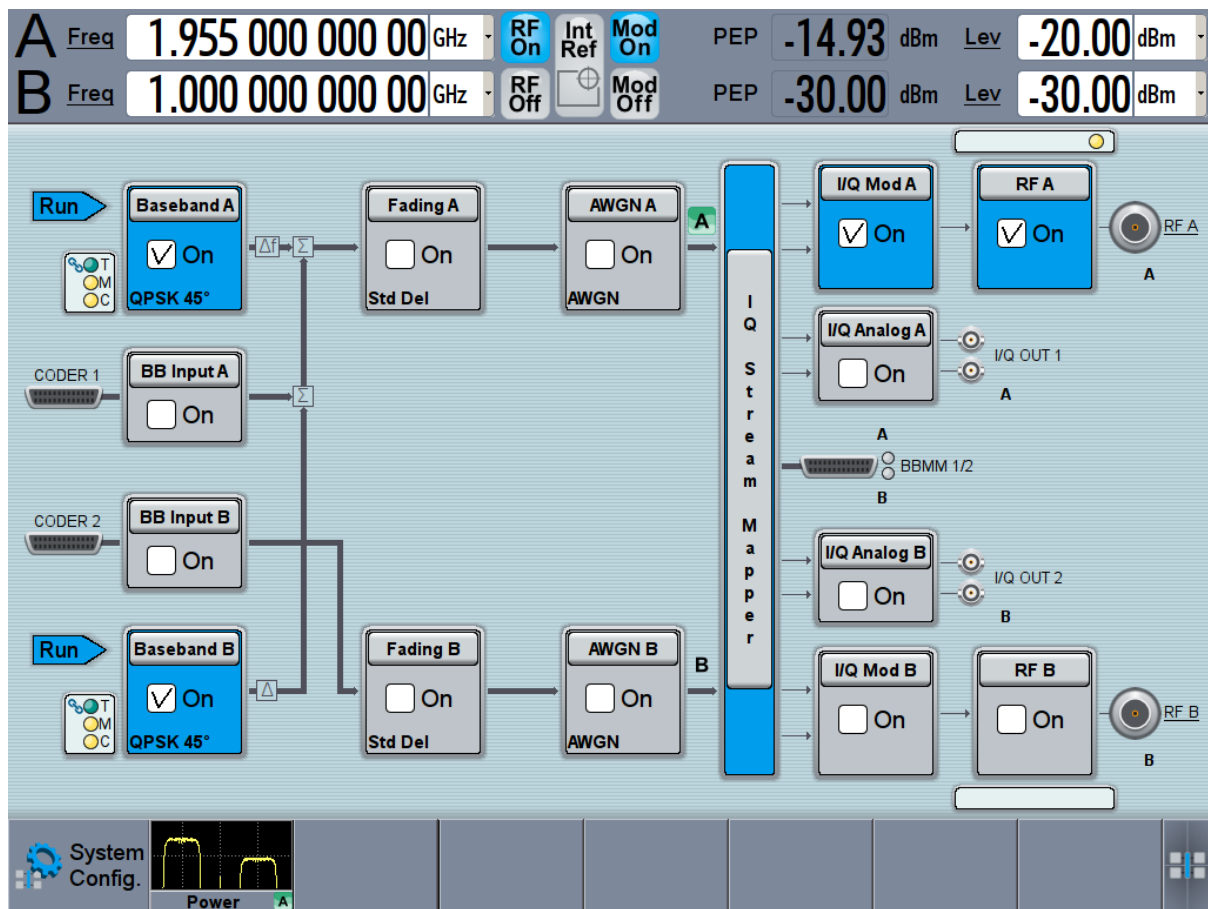


The "Power Spectrum" displays two signals, both 3GPP FDD signals are frequency shifted and the right one is also attenuated.

5. To retrieve more information, zoom in the spectrum and select "Show Marker" to measure the distance between the two signals. In principle, the zoom in function works like the two-finger pinching for magnifying images on your cell phone.
6. In the "Power Spectrum" dialog, select "Configure" to return to the "Graphics Configuration" dialog. Close the "Graphics Configuration" dialog.

This action has no effect on the configured graphics but on the dialog itself.

The block diagram displays the current signal routing. It indicates that frequency and power offsets are enabled and displays the acquisition points for the real time diagrams minimized in the "Taskbar".



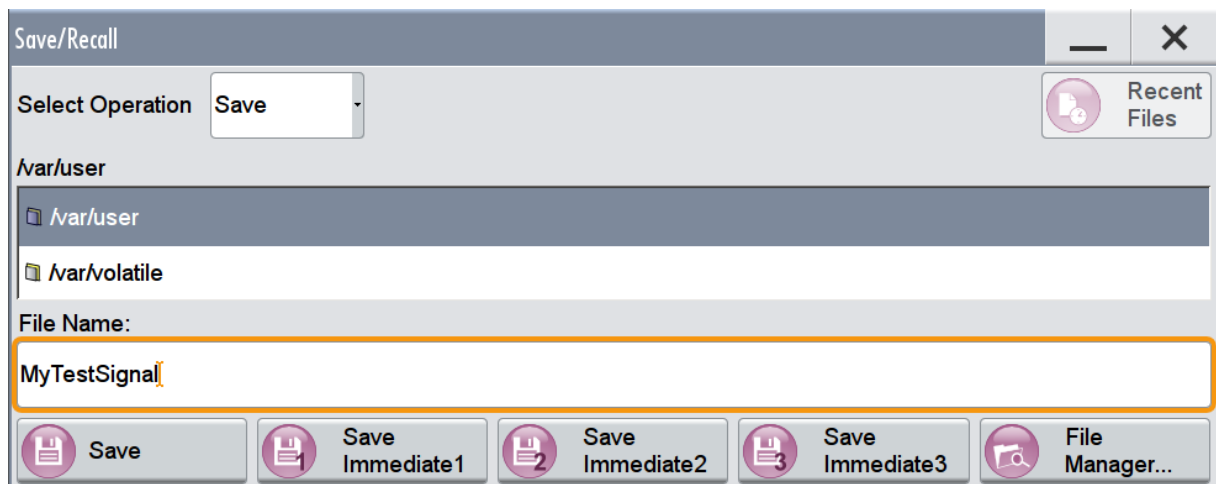
4.7 Saving and Recalling Settings

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

To save the instrument settings to a file

We assume, a test configuration as described in [Chapter 4.5, "Routing the Signal through the Instrument and Defining the Output Connectors"](#), on page 67.

1. Press the SAVE/RCL key on the front panel.
2. In the "Save/Recall" dialog box, select "Select Operation > Save".
Tap the "File Name", use the on-screen keyboard, and enter *MyTestSignal*.



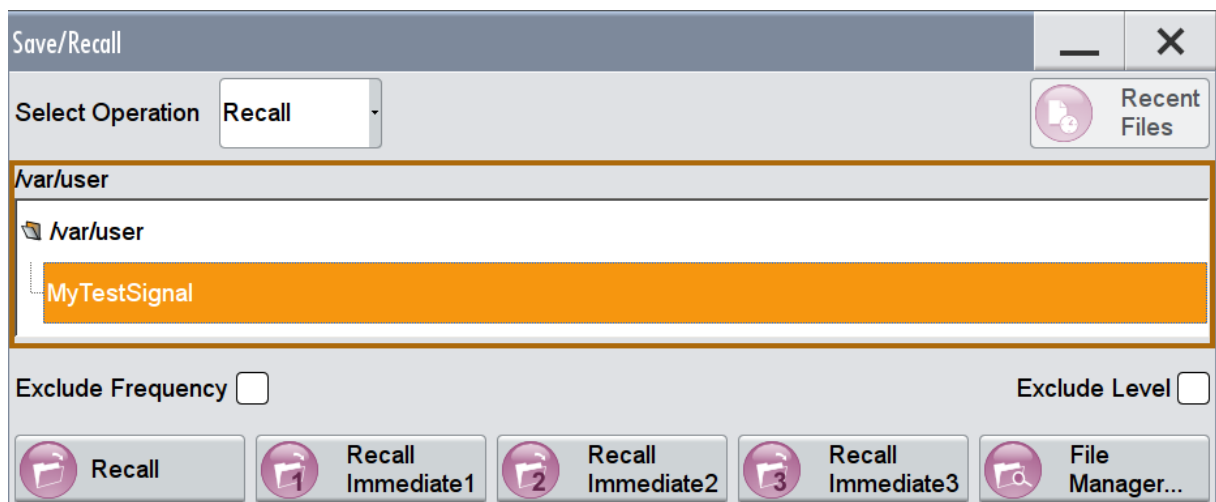
3. Tap the "Save" button.

The file `MyTestSignal.savrcl.txt` is stored in the default directory `/var/user`.

To load stored instrument settings

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

1. Press the PRESET button to restore the default instrument settings so you can check that the stored user settings are restored afterwards.
2. Press the SAVE/RCL key.
3. In the "Save/Recall" dialog, select "Recall" operation. Navigate to the directory the file is stored in and select the `MyTestSignal` file.



4. Tap the "Recall" button.

All instrument settings are restored and the display should resemble [Figure 4-8](#), which shows the instrument display right before the settings were stored.

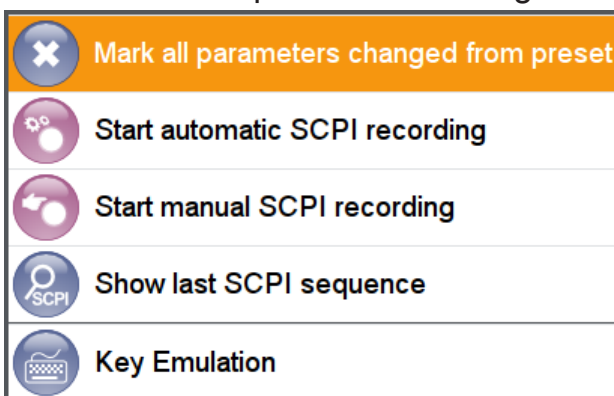


How to display all parameters with values different to their preset values

When you load a file to your instrument, you may do not have enough information on the changed settings. In such case, it is useful to visualize all parameters that have been changed from their default state.

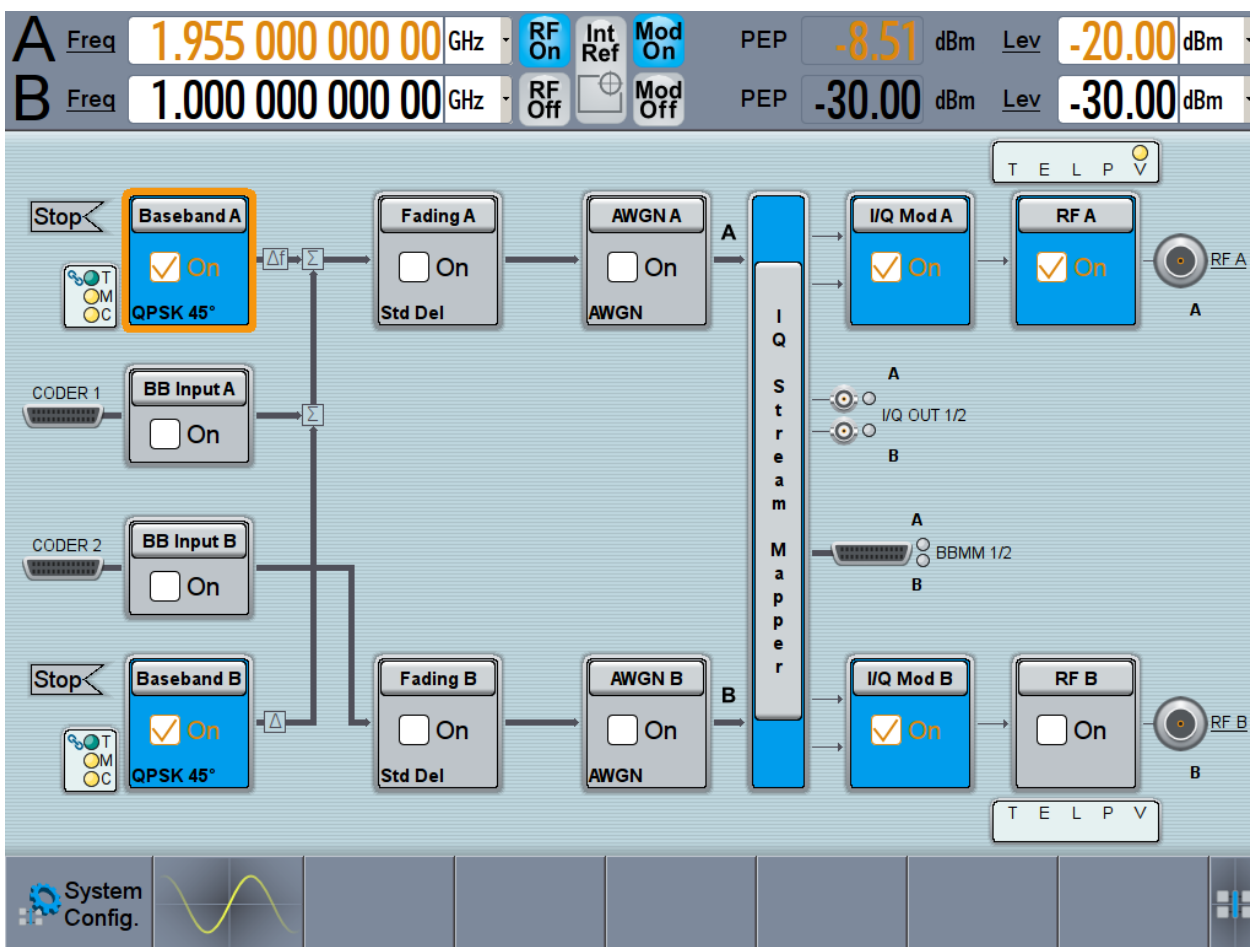
Try out the following:

- Tap and hold on an empty space in the block diagram to access the context sensitive menu.
- Select "Mark all parameters changed from preset".



- All changed parameters are highlighted.

Generating an EUTRA/LTE Signal



4.8 Generating an EUTRA/LTE Signal

The main application field of the R&S SMW is the generation of digital signals in accordance with several telecommunication and wireless standards, like WCDMA, EUTRA/LTE or WLAN, to name a few. This example uses the digital standard EUTRA/LTE to introduce the way you can access and interact with the instrument and experience the advantages provided by the additional options.

The minimum requirement for R&S SMW in this example is a base unit equipped with the additional option R&S SMW-K55 Digital Standard EUTRA/LTE.

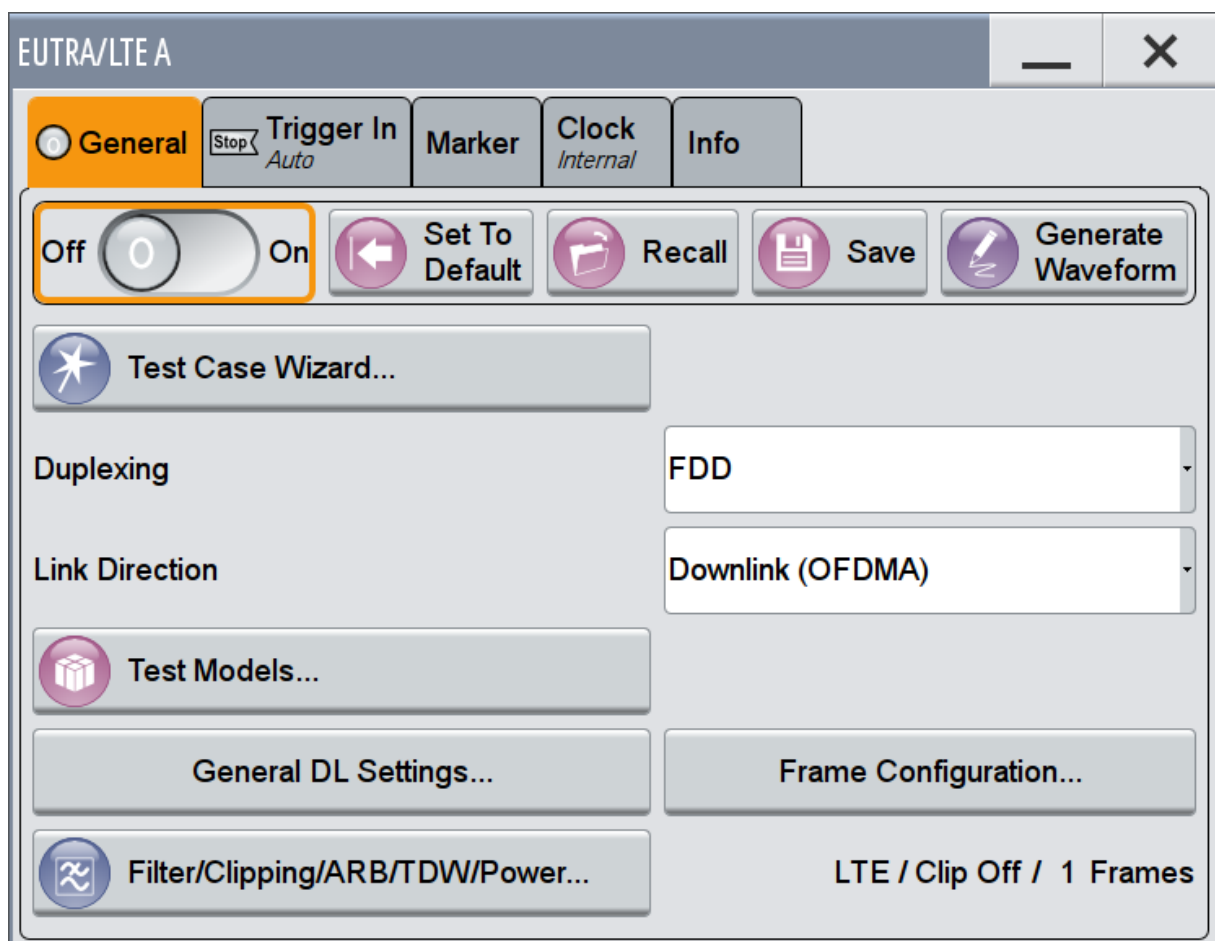
To generate a downlink test signal

The main focus of the following example is not on the R&S SMW capabilities and the features provided by the firmware option. The example aims rather to help you get familiar with the settings and configuration principle common for the digital standards.

We use one of the provided EUTRA Test Models (E-TM) to show how to generate a test signal upon a quick selection.

1. On the R&S SMW front panel, press the PRESET key to start out in a defined instrument configuration.
2. In the block diagram, select "Baseband > Beyond 3G Standards > EUTRA/LTE".

The EUTRA/LTE dialog appears and displays the general settings provided for the digital standard.



As in the user interfaces of all digital standards, the "EUTRA/LTE" dialog is divided into several tabs. The "General" tab comprises the primary settings of the standard, the functions for storing and recalling settings and provides access to further functions and dialogs, like the "Filter" settings. The "Trigger In", "Marker" and "Clock" tabs comprise the settings related to the corresponding function.

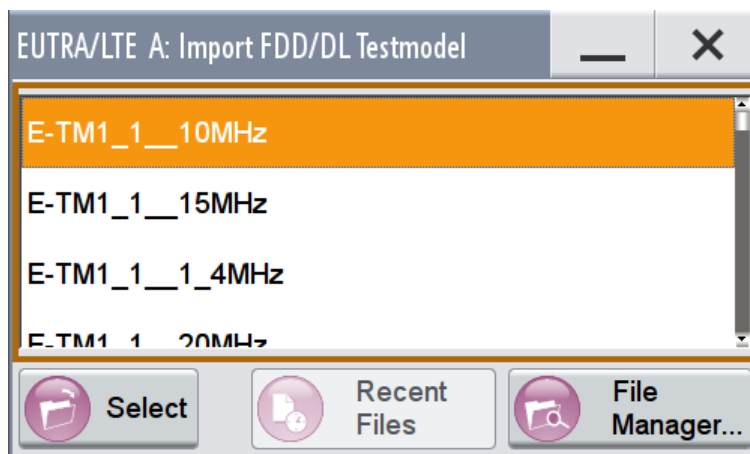
The more complex the digital standard itself is, the more comprehensive the further dialog and tab structure. The start dialog of each digital standard, however, follows a repeating dialog structure that comprises the tabs "General", "Trigger In", "Marker" and "Clock". (See also [Chapter 6.2.4, "Additional Display Characteristics"](#), on page 108).

Tip: To display the dialog in its maximal height, press the RESIZE WINDOW key on the front panel.

3. In the "EUTRA/LTE General" tab, select "Test Models".

The Test Models is a function for quick selection and settings adjustment according to one of the various EUTRA Test Models (E-TM).

A standard "File Select" function enables you to select from files with predefined settings.

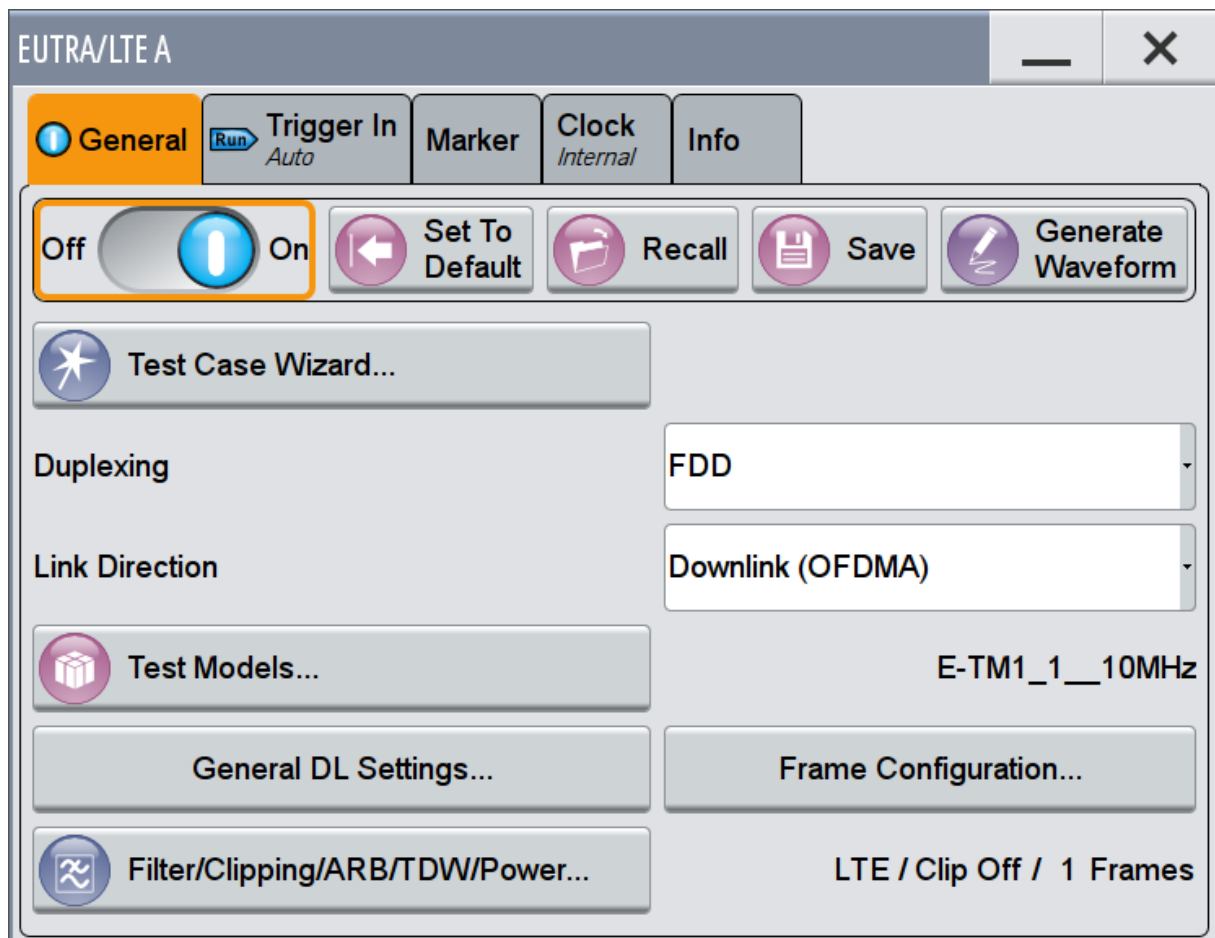


Tip: On the front panel, press the HELP key to retrieve detailed information on the current settings and on the contents of the predefined files.

4. Navigate to a file, for example to the E-TM1_1__10MHz (an E-TM1.1 test model with 10 MHz channel bandwidth) and confirm with "Select".

The dialog closes automatically and the user interface confirms the name of the selected file.

5. In the "EUTRA/LTE > General" tab, select "State > On".

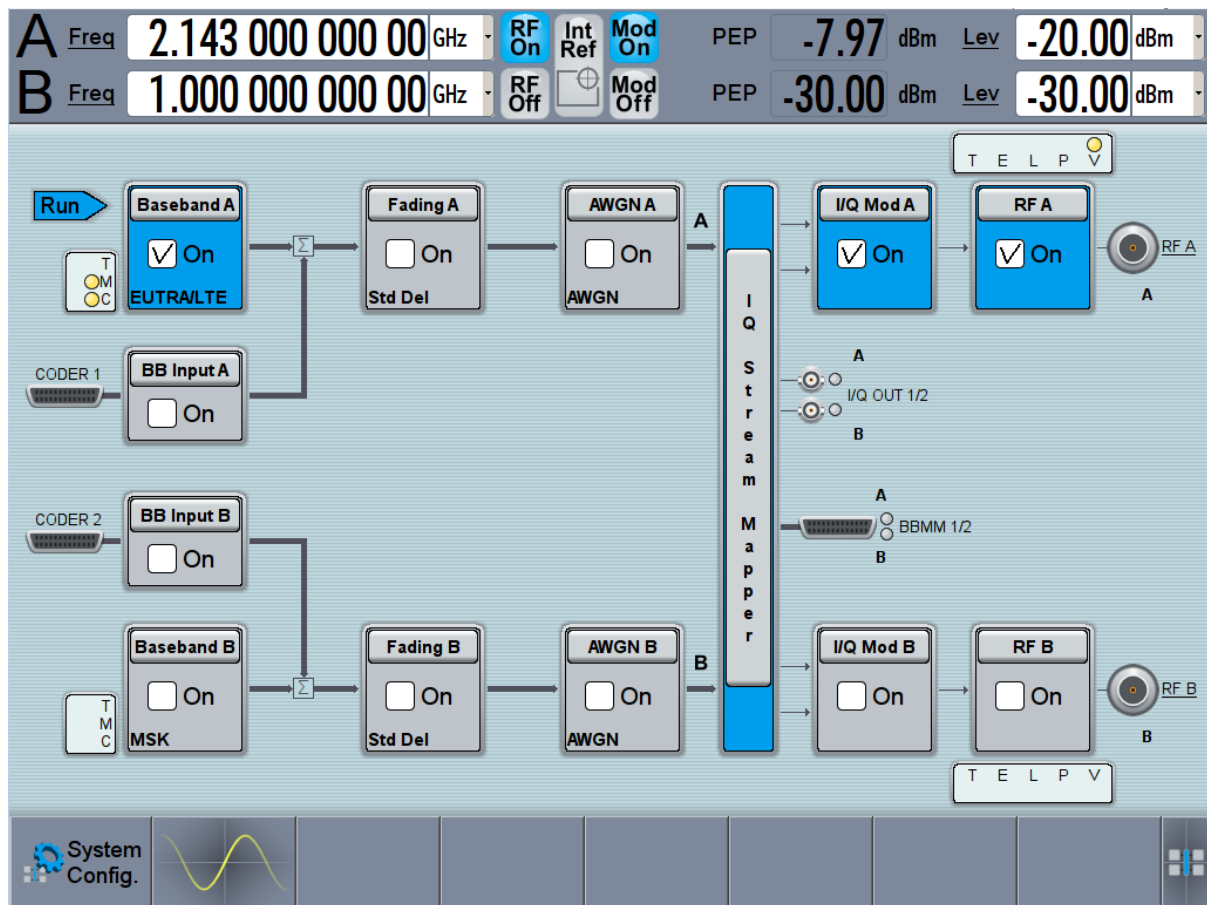


Close the dialog.

- On the "Status Bar", tap the "Freq" and "Lev" fields and enter new values, for example 2.1432 GHz and -20 dBm .

Using the System Configuration Capabilities for MIMO Setups

Select "RF A > On".



The instrument generates an EUTRA/LTE test signal with the selected channel bandwidth, frequency, and level.



With these first steps, you have gained an impression of the provided functionality.

For a comprehensive description of the full range of capabilities, refer to the user manual "EUTRA/LTE Digital Standard for R&S SMW200A".

4.9 Using the System Configuration Capabilities for MIMO Setups

The R&S SMW supports versatile MIMO configurations and provides comfortable functions to simplify the definition and signal routing for MIMO test setups and configuration involving several instruments. For complex routing scenarios, the

Using the System Configuration Capabilities for MIMO Setups

"System Configuration" functionality is the start and central configuration point. Within one dialog, you can configure complex configurations with up to 8 Tx or Rx antennas or up to two stand-alone 2x2 MIMO systems, e.g. 8x2 MIMO or LTE-A Carrier Aggregation with 2x2 MIMO.

This example does not cover the whole range of the "System Configuration" capabilities but delivers an insight into the topic. The example shows how to use coupled baseband sources and select a suitable fading and baseband configuration to generate an EUTRA/LTE signal in 2x2 MIMO configuration.



To learn more and to explore the whole range of capability provided by the "System Configuration" function, in particular how to connect and configure external devices, refer to chapter "Signal Routing and System Configuration" in the R&S SMW user manual.

The instrument in this example is a R&S SMW equipped with two signal paths: two baseband options R&S SMW-B10, two options Fading Simulator R&S SMW-B14, option Fading MIMO R&S SMW-K74, one R&S SMW-B13T, frequency options R&S SMW-B10x/-B20x and two options R&S SMW-K55 Digital Standard EUTRA/LTE.

To access the "System Configuration" function

1. Perform one of the following:
 - a) On the "Taskbar", select "System Config > System Configuration"



Using the System Configuration Capabilities for MIMO Setups

b) In the block diagram, select "Fading > MIMO > System Configuration"

Fading	
Fading Settings...	
Signal Routing (non-MIMO)	
<input checked="" type="checkbox"/> A → A	B → B
<input type="checkbox"/> A → A	B → A
<input type="checkbox"/> A → B	B → B
<input type="checkbox"/> A → A and B	B → (open)
<input type="checkbox"/> A → (open)	B → A and B
<input type="checkbox"/> A → A and B	B → A and B
Signal Routing (MIMO)	
System Configuration...	
Summation Ratio A / B	
0.0 dB	

c) In the block diagram, select "I/Q Stream Mapper" and select the "Fading/Baseband Configuration" tab.

The "System Configuration > Fading/Baseband Configuration" dialog displays the current signal routing. The instrument works in the default "Standard" mode.

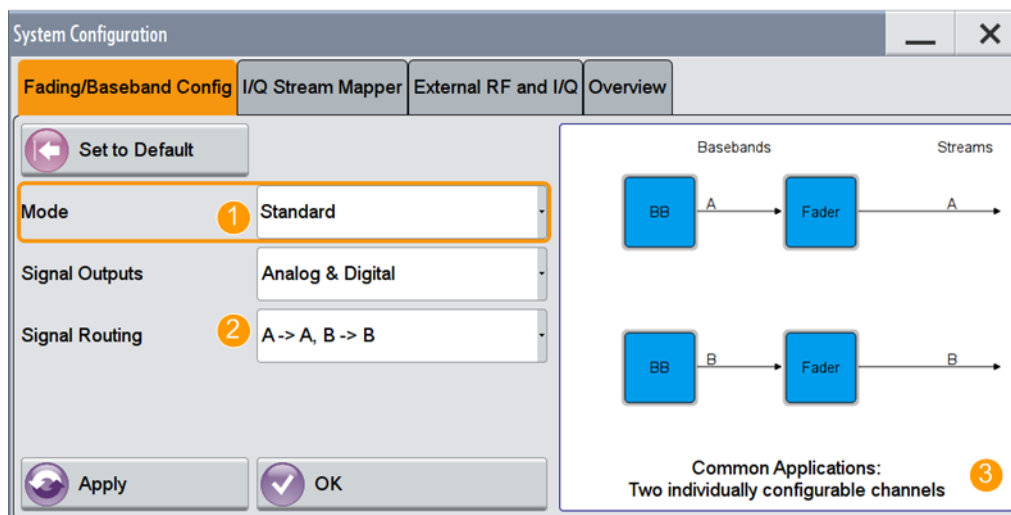


Figure 4-9: System Configuration in the default "Standard Mode"

- 1 = standard or advanced mode; the last is required for configuration of complex LxMxN MIMO scenarios
- 2 = current signal routing
- 3 = simplified preview diagram with a description of the common application for the particular configuration

Using the System Configuration Capabilities for MIMO Setups

- Open "System Configuration > I/Q Stream Mapper" to obtain an overview of the current distribution and mapping of the I/Q streams to the output connectors, see also "To map the I/Q stream and define the output connector" on page 71.
- Open "System Configuration > External RF and I/Q Instruments" to gain information on the current setup.

The tab comprises the additional settings provided to simplify the configuration of connected instruments, like configuring the connectors, establishing a connection to the instruments, or controlling these instruments.

In this test setup no further instruments are connected.

To enable a 2x2 MIMO configuration (1x2x2 Fading and Baseband Configuration)

- In the "System Configuration > Fading/Baseband Configuration" dialog, select "Mode > Advanced" and enable the following settings:
 - "Entities (Users, Cells) > 1", "Basebands (Tx Antennas) > 2", "Streams (Rx Antennas) > 2"
 - Select "BB Source Config > Coupled Sources"
 - Observe the signal routing displayed on the preview diagram. Does it match with the expected signal routing?
 - Select "Apply" to confirm the configuration.

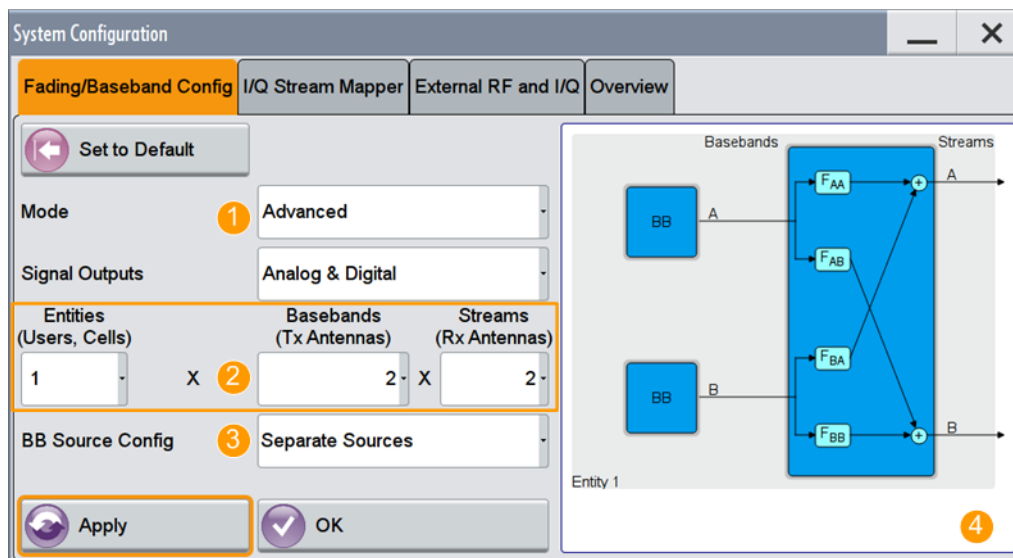


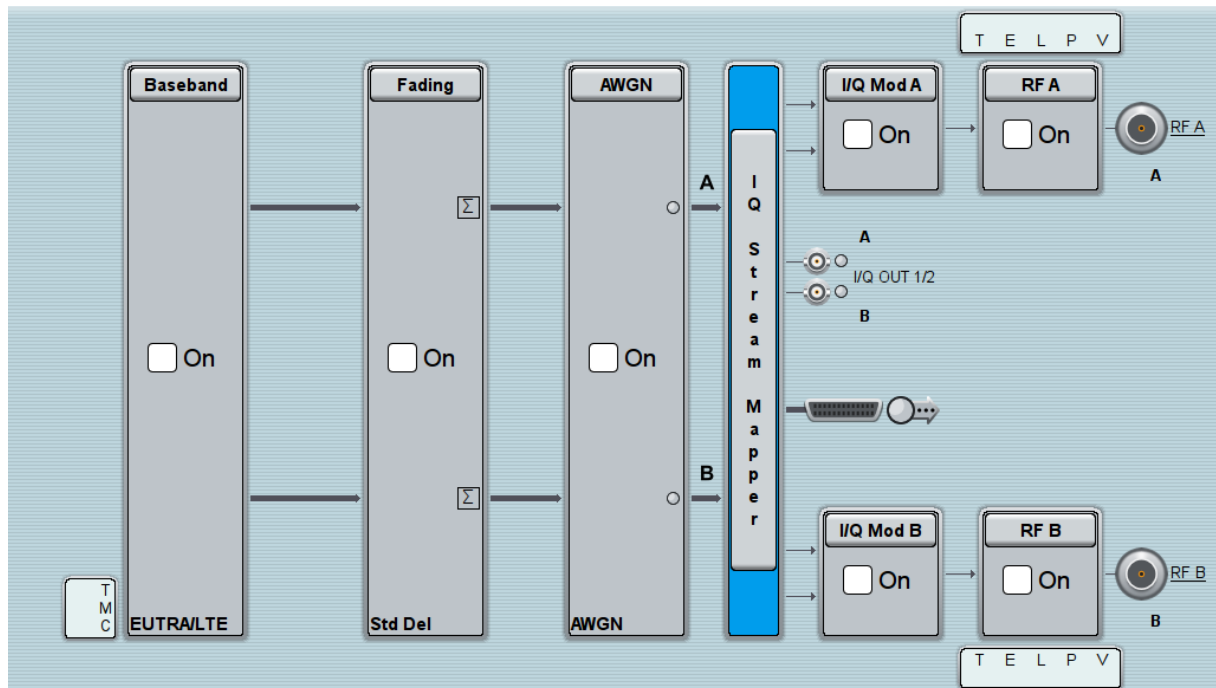
Figure 4-10: System Configuration in the "Advanced Mode" (1x2x2 configuration)

Using the System Configuration Capabilities for MIMO Setups

- 1 = advanced mode, required for configuration of complex LxMxN MIMO scenarios
- 2 = current signal routing; 2x2 MIMO configuration
- 3 = separated and coupled baseband sources
- 4 = simplified preview diagram of the particular configuration

2. Leave all further settings, i.e. the "I/Q Stream Mapper" settings, at their default values and close the "System Configuration" dialog.

The block diagram displays the selected configuration.



To generate an EUTRA/LTE signal in the 2x2 MIMO scenario

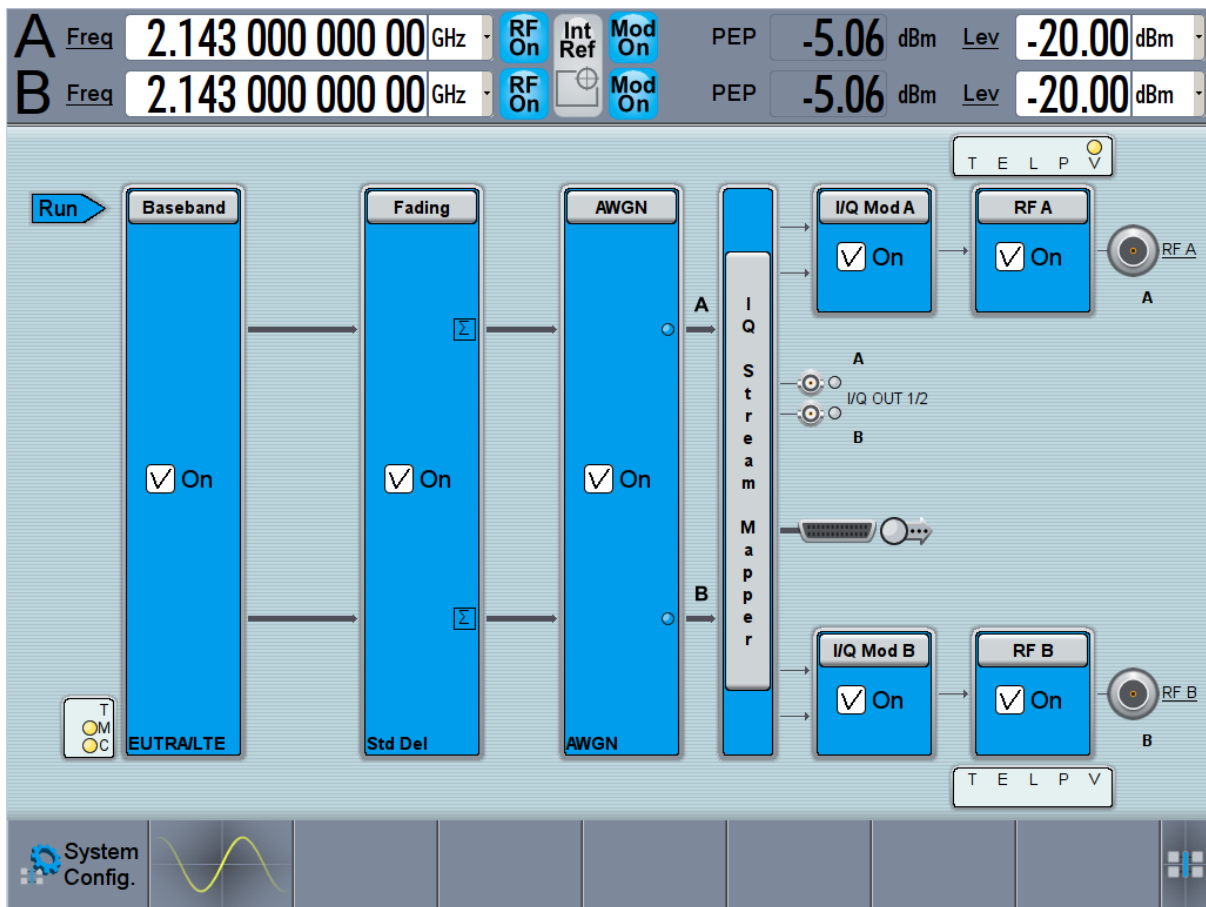
1. In the block diagram, select "Baseband > EUTRA/LTE", select "State > On", and close the dialog.

In coupled baseband source mode, the R&S SMW takes over the baseband signal configuration. The instrument adjusts the settings in the basebands automatically, for example the mapping of the transmitting antennas to the basebands.

2. In the block diagram, select "Fading > On".
The default "Standard Delay" fading profile is applied.
3. On the "Status Bar", set the same frequency and level settings for both paths:
 - a) "A Freq = B Freq = 2.1432 GHz"
 - b) "Lev (A) = Lev (B) = -20 dBm"

Using the System Configuration Capabilities for MIMO Setups

4. In the block diagram, select "RF A > On" and "RF B > On".



The R&S SMW generates a realistic EUTRA/LTE downlink signal with 10 MHz channel bandwidth, though without any scheduled data.



To enable the generation of scheduled data, further configurations are required; these configurations are, however, outside the scope of this description.

For further information, refer to the user manual "EUTRA/LTE Digital Standard for R&S SMW200A".

5 System Overview

This section helps you to get familiar with the R&S SMW. It provides an introduction to the general concept of the instrument with a sample of the possible application fields as well as a description of the main blocks in the signal generation flow.

For information on how to access functions and interact with the R&S SMW, refer to [Chapter 6, "Instrument Control"](#), on page 103.

5.1 Brief Introduction to the Instrument's Concept

The R&S SMW combines up to two independent signal generators in one instrument and offers unrivaled RF and baseband characteristics. Due to its *modular design*, the instrument can be optimally adapted to the requirements of different applications. Both RF paths can be equipped with one of the available frequency options with different upper frequency limit. The baseband section of the R&S SMW is fully digital. It contains the hardware for generating and processing I/Q signals in realtime or generating signals with an arbitrary waveform generator.

5.1.1 Possible Ways to Operate the Instrument

There are three ways to operate the R&S SMW:

- **Manual operation:**
Use the touchscreen, hard keys and rotary knobs, or an optional mouse and/or keyboard. The principles of manual operation are explained in [Chapter 6, "Instrument Control"](#), on page 103.
- **Remote control:**
Create programs to automatize repeating settings, tests and measurements. The instrument is connected to a computer running the program. This way of operation is described in the User Manual, chapter "Network and Remote Control Operation".
- **Remote operation from a computer:**
Remote monitoring and control of the instrument from a connected computer is based on the common cross-platform technology VNC (Virtual Network Computing). On the remote computer, any standard web browser (supporting

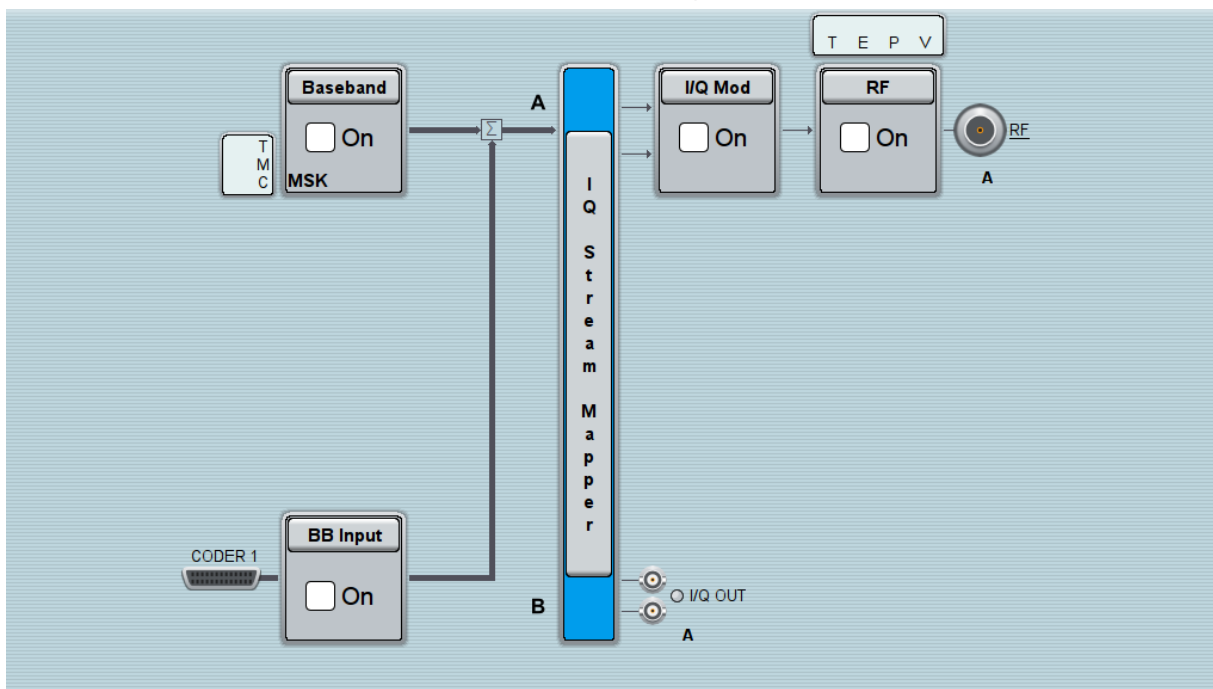
Java) or a dedicated VNC client (like Ultr@VNC) can be used. See also [Chapter 6.7, "Remote Operation over VNC"](#), on page 120.

5.1.2 The Signal Flow at a Glance

The R&S SMW is equipped with a large touchscreen, that displays a block diagram. The block diagram represents the signal flow and the general stages the signal generation goes through. Depending on the options the R&S SMW is equipped with, the appearance of the block diagram changes.

The following examples do not cover all possible cases but aim to introduce the way the block diagram depicts the installed options.

- An example of a base unit, equipped with one signal path (R&S SMW-B10, R&S SMW-B13, and R&S SMW-B103/-B106)



- Two examples of a fully equipped instrument, one in the default instrument state and a second one in an advanced configuration with more abstract representation.
 - In this "classic" representation, the block diagram displays all blocks for that the required hardware and software options are fitted. The block diagram shows the signal flow as it is.

Brief Introduction to the Instrument's Concept

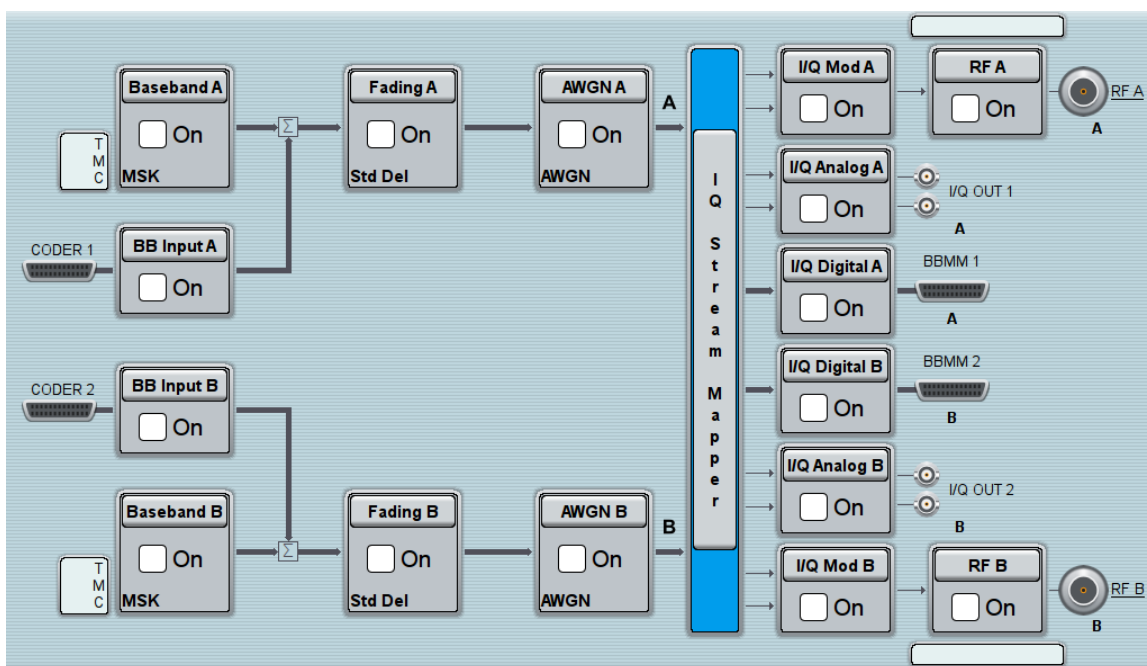


Figure 5-1: Block diagram of a fully equipped two path instrument (default)

- The block diagram depicting a 4x4 MIMO scenario with coupled baseband sources is a more abstract representation. Each stage of the signal generation is still represented by a functional block but the signal routing is displayed in a conceptual manner.

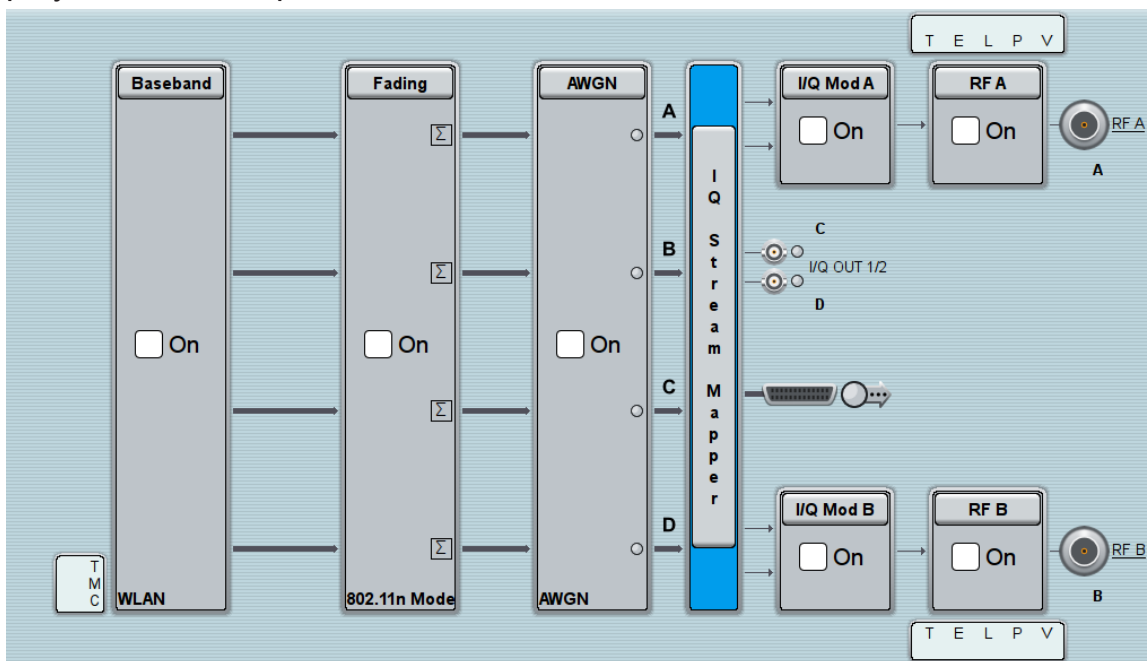


Figure 5-2: Block diagram of a fully equipped two path instrument (4x4 MIMO configuration)

For more examples, see also [Chapter 5.2, "Applications Examples of the R&S SMW"](#), on page 96.

The cross-reference between the installed options and the displayed settings



Throughout this description, a fully equipped instrument is assumed (see [Figure 5-1](#)).

For detailed information on available options, refer to the R&S SMW data sheet and the R&S SMW configuration guide.

Up-to-date information is available at the R&S SMW homepage on the internet <http://www.rohde-schwarz.com/product/smw200a.html>.

The [Table 5-1](#) is an excerpt of the available options and lists only the options required *to display* a functional block in the block diagram.

For exact information on the available options, and on the minimum requirements and the interdependencies between the provided options, refer to the R&S SMW data sheet.

Table 5-1: Required options per functional block (excerpt)

Functional block	Required option
"Baseband A"	R&S SMW-B10
"Baseband B"	Second option R&S SMW-B10
"BB Input A"	Included in R&S SMW-B10
"BB Input B"	Included in second option R&S SMW-B10
"Fading A"	R&S SMW-B14
"Fading B"	Second option R&S SMW-B14
"AWGN A"/"AWGN B"	At least one option R&S SMW-K62
"I/Q Stream Mapper"	-
"I/Q Mod A"	R&S SMW-B103/-B106
"I/Q Mod B"	R&S SMW-B203/-B206
"I/Q Analog A"	R&S SMW-B13
"I/Q Analog B"	R&S SMW-B13T
"I/Q Digital A"	R&S SMW-K18
"I/Q Digital B"	Second option R&S SMW-K18

Functional block	Required option
"RF A"	R&S SMW-B103/-B106
"RF B"	R&S SMW-B203/-B206

5.1.3 Internal Baseband Source ("Baseband" Blocks)

The "Baseband" block represents the source of the baseband signals (basebands).

This functional block is the access point to:

- *The internal baseband generator*
The baseband generator contains modules for real time signal generation (Custom Digital Modulation) and an arbitrary waveform generator (ARB). One or two baseband generators can be fitted in an R&S SMW and operated separately.
- *The available digital standards*
Generation of digital signals in accordance with the supported standards requires additional software options. For example, option R&S SMW-K55 generates signals according to the EUTRA/LTE standard, option R&S SMW-K42 signals to 3GPP FDD standard.
- *The signal routing (in the standard "classic" mode)*
Signals from the baseband generators can be routed between the available paths, and added (possibly with frequency, phase and power offsets).

5.1.4 Digital Baseband Input and Output ("BB Input" and "I/Q Digital" Blocks)

The "BB Input" and the "I/Q Digital" blocks are the access point to the settings of the digital interfaces.

The R&S SMW is - depending on SW and HW options - able to receive digital baseband signals and to output digital baseband signals. A fully equipped instrument provides eight configurable digital interfaces. Depending on the configuration, the available digital interfaces may be used as up to six inputs or up to six outputs.

The digital baseband inputs and outputs can be used together with other Rohde&Schwarz instruments, like signal generators, signal analyzers, the digital interface module R&S®EX-IQ-BOX, or the R&S®CMW500 Radio Communication

Tester. A Rohde&Schwarz signal generator for instance may serve as digital signal source in test configuration requiring more than two baseband sources. A test setup with the R&S®CMW500 Radio Communication Tester is suitable for testing under fading conditions.

The "BB Input" block is the access point to the settings of:

- *The external digital I/Q signals*
The external digital I/Q signals are further processed in the baseband section (e.g. fading, addition of noise)
- *The signal routing (in the standard "classic" mode)*
The external and internal baseband signals can be routed and added (possibly with frequency, phase and power offsets).

The "I/Q Digital" block is the access point to the settings of:

- The digital I/Q output signals
- The digital I/Q impairments

5.1.5 Fading Simulator ("Fading" Blocks)

The "Fading" block is displayed only in instruments equipped with the option R&S SMW-B14, Fading Simulator. This block controls the fading module and, in standard mode, the signal routing at the output of this module.

The fading simulator functionality enables you to simulate real time fading effects on the baseband signal. Provided the instrument is equipped with the required options, up to 20 dynamic fading paths in a SISO mode (Single Input Single Output, i.e. non-MIMO mode) and up to 20 paths per MIMO channel in MIMO mode can be created simultaneously.

The fading extension options provide even more functionality, for example:

- Second option R&S SMW-B14 permits also real two-channel fading irrespective of the RF carrier spacing of the two channels
- The option R&S SMW-K71 comprises the 3GPP dynamic fading configurations moving propagation and birth-death propagation, and the fine delay fading configurations offering enhanced delay resolution
- The option R&S SMW-K72 extends the statistic functions and is required for additional fading profiles and some of the predefined test scenarios
- The option R&S SMW-K74 enables the simulation of MIMO scenarios with up to 8 transmitting or 8 receiving antennas.

5.1.6 Additional White Gaussian Noise ("AWGN" Blocks)

The "AWGN" block is displayed only in instruments equipped with at least one option R&S SMW-K62. This block controls the additional white Gaussian noise generator (AWGN). An additive white noise is required for measurements of mobile radio base stations.

5.1.7 "I/Q Stream Mapper" Block

As one of the access points to the system configuration settings, the "I/Q Stream Mapper" provides direct access for configuring the distribution and mapping of the generated I/Q streams to the available output connectors, to the analog RF and I/Q output and to the digital I/Q output connectors.

5.1.8 I/Q Modulator ("I/Q Mod" Blocks)

The "I/Q Mod" blocks represent the I/Q modulators.

These functional blocks are the access point to:

- The I/Q modulation of the internal baseband signal
- The I/Q modulation of an external analog wideband signal (single ended or differential)
- The analog I/Q impairments

5.1.9 Analog I/Q Output ("I/Q Analog" Blocks)

The "I/Q Output" block represents the analog I/Q output connectors.

This block is the access point to the settings of:

- The analog I/Q output signals
The generated signal can be output as single ended or differential analog signal.
- The analog I/Q impairments

5.1.10 RF and Analog Modulations ("RF" Blocks)

The "RF" block represents the RF settings of the instrument.

This block is the access point to:

- RF frequency and level settings, as well as the reference frequency, local oscillator, user correction, etc.
- The analog modulations
- The list and sweep modes

5.2 Applications Examples of the R&S SMW

Due to its modular design, the R&S SMW can be optimally adapted to the requirements of different applications:

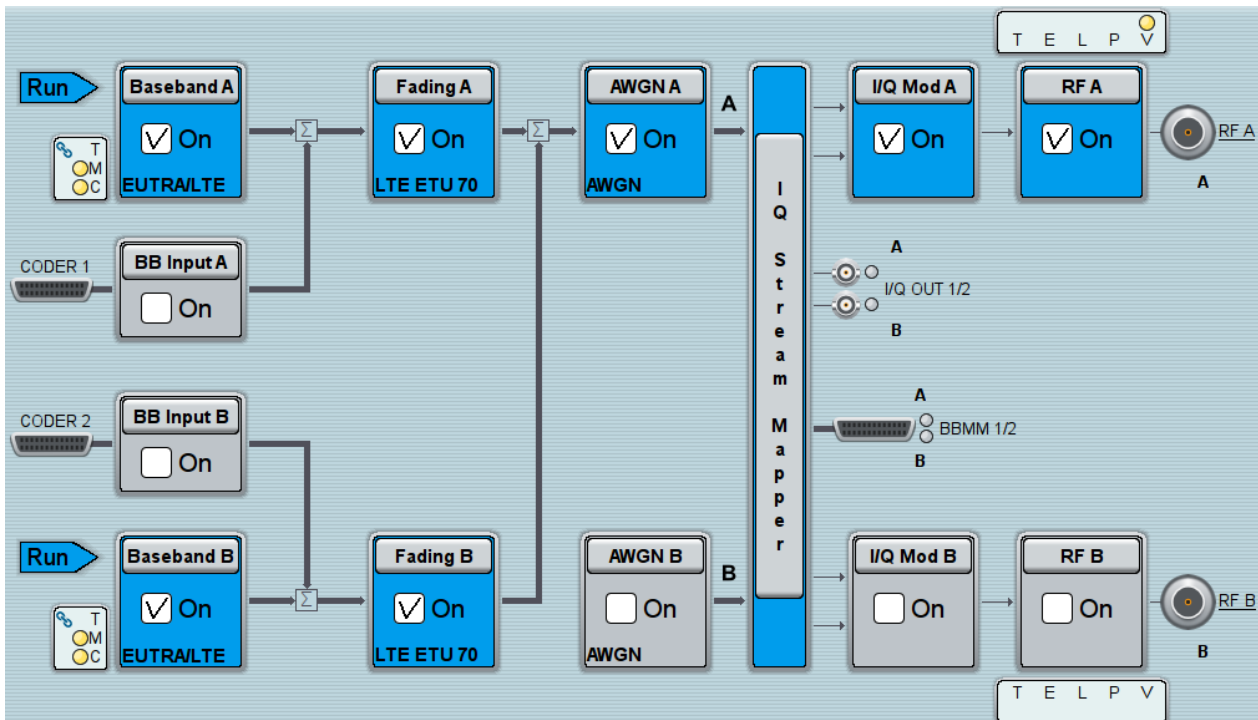
- Generation of digitally modulated signal
The main field of application of the R&S SMW is the generation of digitally modulated signals. The R&S SMW generates a digitally modulated signal in several ways: using the internal baseband generator, using the externally applied digital baseband signals or in an analog wideband I/Q operation.
- Generation of test signals for diversity tests and MIMO scenarios
The R&S SMW enables you to generate test signals in versatile MIMO configuration for which several signal generators were previously required.
- Generation of a wanted signal and an interfering signal for receiver tests
- Addition of real time signals of different standards, for example EUTRA/LTE and 3GPP FDD
- Generation of signals with up to 160 MHz signal bandwidth, for example for WLAN IEEE 802.11ac signals
- Generation of fading scenarios, e.g for test setups involving R&S SMW and R&S®CMW

A few examples are given in the following:

- [Tx Diversity Test \(MISO scenario\)](#)..... 97
- [Rx Diversity Test \(SIMO scenario\)](#)..... 98
- [Generation of Signals for Testing of WCDMA Handover \(Two Cells\)](#)..... 99
- [Generation of an EUTRA/LTE 8x2 MIMO Signal for UE Tests](#)..... 100
- [Generation of an LTE Test Signal with Carrier Aggregation and 2x2 MIMO each Component Carrier](#)..... 101
- [Generation of a WLAN 802.11ac signal with 160 MHz](#)..... 102

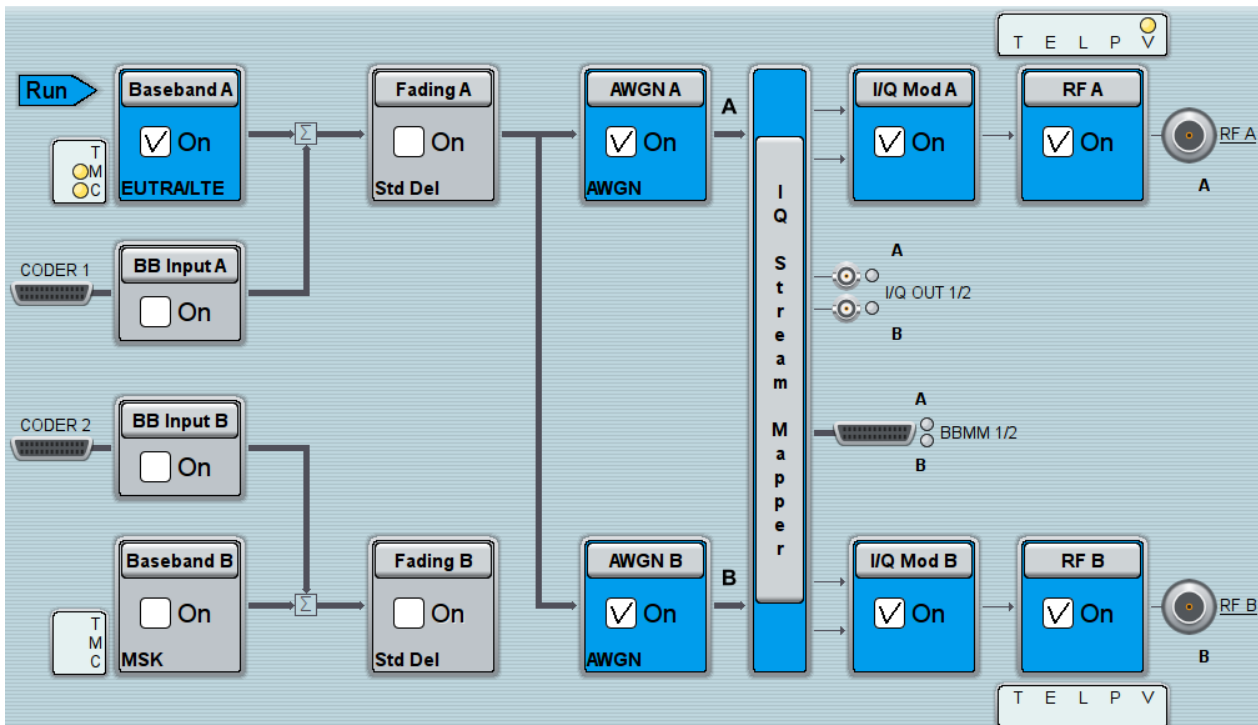
5.2.1 Tx Diversity Test (MISO scenario)

The block diagram in this example depicts the generation of a test signal using both internal baseband generators and 1 RF output (RF A).



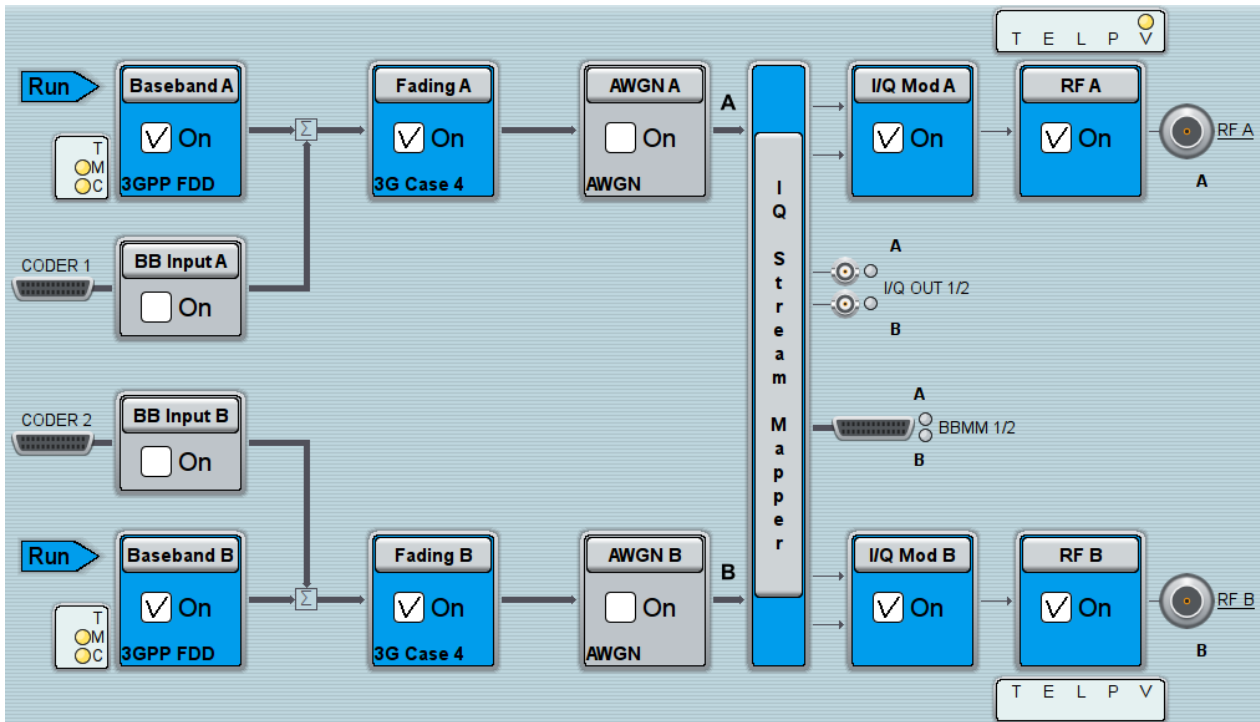
5.2.2 Rx Diversity Test (SIMO scenario)

The block diagram in this example depicts the generation of a test signal using one internal baseband generator (Baseband A) and distributing the signal to both RF outputs.



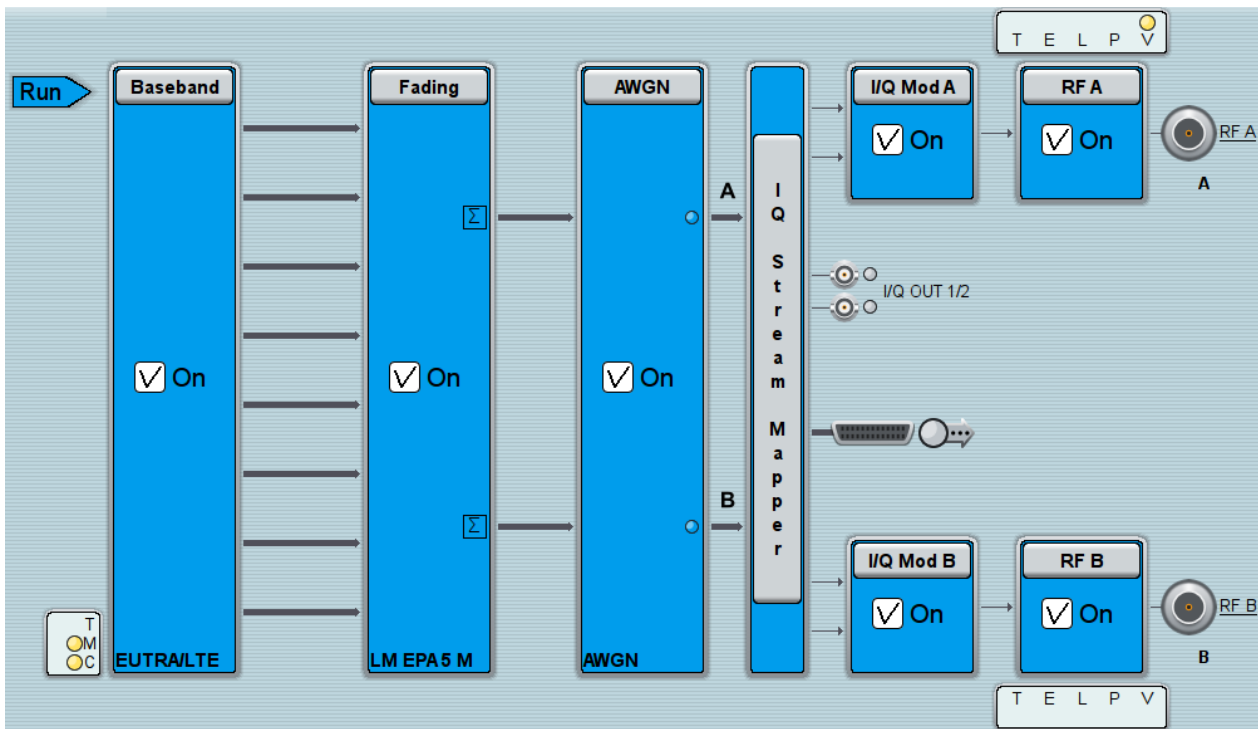
5.2.3 Generation of Signals for Testing of WCDMA Handover (Two Cells)

The block diagram in this example depicts the generation of a test signal using both internal baseband generators and both RF outputs, for example for hand-over tests. The R&S SMW acts as two independent generators in one instrument.



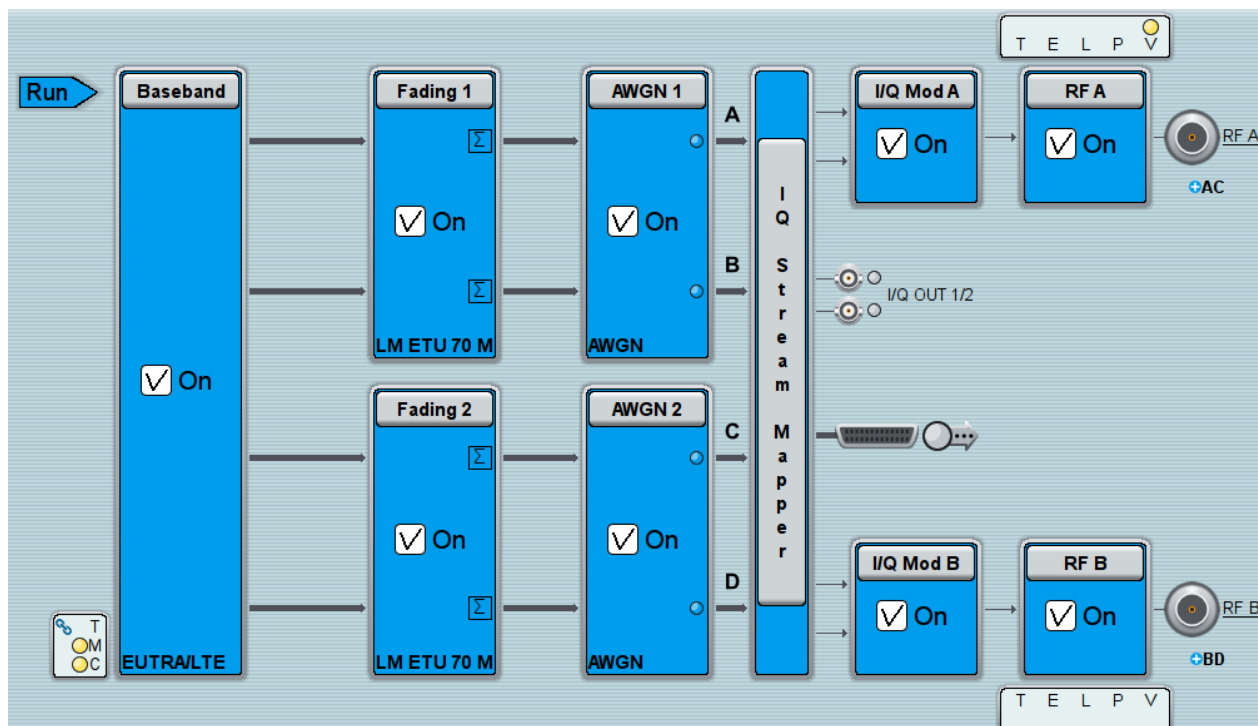
5.2.4 Generation of an EUTRA/LTE 8x2 MIMO Signal for UE Tests

The block diagram in this example depicts the generation of an EUTRA/LTE test signal in a 8x2 MIMO scenario, for example for UE tests. The instrument uses a coupled internal baseband source to generate all required baseband signals.



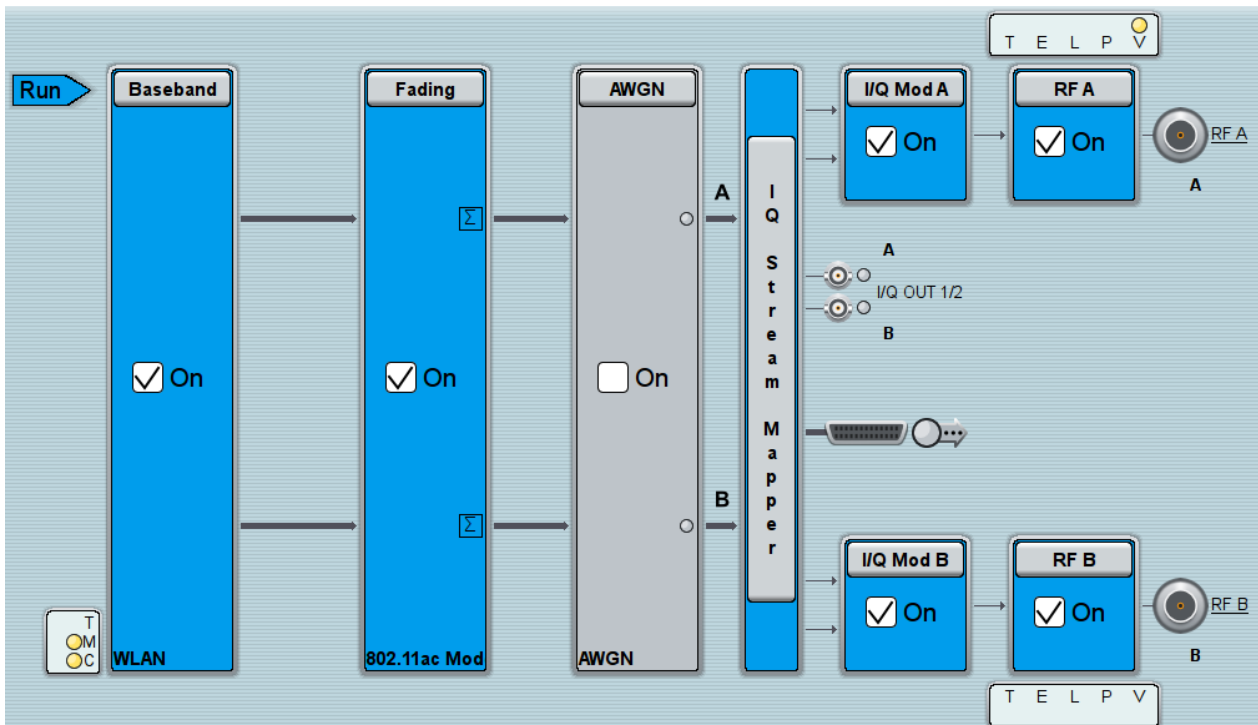
5.2.5 Generation of an LTE Test Signal with Carrier Aggregation and 2x2 MIMO each Component Carrier

The block diagram in this example depicts the generation of an EUTRA/LTE test signal with two component carriers (intra-band carrier aggregation) and 2x2 MIMO fading each, for example for UE tests. The instrument uses a coupled internal baseband source and both RF outputs.



5.2.6 Generation of a WLAN 802.11ac signal with 160 MHz

The block diagram in this example depicts the generation of a WLAN 802.11ac test signal with 160 MHz bandwidth in a 2x2 MIMO scenario. The instrument uses a coupled internal baseband source and both RF outputs.



6 Instrument Control

This chapter provides an overview on how to work with the R&S SMW. It describes what kind of information is displayed in the diagram area, how to operate the R&S SMW via the touchscreen, the front panel keys and other interaction methods, and how to use the online help.

This section describes the manual operation of the R&S SMW. For an overview of alternative ways, refer to [Chapter 5.1.1, "Possible Ways to Operate the Instrument"](#), on page 89.

6.1 Means of Manual Interaction

The R&S SMW provides the following means of manual interaction, which you can use alternatively or complementary:

- **Touchscreen:**

This is the most direct interaction way. Use your finger to set parameters in dialog boxes, enter data, and much more. Most of the control elements and actions on the screen are based on the standard operating system concept. Tapping the screen works like clicking mouse buttons:

 - Tap = click: Selects a parameter or provokes an action.
 - Touch and hold = right-click: Opens a context-sensitive menu.
 - Touch and drag = drag&drop:

Moves a window (dialog or graphic) by dragging it to a new position on the screen, or
Routes a signal by selecting a block and dragging to the destination block, or
Resizes a window (dialog or graphic) by dragging an edge or a corner of a window to the destination size
 - Two-finger pinching = zoom in:

Zooms in a graphical display as it works on your cell phone
- **Function keys and rotary knobs:**

The front panel provides nearly all functions and controls to operate the instrument in the classic ways, without touchscreen.
- **Optional mouse and/or keyboard:**

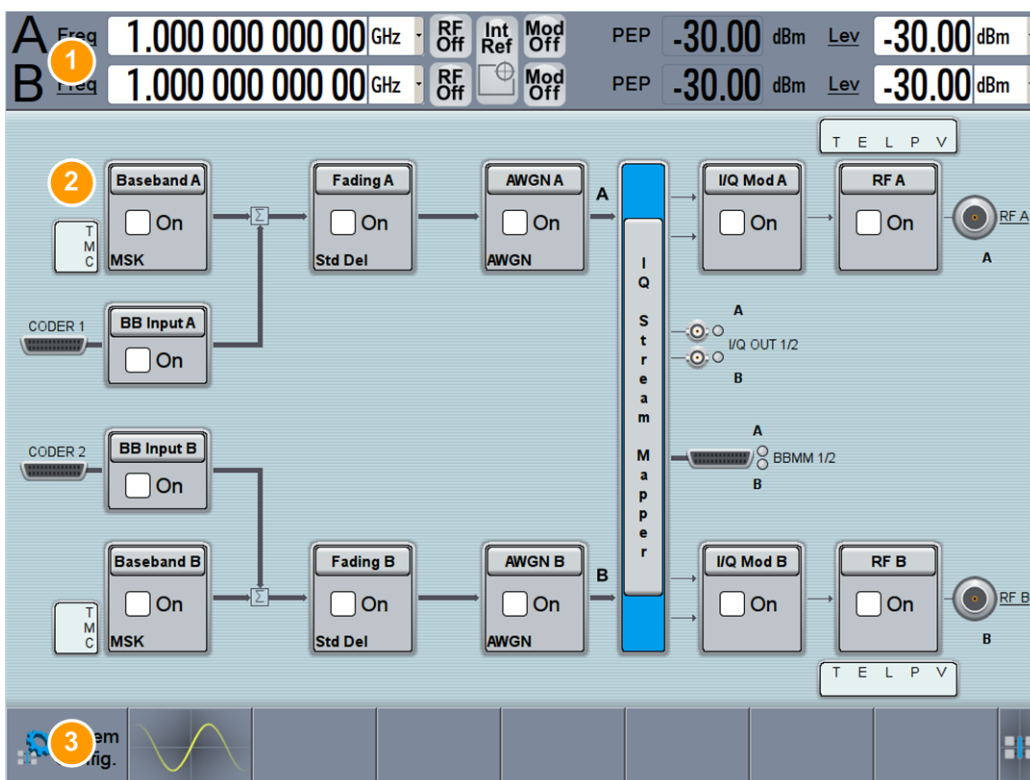
Understanding the Display Information

These devices work like known from PCs. The navigation keys on the front panel correspond to the keys on the keyboard.

The usage of the touchscreen and navigation keys is described in detail in the following sections.

6.2 Understanding the Display Information

The screen display of the R&S SMW shows all main settings and generator states, divided into three main operation areas:



- 1 = Status bar
- 2 = Block diagram
- 3 = Taskbar/softkey bar

The labeled operation areas are explained in detail in the following sections.

- [Chapter 6.2.1, "Status Bar"](#), on page 105
- [Chapter 6.2.2, "Block Diagram"](#), on page 105
- [Chapter 6.2.3, "Taskbar"](#), on page 107

See also [Chapter 6.2.4, "Additional Display Characteristics"](#), on page 108 for additional information.

6.2.1 Status Bar

The status bar in the header of the display indicates the frequency and level settings of the RF output signal, containing offset and peak envelope power (PEP).



- 1 = Frequency display
- 2 = Status buttons
- 3 = Level display

The main characteristics of the RF signal, frequency and level, are displayed continuously and can be set. Status buttons indicate key parameters that are set for the output signal. Most of the status buttons are virtual keys you can use to open a corresponding menu or dialog.



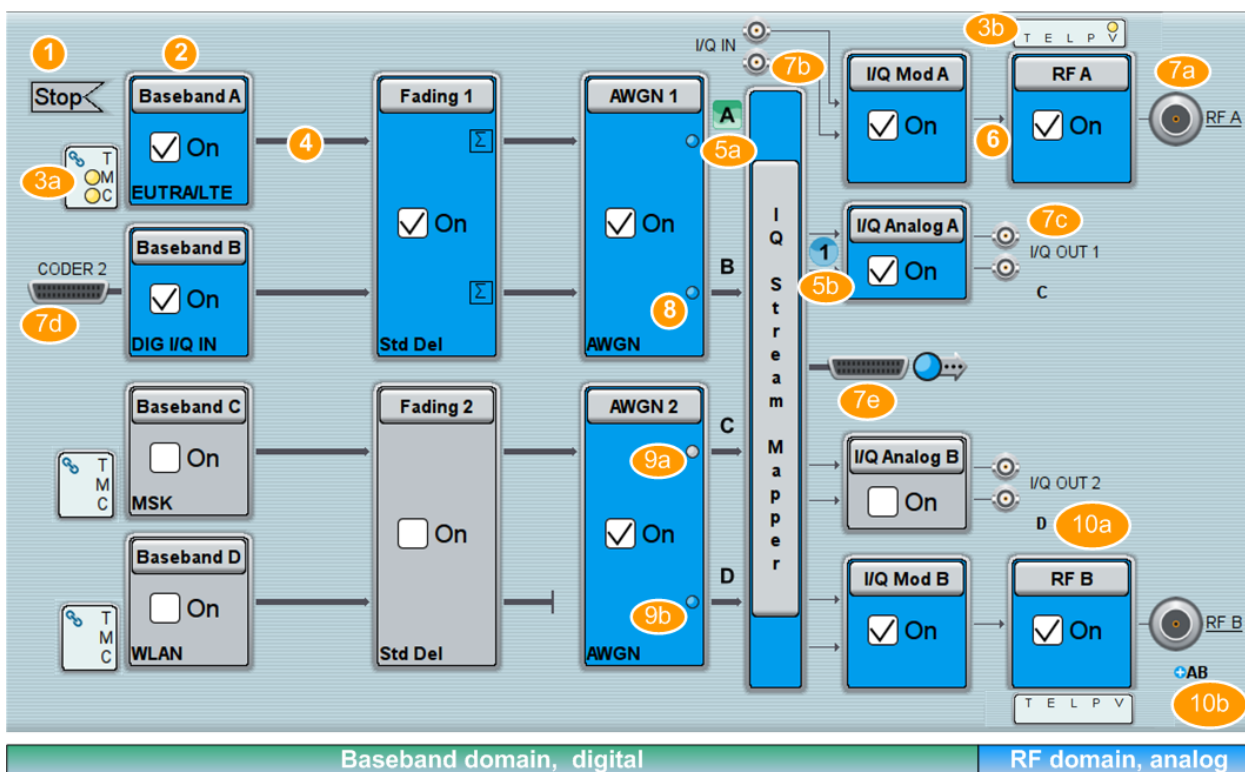
Underlined names, such as Freq, Lev, or RF A (in the block diagram) are also touch-sensitive. By touching them, you can execute a setting or access the dialog or menu.

An overview of the status buttons and their functionality is given in the appendix of the User Manual.

6.2.2 Block Diagram

The block diagram shows the current configuration and the signal flow in the generator with the aid of function blocks, connected by signal lines. The following figure displays almost all the elements that can appear in the block diagram. However, it does not necessarily represent a useful configuration.

Understanding the Display Information



- 1 = Status indicator
- 2 = Functional block
- 3a / 3b = Control signal block
- 4 = Signal line (digital)
- 5a / 5b = Graphics indicator
- 6 = Signal line (analog)
- 7a / 7b / 7c / 7d / 7e = Connector icons (RF, analog, digital)
- 8 = Stream indicator
- 9a / 9b = Stream status indicator (On/Off)
- 10a / 10b = Stream indicator (Single, Add)

Starting from left up to the "Stream Mapper", you can see the functional blocks provided in the baseband domain. After the stream mapper, the analog section contains the digital to analog conversion and modulation to RF.

Legend	Item	Description
1	Status indicator	Indicates whether the signal is running or waiting for a trigger.
2	Functional block	Represents a basic task in signal generation. The push button provides access to any number of associated actions to accomplish the task. The On/Off (checkbox) and the block label quickly activates the basic task.

Legend	Item	Description
3	Control signal block	Indicates information on the control signals like signal content, input or output and provides quick access to the corresponding configuration dialog. A dedicated control block is displayed for each baseband (3a) and RF block (3b).
4, 6	Signal lines (digital/ analog)	Show the currently configured signal flow. <ul style="list-style-type: none"> Thick lines represent the digital I/Q streams, see (4) in the figure above Thin lines represent the analog signals (6)
5	Graphics indicator	Denotes that the signal is displayed graphically (5a /5b).
7	Connector Icons	Represent the interfaces for signal input and output. <ul style="list-style-type: none"> RF signal connector output (7a); (icons vary depending on the frequency) Analog I/Q signal connector input (7b) Analog I/Q signal connector output (7c) Digital I/Q signal connector input (7d) Digital I/Q signal connector output (7e)
8	Stream indicators	Show the input streams at the I/Q stream mapper.
9	Stream status indicators	Show the status of a stream (On/Off)
10	Stream indicators	Indicates the output streams that are routed to the corresponding connectors, and the way the streams are internally processed: <ul style="list-style-type: none"> Single One stream mapped on the connector (9a). Add More than one stream are routed to a connector (9b).

6.2.3 Taskbar

The "Taskbar" contains labeled softkeys and minimized views (thumbnails) of active graphics and dialogs.

Initially, it shows the permanently assigned softkeys. The softkey with the sine wave denotes that no signal is activated for graphical representation.



Figure 6-1: Taskbar in default state

Understanding the Display Information

Whenever you open a settings or graphics dialog, it is automatically assigned to the "Taskbar". The softkeys shown in the following figure represent the variants.

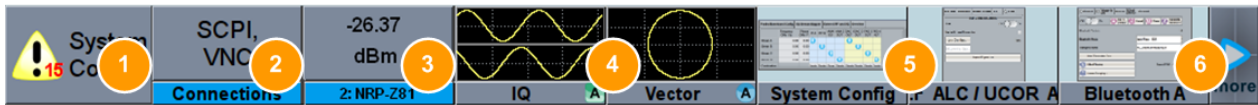


Figure 6-2: Taskbar fully assigned

- 1 = System configuration
- 2 = Remote control connections
- 3 = R&S NRP-Zxx power sensors
- 4 = Graphics
- 5 = Dialogs
- 6 = Diagram / More

1	System Config	Provides access to general system configurations like setup, display, or remote. Note: The warning symbol signifies a permanent error message. It replaces the default symbol, as shown in Figure 6-1 .
2	Remote	Shows the established remote connections when the instrument is remotely controlled. Tip: An indicator in the status bar shows the current remote control status.
3	NRP-Zxx	Shows a connected external power sensor. The softkey is labeled on a blue background when it is active.
4	Graphics	Shows that a signal is represented graphically.
5	Dialogs	Shows a dialog as a thumbnail, the dialog name, and the name of signal channel.
6	Diagram / More	The diagram icon as shown in Figure 6-1 minimizes all dialogs indicated on the screen. The block diagram is in the foreground. Note: The "More" softkey indicates that more dialogs are open than can be displayed in the taskbar. Use this softkey to open a selection list with the remaining active dialogs, as well as the "Diagram" function.

6.2.4 Additional Display Characteristics

The following section provides a short insight on the indication of the screen in general, and significant elements that you see under specific operating modes, in

dialogs or settings. They are described in detail in the User Manual in the appropriate chapters.

- **Appearance of active elements**

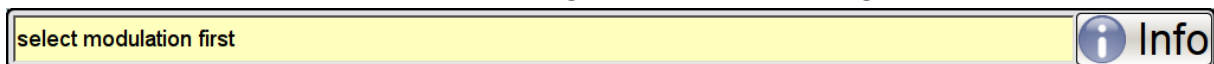
- *Active* elements like On/Off switches, state buttons, blocks and symbols have a **blue** background
- *Selected* elements such as blocks and connectors in the block diagram are highlighted **orange**.
- *Inactive* elements are **gray**

- **On-Screen keypads**

As additional means of interacting with the instrument without having to connect an external keyboard, either a numerical or alphanumerical on-screen keypad appears when you activate an entry field (see [Chapter 6.4, "Entering Data"](#), on page 112).

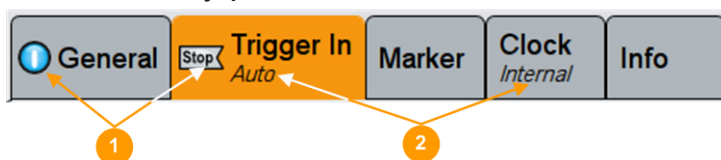
- **Info Line**

The "Info line" shows brief status information and error messages. It appears above the "Taskbar" when an event generates a message.



- **Key parameters indicated in tab labels**

Most dialogs are divided into tabs with logically grouped parameters. The tab label expresses the content and may also contain status indicators or the set value of a key parameter.



1 = Status indicators

2 = Key parameter values

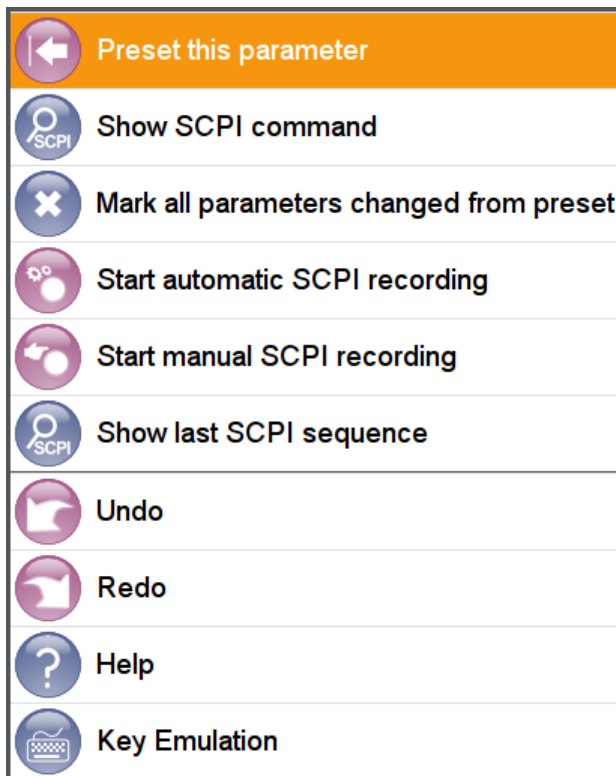
- **Scroll bar handle**

An arrow icon that appears when you touch a scroll bar helps you to scroll in a dialog or list.



- **Context-sensitive menus**

Within the entire screen display, including single parameters, you can access context-sensitive menus that provide some additional functions.



6.3 Accessing the Functionality

All functionalities are provided in dialog boxes as known from computer programs. You can control the instrument intuitively with the touchscreen. This section provides an overview of the accessing methods.

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

- Using the touchscreen
- Using other elements provided by the front panel, for example the keypad, rotary knob, or arrow and position keys

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

- System and function keys on the front panel of the instrument
- Taskbar/softkeys on the touchscreen
- Context-sensitive menus for specific elements on the touchscreen

- Elements on the status bar in the touchscreen
- Displayed setting on the touchscreen, that means block diagram and all settings available in dialogs.

To open a dialog box

- ▶ Perform one of the following actions:
 - Tap the required block, and then the menu entry.
 - Tap the minimized view (thumbnail) on the taskbar.
- Some of the Utility keys access a dedicated dialog, too.

To minimize a dialog box

- ▶ Tap the "Minimize" icon in the upper right corner.

To close a dialog box

- ▶ Tap the "Close" icon in the upper right corner.
Or:
Press the ESC key on the front panel.

To select an option in a dialog box

- ▶ Tap the required option.

To select an option in a list

If many options are available - for example, for the trigger mode - the options are provided in a list. The current selection is shown on the list button.

- ▶ Tap in the list, scroll in the list and then tap the required option.
Or:
Use the rotary knob
Or:
Use ON/OFF/TOGGLE key to select the succeeding option
Or:
Use the front panel keys:
 - a) Press the LEFT and RIGHT arrow keys to navigate to the list button.
 - b) Press the ENTER key to open the list.
 - c) Press the UP ARROW and DOWN ARROW keys to navigate to the required option in the list.

- d) Press the ENTER key to select the marked option.

6.4 Entering Data

Some parameters have their own key on the front panel.

For data input in dialog boxes, the touchscreen provides an on-screen keypad to enter numeric values and units. For text input, the on-screen keyboard with English layout is used.

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

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

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.
3. The entry to the left of the cursor is deleted.
4. 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.

6.4.1 Entering Numeric Parameters

To enter values with the on-screen keypad

If a field requires numeric input, the keypad provides only numbers. The provided units correspond to the units of the parameter.



Figure 6-3: Example of a keypad for frequency parameter

1. Enter the numeric value.
2. Tap the unit button to complete the entry.
The unit is added to the entry.
3. If the parameter does not require a unit, confirm the entered value by pressing "Enter".

To enter values by using the front panel controls

1. Change the currently used parameter value by using the rotary knob (small steps) or the UP or DOWN keys (large steps).
2. If the parameter does not require a unit, confirm the entered value by pressing the ENTER key or any of the unit keys.
The editing line is highlighted to confirm the entry.

If you edit numeric data in tables, the entry field must be in edit mode: Press ENTER, or the rotary knob to activate the edit mode.

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 [Figure 6-4](#)).



Figure 6-4: On-screen keyboard

The interaction with the on-screen keyboard is as tipping on a connected keyboard.

6.4.3 Undo and Redo Actions

Accessed via the context-sensitive menus, "Undo" allows you to restore one or more actions on the instrument. Depending on the available memory, the "Undo" steps may restore all actions.



"Redo" restores a previously undone action.

6.5 Getting Information and Help

In some dialog boxes, graphics are included to explain the way a setting works. For further information, you can use the following sources:

- Tooltips give the value range of the parameter.
- The context help provides functional description on a setting.
- The general help explains a dialog box, provides instructions, and general information.
- The tutorials are interactive examples and demonstrations on how to perform specific tasks.

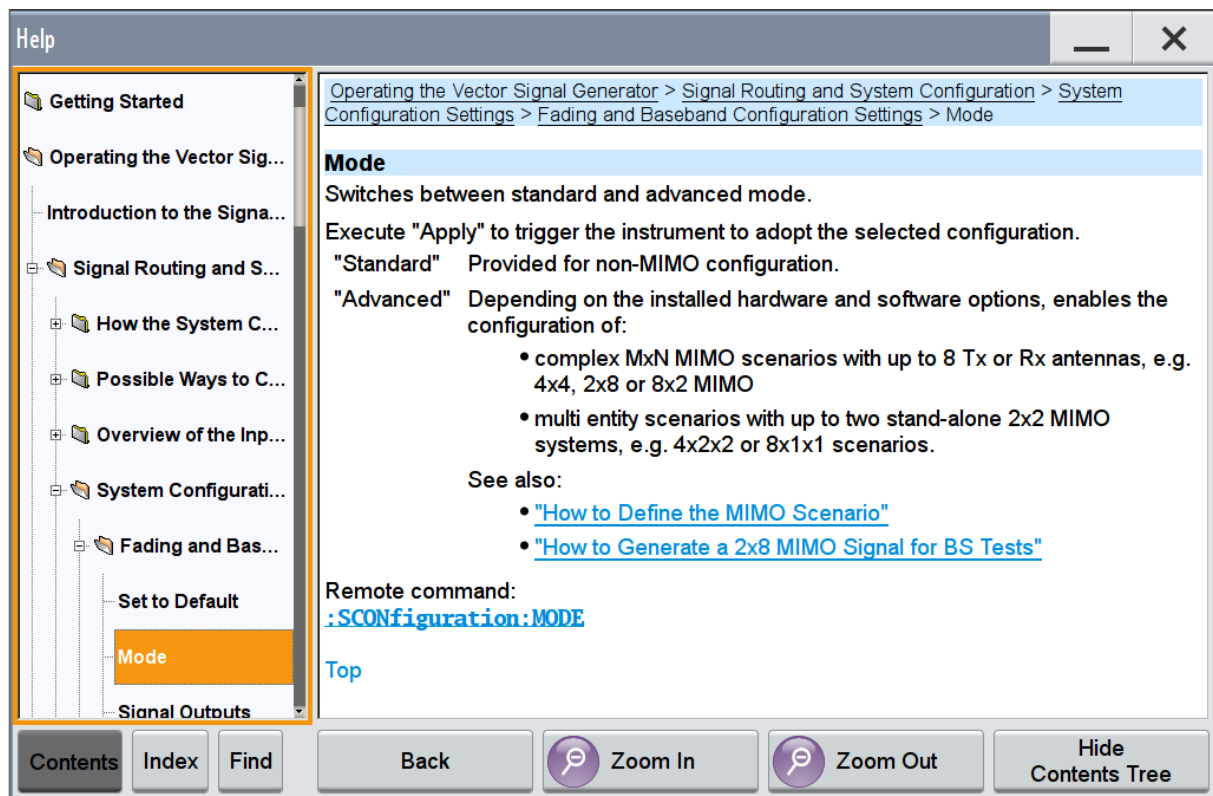
To access the tutorials

- ▶ Follow the instructions in [Chapter 6.5.1, "Using the Tutorials"](#), on page 117.

To display context help

- ▶ To access a help topic, perform one of the following:
 - a) Tap and hold the parameter for which you need information and tap "Help" in the context menu.
 - b) Tap the parameter and press the HELP key.

The "Help" dialog opens. You can browse the help for further information.



Contents of the help dialog box

The help dialog box covers two main areas:

- "Contents" - contains a table of help contents
- "Topic" - contains a specific help topic

The help system also provides an "Index" and a "Find" area, and "Zoom" functions that are accessed via the corresponding buttons.

To open general help

- ▶ Press the yellow HELP key on the front panel.

If a dialog box is opened, the help topic for the current tab is shown. Otherwise the "Contents" page appears.

Navigating in the table of contents and in the help topics

1. To move through the displayed contents entries, tap on an entry and scroll or use a connected mouse or the UP/DOWN keys. Entries with a plus sign contain further entries.

2. To display a help topic, tap on the topic name or double click on the topic name or press the ENTER key.
3. To follow a cross-reference, tap on the link text.
4. To return to the previous page, select "Back".
This function scrolls back all steps you have performed before.
5. Use the "scroll bars" to shift the visible section of content shown.
6. To maximize the "Topics" area, tap the "Hide Contents Tree" button to hide the contents tree.

Using the Index

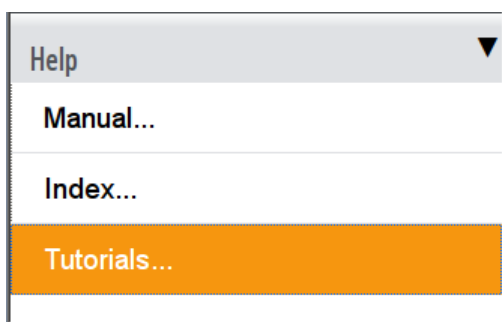
1. Select the "Index" button in the task bar.
2. Enter the first characters of the topic you are interested in.
The entries starting with these characters are displayed.
3. Tap on the index entry.
The corresponding help topic is displayed.

6.5.1 Using the Tutorials

A set of tutorials is embedded in the software. The tutorials are interactive examples and demonstrations on how to perform specific tasks.

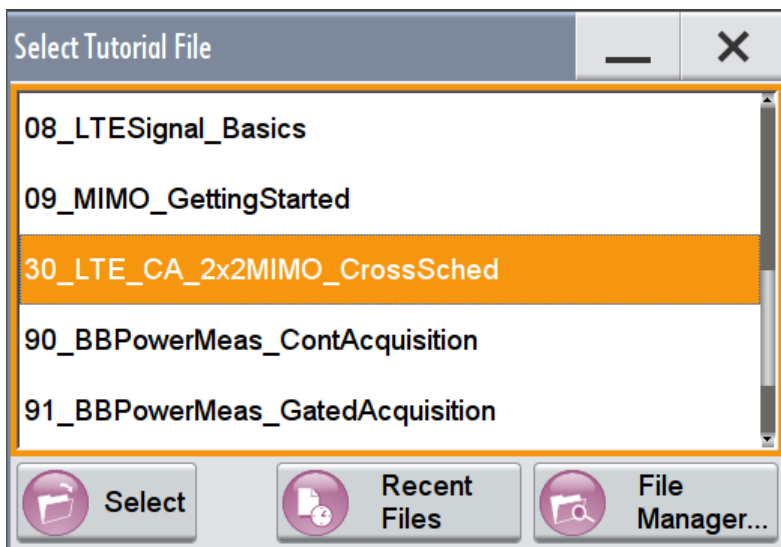
To start a tutorial in an interactive step-by-step mode

1. Press the SETUP key on the front panel.
2. Scroll-down in the list, tap on the "Help" section to expand it and tap on "Tutorials".

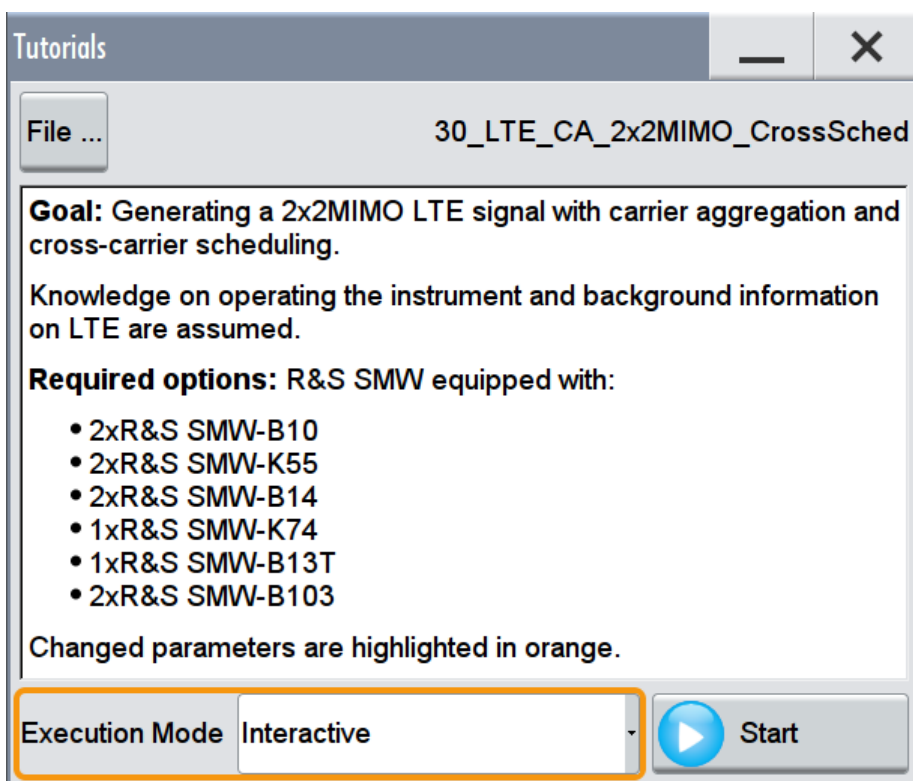


The "Tutorials" dialog opens.

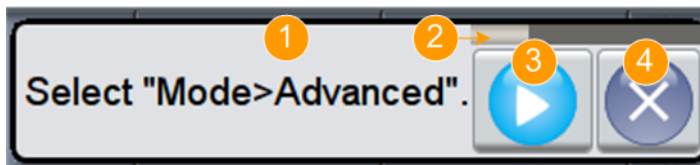
3. Select "File > Load Predefined Tutorial".



4. Tap on a tutorial from the list and confirm with "Select".
If the file contains a description, it is displayed.



5. Use the default mode, that is "Execution Mode > Interactive".
6. Tap on the "Start" button.
7. Observe the information displayed in the "Info" line (bottom of the display).



- 1 = Information on the performed action
- 2 = Progress bar
- 3 = "Next Step": confirms the execution of the step
- 4 = "Stop": terminates the tutorial

8. To execute a subsequent step, select the "Next Step" button.
A blinking cursor indicates the block or parameter affected by the step.



The instrument performs the configurations step-by-step and expects your confirmation. Dialogs are opened and closed; changed parameters are highlighted in orange.

Additional information is displayed in the "Info" line.

To stop the tutorial

The demonstration can be terminated at any time.

- Select the "Stop" button.

The demonstration stops.



You may reopen the "Tutorials" dialog and start another file or exit the tutorial mode.

To use the demonstration mode

1. Start the tutorials as described in ["To start a tutorial in an interactive step-by-step mode"](#) on page 117.
2. In the "Tutorials" dialog, select "Execution Mode > Auto (Looped) 3 sec".

The configurations are performed automatically; your interaction is not required.

Dialogs are opened and closed; changed parameters are highlighted in orange. Additional information is displayed in the "Info" line.

6.6 Remote Control

In addition to working with the R&S SMW interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC.

The R&S SMW supports various methods for remote control:

- Connecting the instrument to a (LAN) network (see [Chapter 2.4, "Setting Up a Network \(LAN\) Connection"](#), on page 26)
- Using the LXI browser interface in a LAN network
- Connecting a PC via the IEC-bus (IEEE 488) interface
- Remote control via the USB interface



For remote control over LAN or USB, you can use the R&S VISA (Virtual Instrument Software Architecture) library provided for download at the Rohde & Schwarz website <http://www.rohde-schwarz.com/rsvisa>.

How to configure the remote control interfaces is described in the user manual, chapter "Network and Remote Control Operation".

6.7 Remote Operation over VNC

The VNC is an 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 VNC provides access to all applications, files, and network resources of the instrument. Thus, remote operation of the instrument is possible.



Instrument control from a remote computer

To access the basic utility functions of the R&S SMW, perform a right mouse click on the block diagram and select "Key Emulation".

A key panel to the right of the block diagram gives access to the utility functions provided by the front panel keys.

The VNC is an add-on program, included in operating system Linux/Unix, and available as a free-of-charge download on the internet.

For more information, refer to the R&S SMW user manual, chapter "How to Set Up Remote Operation via VNC".

7 Obtaining Technical Support

If problems occur, the instrument generates error messages which usually are sufficient for you to detect the cause of an error and find a remedy. Error message types are described in the R&S SMW user manual, section "Troubleshooting and Error Messages".

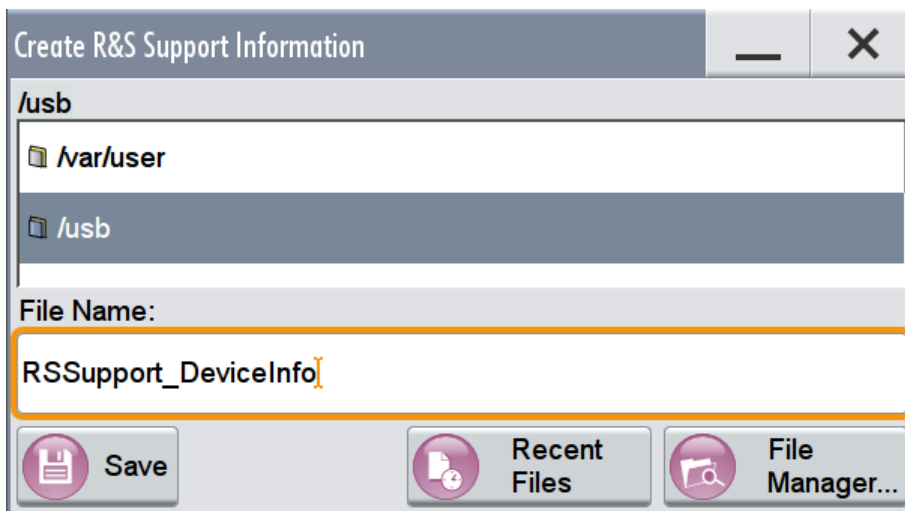
In addition, our customer support centers are there to assist you in solving any problems that you may encounter with your R&S SMW. We will find solutions more quickly and efficiently if you provide us with the following information.

- The following dialog boxes in the "Setup > Instrument Assembly" menu provide useful information:
 - **Hardware Configuration:** hardware assemblies
 - **Software and Options:** the status of all software and hardware options installed on your instrument
- **System Messages:** displayed in the "Info" line and provide information on any errors that may have occurred
- **Support file:** a special file (*.tar.gz file) with important support information that can be created automatically.
The support *.tar.gz file has a user definable name and contains the following information:
 - Error Log
The `SgErrors.txt` file contains a chronological record of errors.
 - Save/Recall file
The `SystemRestorationSMW.savrcl.txt` file contains the instrument settings at the last correct shutdown of the instrument.
 - Device footprint
The `DeviceFootprint_<SerialNumber>_<Date>_<Time>.xml` file contains service-related information on the instrument's configuration.
 - Adjustment files
Several files with information on the last performed adjustment

Collect the error information and send an e-mail in which you describe the problem to the customer support address for your region as listed at the beginning of the R&S SMW Getting Started manual.

To collect error information in a support file

1. Connect a USB device to the R&S SMW.
2. On the front panel, press the SETUP key and select "Maintenance > Create R&S Support Information".
3. In the "Create R&S Support Information" dialog, navigate to the `/usb` directory and enter the support file name, for example `RSSupport_DeviceInfo`.



The error information and further required data is collected automatically. The support file `RSSupport_DeviceInfo.tar.gz` is created and stored in the `/usb` directory.

To remove sensitive data

- ▶ For information on how to handle or remove the sensitive data from your instrument, refer to the description "Resolving Security Issues when working with R&S SMW".



Packing and transporting the instrument

If the instrument has to be transported or shipped, for example due to damage during delivery, observe the notes described in [Chapter 2.1.2, "Unpacking and Checking the Instrument"](#), on page 17.

Annex

A Summary: New Features for R&S SMU200A Users

The R&S SMW introduces new features in the R&S Signal Generators family. If you have used an R&S SMU or other R&S Vector Signal Generator before, you may find the summary information in the following sections and the comparison to the R&S SMU useful.



To gain a better overview of the new functionality, refer to the configuration examples in [Chapter 4, "Trying Out the Instrument"](#), on page 53. The following sections are a short summary for experienced R&S SMU users.

During this section, we use the R&S SMU as an example instrument that represents the vector signal generators family.

A.1 Improvements in the Manual Operation

- The R&S SMW is equipped with a modern touchscreen. You can operate the instrument completely from the touchscreen. This makes interaction with the user interface easy and fast.
- The touchscreen provides *an alternative way* to control blocks and dialog boxes, and to change instrument settings. Tap a function field like "RF Freq" or "Level" and enter the value in the input field that appears.
- If you however prefer to use the front panel keys and/or the Rotary knob, you can use one of the following modes:
 - exclusive operation from the touchscreen
 - exclusive operation by front panel keys and/or the Rotary knob, as you perform this in a signal generator like R&S SMU.
 - mixed operation by combining both operation possibilities, possibly also in combination with a connected mouse.

- To access important functions or dialogs directly by one tap, use also the provided hot spots. There are several of them on the block diagram, like:
 - Icons
 - Connectors
 - Underlined text labels

Example: Configuring a RF offset of 10 MHz

Compare the steps necessary to fulfill the same task in R&S SMU and R&S SMW.

Required steps in R&S SMU	Required steps in R&S SMW
Press the DIAGRAM key Turn the rotary knob and select "RF A" block Push the rotary knob to open the context menu Turn the rotary knob to navigate and select "Frequency" Push the rotary knob to open the dialog Turn the rotary knob and select "Offset" Use the front panel keypad and enter 10 MHz Press ESC to close the dialog	In the block diagram, tap the "RF A" button In the context menu, tap the "Frequency" In the "Frequency" dialog, tap the parameter "Offset" In the on-screen keypad, tap on "1"0"MHz" Close the dialog

A.2 Revised Front Panel Keys

The R&S SMW introduced redesigned front panel keys. There are new or changed functions assigned to the front panel keys; keys are removed and new keys are introduced.

Consider the following comparison between the R&S SMW and the R&S SMU front panel keys.

Front panel keys in R&S SMU	Front panel keys in R&S SMW	Comment	Assigned Function
-	USER	New	Key with a customizable function. You can define the action to be executed.
FILE	SAVE/RCL	Renamed	Saves and loads instrument setting Accesses the file manager
CLOSE HIDE WINBAR	-	Removed The touchscreen functions take over the window/dialog management	-
-	NEXT WINDOW	New	Toggles between the active dialogs
MENU	-	Removed Access to the main and setup menus is provided via the block diagram and the soft-keys on the taskbar	-

A.3 New Connectors' Concept

The R&S SMW introduced new connectors' concept.

- The R&S SMU uses a static routing of the control signals and dedicated connectors. For example, the "Marker 1" signal of "Baseband A" is output at the MARKER 1 connector.
In R&S SMW, however, the signal to connector mapping is not dedicated. You define the connector at which the "Marker 1" signal of "Baseband A" is output.
- The R&S SMW distinguishes between shared and local connectors:
 - the globally shared connectors (USER 1 .. 6)
 - the local connectors of the modulation coders (T/M/(C) 1/2/3 and T/M/(C) 4/5/6)
- The signal to connector mapping requires two major steps:
 - defining the signal
 - defining the connector

For example, in the dialog of a digital standard, select the "Marker" tab and define the marker pattern.

In the "Marker" tab, select the "Local/Global Connector Setting" and define the connector.



For details, see the configuration examples in [Chapter 4, "Trying Out the Instrument"](#), on page 53.

In the default state, the signal to connector mapping in R&S SMW repeats the one you are familiar with. Consider the following comparison between the R&S SMW and the R&S SMU connectors.

Table A-1: Default signal to connector mapping in the R&S SMW

Connector on R&S SMU	Connector on R&S SMW	Physical location on the R&S SMW	Default assigned signal
MARKER1 (Path A)	USER 1	Front panel	output Baseband A Marker 1
MARKER2 (Path A)	USER 2	Front panel	output Baseband A Marker 2
TRIGGER1	USER 3	Front panel	input Global Trigger 1
TRIGGER2	USER 4	Rear panel	input Global Trigger 2
USER with default signal "No Signal (Blank)", path A	USER 5	Rear panel	output Signal Valid A
CLOCK	T/M/C 1 T/M/C 4	Rear panel (CODER 1 board, topmost left) (CODER 2 board, topmost right)	output Symbol Clock A/C Symbol Clock B/D
BBIN A	DIG I/Q IN/OUT 1	Rear panel (CODER 1 board, topmost left)	input BB Input A

Connector on R&S SMU	Connector on R&S SMW	Physical location on the R&S SMW	Default assigned signal
BBIN B	DIG I/Q IN/OUT 2	Rear panel (CODER 2 board, topmost right)	input BB Input B
BBOUT A	DIG I/Q OUT 1	Rear panel (BBMM board, left side)	output Stream A
BBOUT B	DIG I/Q OUT 2	Rear panel (BBMM board, right side)	output Stream B
EXT MOD	EXT1 and EXT2	Rear panel (BBMM board)	dedicated inputs External analog modulation signals
I/Q (analog outputs)	I/Q OUT 1/2	Rear panel (BBMM board)	output Stream A/B Note: By default, the output connectors are deactivated

A.4 Revised Options Concept

The R&S SMW uses revised options concept.

- The input of digital baseband signals Baseband Inputs is included in the R&S SMW-B10, i.e. no additional option like R&S SMU-B17 is required. The R&S SMW does not support input of analog signals in the baseband generator. Analog I/Q signals are input directly to the I/Q Modulator.
- The features of the 3GPP FDD digital standard are split into two main options, the R&S SMW-K42 (as in R&S SMU) and one enhanced option, R&S SMW-K83.
- The features of the IEEE 802.11 a/b/g digital standard are included in the R&S SMW-K54 WLAN a/b/g/n, i.e. no additional option like R&S SMU-K48 is required. The features of the IEEE 802.11 ac digital standard, however, require the additional option R&S SMW-K86.

A.5 Redesigned Dialog Concept Based on a New Tab Structure

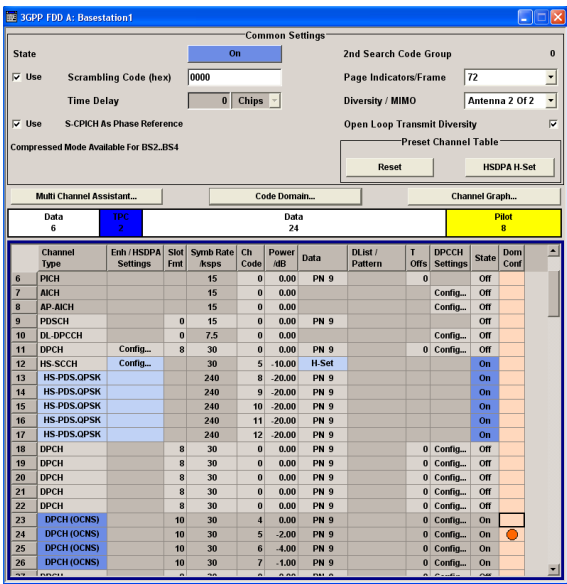
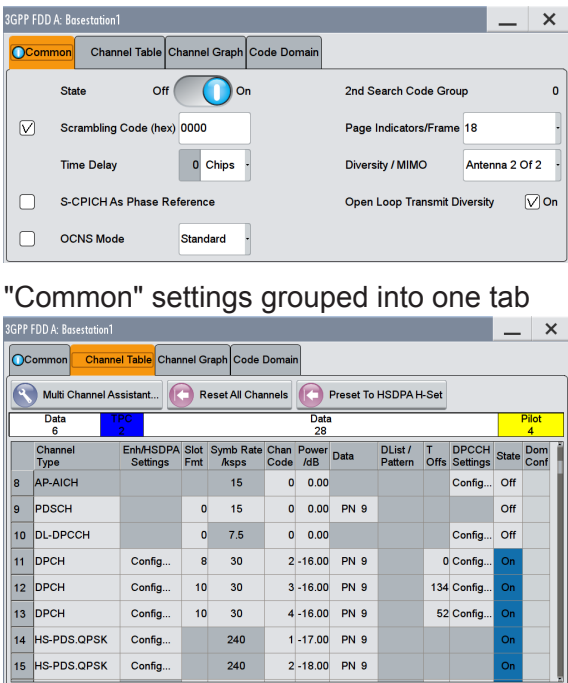
The R&S SMW introduces more user friendly representation in the user interface by:

- Settings split into tabs rather than arranging them vertically in very long dialogs
- Dialog structure based on a repeating tab concept
- Integrated (sub)dialogs as additional tabs in the main dialog
- Redesigned user interface for faster information acquisition
 - display of summary information with icons, state indicators, dialog and tab headers
 - improved blocks/dialog/tab naming conventions

Example:

Consider the following comparison between the R&S SMU and the R&S SMU dialog concept.

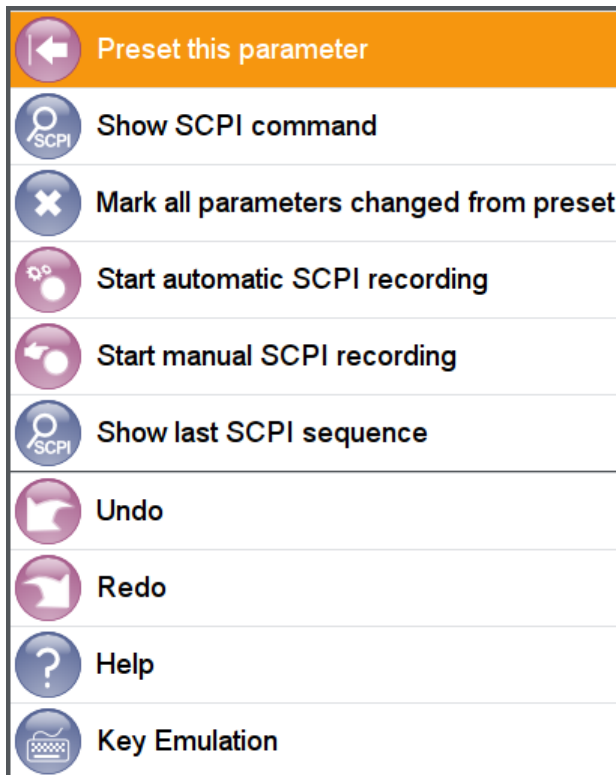
Table A-2: Comparison of the settings representation ("3GPP FDD > Basestations > BS1" settings)

Dialog in the R&S SMU	Dialog in the R&S SMW
 <p>"Common Settings" and channel table listed in one dialog</p>	 <p>"Common" settings grouped into one tab</p> <p>"Channel Table" builds another separate tab</p> <p>The two separate windows "Code Domain" and "Channel Graph" implemented as tabs</p>

A.6 Quick Access to Important Information and Actions via Context-Sensitive Menu

The R&S SMW offers a context-sensitive menu to all parameters or interactive elements on the user interface

- To access this menu, touch an element and hold
 - The context-sensitive menus provide extended and new functionality
 - The context-sensitive menus are tailored to the particular parameter.
- The following figure is an example of the one provided for a numeric value.



Refer to [Chapter 6.3, "Accessing the Functionality"](#), on page 110 for more information.

A.7 Improved and New Introduced Features

Concerning the baseband signal generation and the digital standards, the R&S SMU and R&S SMW support nearly the same feature set. Consider the following main differences:

- External clock signal
The R&S SMU supports only one external baseband clock signal.
The R&S SMW supports two baseband clocks, one per "Baseband A/C" and "Baseband B/D".
Per default, the external clock signals are available at the T/M/C 1 and T/M/C 4 connectors respectively (see [Table A-1](#)).
- Digital impairments
In R&S SMW, you access this function from the blocks "I/Q Analog", "I/Q Digital" and "I/Q Mod".
- Handling of data lists

Flexible Signal Routing and Mapping of the I/Q Streams to the Output Connectors

You can create new and edit existing data lists directly from the dialog you define the data source.

- Number of baseband sources
The R&S SMW uses four baseband sources, the "Baseband A,B,C and D".
- Generation of the signal of more than one antennas
In some digital standards in R&S SMU, like the "EUTRA/LTE", "IEEE 802.11n" or "WiMAX", the generation of the signal of more than one antenna is implemented with the function "Use Baseband A+B".
In R&S SMW, the number of "Tx Antennas" is a "System Configuration" setting.
- Analog I/Q outputs in inactive state
By default, the analog I/Q OUT connectors are deactivated.

A.8 Flexible Signal Routing and Mapping of the I/Q Streams to the Output Connectors

The R&S SMW introduced new signal routing concept.

- The R&S SMU provides rather limited routing possibility for the generated baseband signals. For example, the signal of "Baseband A" is output at one of the following connectors: the RF A, the analog I/Q A outputs and, if available, the DIG I/Q A.
In R&S SMW, however, you define how the generated I/Q streams are mapped to the available output connectors.
- The default stream mapping is compatible to the R&S SMU capabilities.
- You have basically two possibilities to route the signal and map the streams:
 - drag and drop blocks
 - use the new dedicated functional block, the "I/Q Stream Mapper", and the corresponding dialog

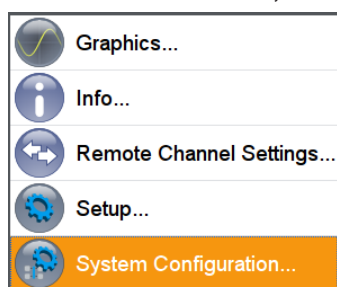
	Frequency Offs /Hz	Phase Offs P	RFA	RF B	I/Q OUT 1	I/Q OUT 2	BBMM 1	BBMM 2
Stream A	0.00	0.00	ⓘ		ⓘ		ⓘ	
Stream B	0.00	0.00		ⓘ		ⓘ		ⓘ
Combination			Single	Single	Single	Single	Single	Single

To route a stream, tap on the switching matrix.

See [Chapter 4.5, "Routing the Signal through the Instrument and Defining the Output Connectors"](#), on page 67 for a description of how this works.

A.9 Support of Versatile MIMO and Multi-Entity Configurations

- In R&S SMU, you select a 2x2 MIMO configuration under the "Fading" block. To support higher order MIMO configurations, the R&S SMW introduces the "System Configuration" settings and the concept of multi-entity operation.
- To access the "System Configuration" function, perform one of the following:
 - On the "Taskbar", select "System Config > System Configuration"



- In the block diagram, select "I/Q Stream Mapper" and select the "Fading/Baseband Configuration" tab.

Example:

To enable a 2x2 MIMO configuration, open the "System Configuration > Fading/ Baseband Configuration" dialog and enable the following setting.

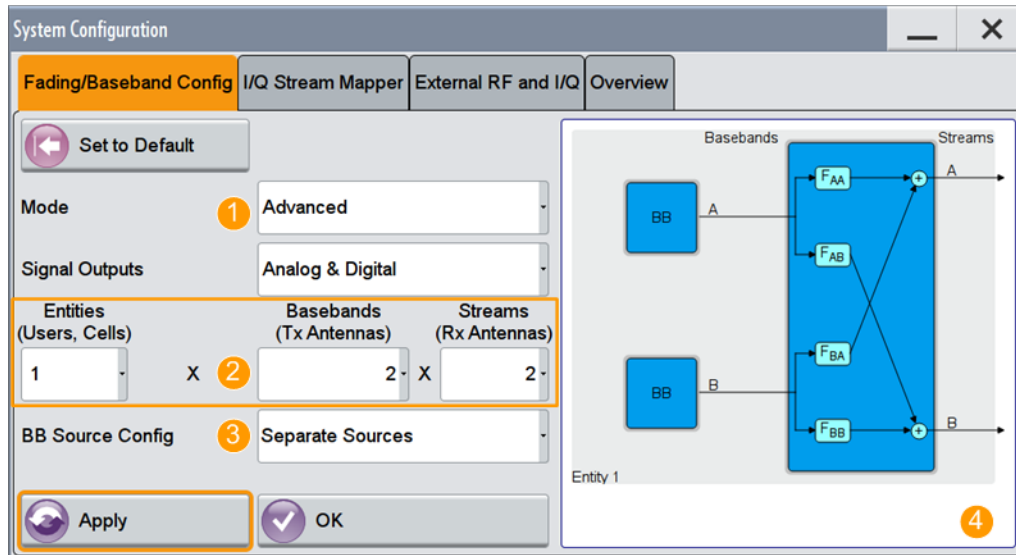


Figure A-1: System Configuration in the "Advanced Mode" (1x2x2 configuration)

1 = advanced mode, required for configuration of complex $L \times N \times M$ MIMO scenarios

2 = current signal routing; 2x2 MIMO configuration

3 = separated and coupled baseband sources

4 = simplified preview diagram of the particular configuration

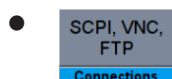
A.10 Info Manager and Remote Indication

- The R&S SMW does not permanently display the "Info" line. It appears when an event occurs.

A remote operation is indicated by:



Symbol displayed in the status bar.



Information on the used remote channels displayed in the task bar.

A.11 Operating System

The R&S SMU is based on Microsoft Windows, the R&S SMW on Linux embedded.

Consider the following main differences:

- Shorter boot time and higher level of security
- Changed file system structure

	R&S SMU	R&S SMW
Standard path for user data	D:\	/var/user
System files	C:\	not visible
USB memory stick	E:\	/var/usb

A.12 Remote Control, Remote Operation and File Transfer

- Changes in Hostname Syntax

If you are using remote control scripts which access an instrument in the LAN with the computer name (hostname), note that from **FW version 3.20.200.xx** the syntax for the **R&S SMW** has changed, complying to latest conventions of Rohde & Schwarz.

The modification applies to the R&S SMW, and the corresponding FW version, it does not affect instruments of the R&S SMU family.

Note also, that a Factory Preset resets the computer name, i.e. depending on the installed firmware version the computer name may change compared to the past.

Example:

The default hostname of an R&S SMW with a serial number 100007 will be `SMW200A-100007` (previous name `rssmw200a100007`).

- Compatibility

The R&S SMW is code compatible with the R&S SMU as far as it is possible. To allow you to use your existing scripts, modify the answers to the requests `*IDN?` and `OPT?`.

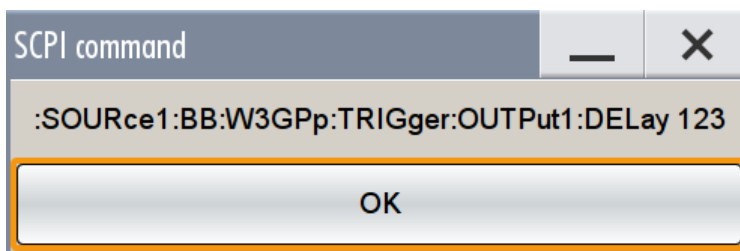
- Speeding up the development

The R&S SMW introduces several new features to simplify your development task, like writing a remote script.

- Indication of the complete SCPI command string corresponding to a manual selection

Example: Finding out the SCPI command for setting a Marker2 delay of 123 chips in the 3GPP FDD standard

Open the context menu for the parameter (tap and hold) and select "Show SCPI command" to get the complete string.



- Color indication of all parameters changed from preset state
- Record of all SCPI commands during manual operation
- Saving the current instrument configuration as a SCPI list
- Generation of source code (NI LabWindows, Matlab, etc.) instead of plain SCPI list
- Remote operation

The preferred method for remote operation of R&S SMU is the Windows Remote Desktop.

A remote access to the R&S SMW is provided by the VNC protocol. Some of its advantages:

 - You can use any internet browser
 - dedicated VNC viewer clients are available for all operating systems or terminals, like smart phones and tablet PCs.
 - Supported concurrent operation with a local user and one or more remote users
- File transfer

To transfers files from and to the instrument, use the ftp or smb/samba protocols.

Refer to Application Note 1GP72 "Connectivity of Signal Generators" (provided on the CD).

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