R&S®SGT100A
SGMA Vector RF Source
Service Manual

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Test & Measurement

Service Manual

ROHDE&SCHWARZ

This Service Manual provides servicing and maintenance procedures for the R&S® SGT100A.

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The following abbreviations are used throughout this manual:
R&S®SGT100A is abbreviated as R&S SGT100A.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

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

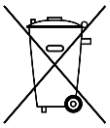
The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English.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

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

Safety labels on products

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

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

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

Signal words and their meaning

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

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

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

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

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

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

Operating states and operating positions

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

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

Electrical safety

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

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

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

Operation

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

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

Repair and service

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

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

Batteries and rechargeable batteries/cells

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

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

Transport

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

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

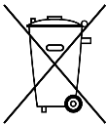
Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa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

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

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

Señalización de seguridad de los productos

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

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

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

Palabras de señal y su significado

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

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.

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

Seguridad eléctrica

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

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

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

Funcionamiento

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

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

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

Transporte

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

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

Eliminación/protección del medio ambiente

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

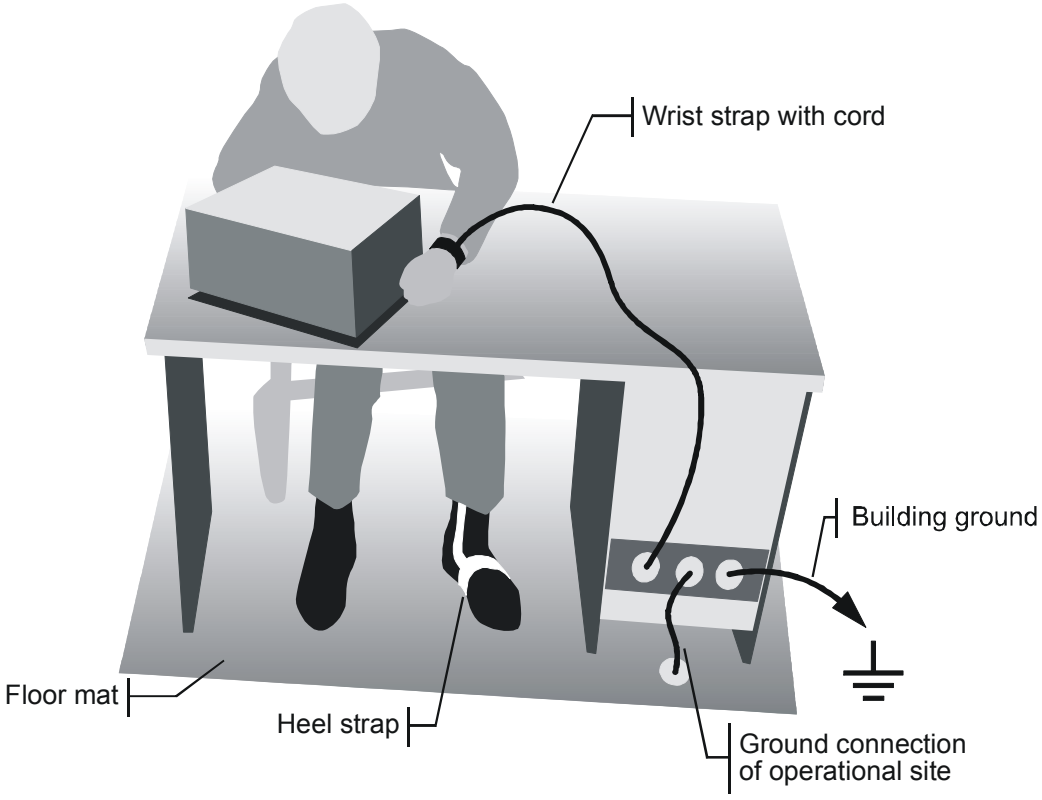
Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Instructions for Electrostatic Discharge Protection

NOTICE

Risk of damaging electronic components

To avoid damage of electronic components, the operational site must be protected against electrostatic discharge (ESD).



The following two methods of ESD protection may be used together or separately:

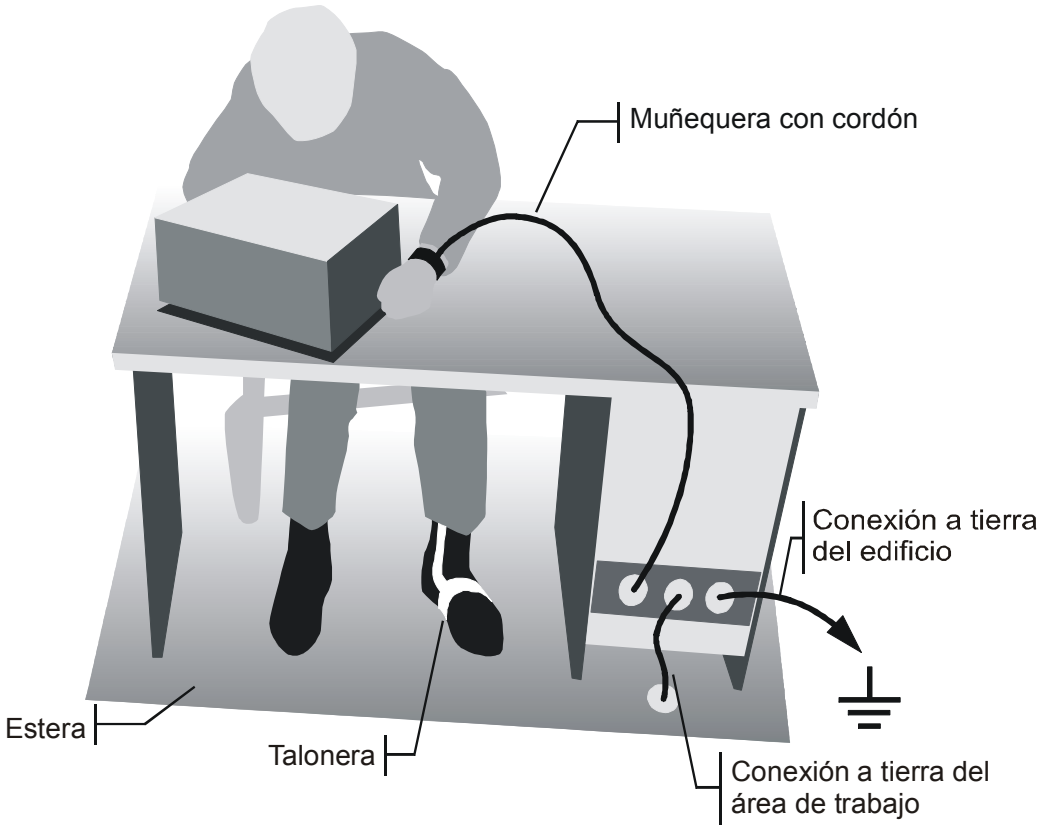
- Wrist strap with cord to ground connection
- Conductive floor mat and heel strap combination

Instrucciones para la protección contra descargas electroestáticas

AVISO

Riesgo de avería de los componentes electrónicos

Para evitar averías en los componentes electrónicos, el área de trabajo tiene que estar protegido contra descargas electroestáticas ESD (electrostatic discharge).



Los siguientes dos métodos de protección ESD pueden ser usados juntos o separados:

- Muñequera con cordón para conexión a tierra
- Combinación de estera antiestática y talonera

Procedure in Case of Service and Ordering of Spare Parts

This section contains information on shipping an instrument to your service center and ordering spare parts.

Please contact your local Rohde & Schwarz service center if you need service or repair work of your equipment or to order spare parts. You can find the current address of your representative on our homepage www.rohde-schwarz.com.

Shipping the Instrument

We require the following information in order to answer your inquiry fast and correctly and to determine whether the warranty is still valid for your instrument:

- Instrument model
- Serial number
- Firmware version
- Must the instrument be returned with this firmware?
- Detailed error description in case of repair
- Indication of desired calibration
- Contact person for possible questions

In some countries, an RMA process is available for the return shipment of the instrument. For details, contact your local representative.

When shipping the instrument, be careful to provide for sufficient mechanical and antistatic protection.

- Use the original packaging for transporting or shipping the instrument. The protective caps for the front and rear prevent damage to the operating elements and the connectors.
- If you do not use the original packaging, provide for sufficient padding to prevent the instrument from slipping inside the box. Wrap antistatic packing foil around the instrument to protect it from electrostatic charging.

Rohde & Schwarz offers repair and calibrations of the test systems it produces. The calibration documentation fulfills ISO 17025 requirements.

Shipping Defective Modules

Also when shipping a module, be careful to provide for sufficient mechanical and antistatic protection.

- Ship the module in a sturdy, padded box.
- Wrap the module in antistatic foil.

If the packaging is only antistatic but not conductive, additional conductive packaging is required. The additional packaging is not required if the tightly fitting packaging is conductive.

Exception:
If the module contains a battery, the tightly fitting packaging must always consist of antistatic, non-chargeable material to protect the battery from being discharged.

Ordering Spare Parts

To deliver spare parts promptly and correctly, we need the following information:

- Stock number (see list of spare parts in chapter "Documents")
- Designation
- Component number according to list of spare parts
- Number of pieces
- Instrument type for which the spare part is needed
- Instrument stock number
- Instrument serial number
- Contact person for possible questions

Refurbished Modules

Refurbished modules are an economical alternative to original modules. Bear in mind that refurbished modules are not new, but repaired and fully tested parts. They may have traces from use, but they are electrically and mechanically equivalent to new modules.

Your Rohde & Schwarz representative will be happy to inform you about which modules are available as refurbished modules.

Taking Back Defective Replaced Modules

Defective modules of the replacement program which cannot be repaired are taken back within three months following delivery. A repurchasing value is credited.

Excluded are parts which cannot be repaired, e.g. printed boards that are burnt, broken or damaged by attempts to repair them, incomplete modules, and parts with severe mechanical damage.

Please return the defective replacement modules, together with the accompanying document for returned merchandise, which you received with the spare module. We need the following information:

- Stock number, serial number and designation of the removed part
- Detailed error description
- Stock number, serial number and type of instrument from which the module was removed
- Date of removal
- Name of the engineer/technician who replaced the module
- R&S ordering number
- Service reference number (if available)

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1 Performance Test

Test Instructions

To ensure that rated specifications are maintained, the following preparations must be made prior to checking the rated characteristics:

- Check the instrument condition. Make sure the instrument fan operation is not constrained by dust etc. The fan can be inspected through the air intake at the case bottom side.
- Allow for a minimum warm-up time of 30 minutes at ambient temperature.
- Carry out all internal adjustments.
- The values are specified in the data sheet. Additional uncertainties introduced by the measurement equipment must be taken into account when checking the rated values.

This performance test describes the steps for testing the R&S SGT100A Signal Generator family and the installed options with respect to function and compliance with specifications.

In the following, the term DUT (Device Under Test) is used for any signal generator of this family. The tests to be performed depend on the installed options. The values are given in the data sheet of the respective instrument

1.1 Test Equipment

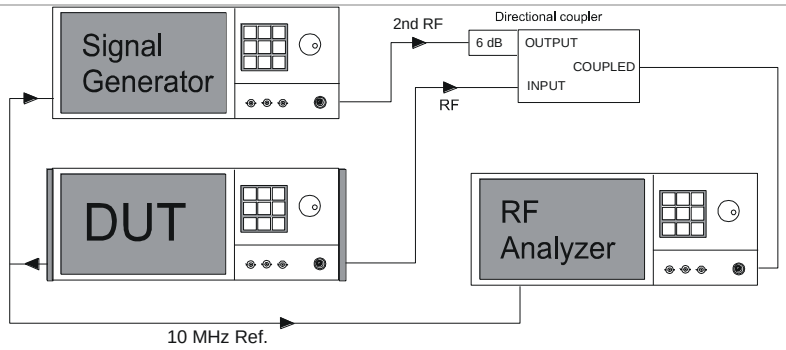
Table 1-1 Measuring equipment and accessories

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.
1	Frequency counter	1 Hz to RFmax, resolution 0.1 Hz (included in RF analyzer item 19)		
4	Controller	Industry standard PC/XT/AT with IEC-60625 interface and USB interface and LAN interface and optional PCI Express interface		
5	Signal generator	1 MHz to RFmax	R&S SMBV100A with option R&S SMBV-B106 or R&S SMBV-B103 and R&S SMBV-B10 or SMBV-B50 or SMBV-B51 R&S SMU with options R&S SMU-B106, -B10, -B31	1407.6004.02 1407.9703.02 1407.9706.02 1407.8607.02 1407.8907.02 1407.9003.02 1141.2005.02

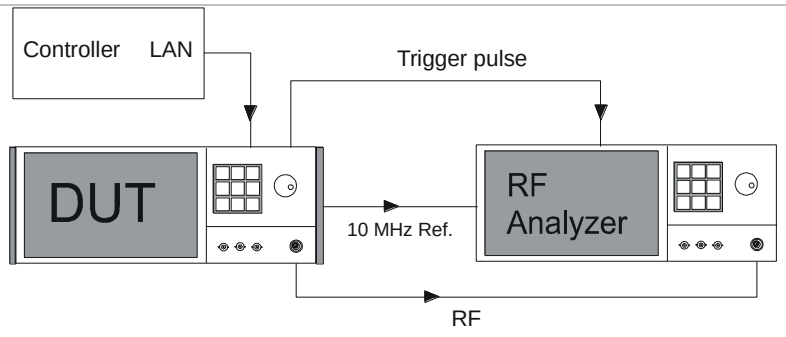
6	Phase noise test assembly	Phase Noise Test Set	R&S FSUP 26 or R&S FSUP 50	1166.3505.27 1166.3505.51
7	Oscilloscope	Bandwidth ≥ 500 MHz, two chan. with DC coupling	R&S RTM1052 or similar	1305.0008.52
8	RF power meter	1 MHz to RFmax	R&S NRP with R&S NRP-Z55 or R&S NRP-Z51 or R&S NRP-Z91	1143.8500.02 1138.2008.02 1138.0005.0x 1168.8004.0x
9	Mixer	10 MHz to RFmax IF down to DC		
10	VSWR bridge	1 MHz to RFmax directivity > 30 dB	f < 4 GHz: R&S ZRC 3 GHz f < 6 GHz: Agilent 773D	1039.9492.55
14	Arbitrary wave generator	two channels	R&S SMBV R&S SMU with option B18 (Dig. OUT)	1407.6004K02 1141.2005.02
15	AC/DC voltmeter	10 Hz to 10 MHz	R&S URE3	350.5315.03
16	Broadband FM demodulator	(included in RF analyzer item 19)		
19	RF analyzer & Demodulator for analog modulations & FM-demodulator	1 MHz to RFmax * 2	R&S FSQ26 with options R&S FSU-B25 R&S FSQ K7 R&S FSQ-K70 (Vector Signal Analysis) R&S FS-K5 (GSM/EDGE)	1155.5001.26 1044.9298.02 1141.1796.02
20	Software for simulation of digital modulations	Generation of data for ARB generator	R&S WinIQSIM	
21	Lowpass filter (2 pieces required)	Lowpass filter 2.5 MHz to remove WCDMA I/Q BB test signal noise Passband loss < 0.5 dB for f = 0…2 MHz Stopband loss > 15 dB for f > 3 MHz Linearity IP3 > 50 dBm		
22	DX DIGITAL I/Q-KABEL	TVR290 Digital Interface Connection Cable (26 pin Mini D Ribbon Cable 14526-EZHB-XXX-0QC)	R&S SMU-Z6	1415.0201.02
23	PCI express cable 1 lane	PCIe extension cable with single lane connectors, length max. 5 m	One Stop Systems OSS-PCIe-CBL-x1 or equivalent	
24	PCIe device	External single lane PCIe device	R&S PCIe test port	5009.9002.02

1.2 Test Assemblies

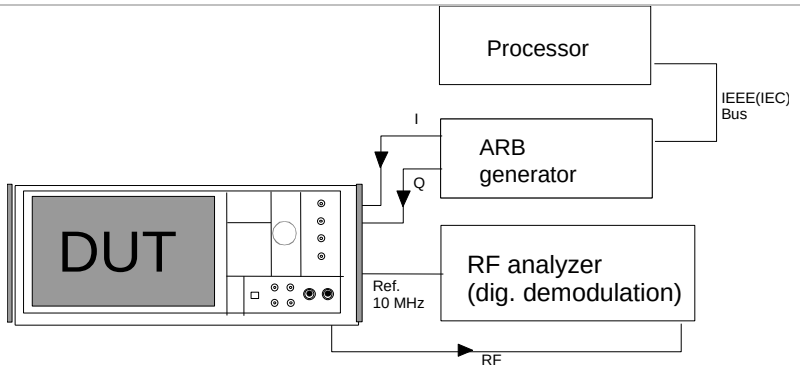
1.2.1 Test Assembly for Output Impedance (VSWR)

Test equipment	- VSWR bridge (item 10) - Signal generator (item 5) - RF analyzer (item 19)
Test setup	
	Note: *The INPUT of the directional coupler is directly screwed to the DUT. The second signal generator is connected to the line connector (OUTPUT), the analyzer to the coupling output (COUPLED) of the directional coupler. When using the R&S ZRC, connect the second signal generator directly to the ZRC IN port, the analyzer to the ZRC OUT port and the DUT to the ZRC TEST port.*

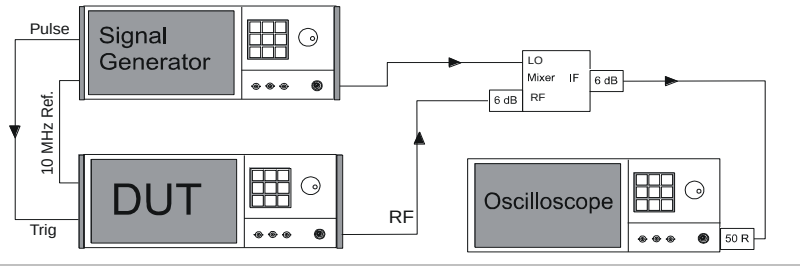
1.2.2 Test Assembly for Setting Time

Test equipment	- RF analyzer (item 19)
Test setup	

1.2.3 Test Assembly for I/Q Modulation

Test equipment	- RF analyzer (item 19) - Arbitrary waveform generator (item 14) - Software for simulation of digital modulations (item 20) - Controller (item 4)
Test setup	

1.2.4 Test Assembly for Pulse modulation

Test equipment	- Oscilloscope (item 7), - Signal Generator (item 5) - Mixer (item 9)
Test setup	

1.3 Preparation, Recommended Test Frequencies and Levels

To ensure proper conditions for the performance test and prevent setting errors, the instrument must be prepared as follows:

- Check the instrument condition. Make sure the instrument fan operation is not constrained by dust etc. The fan can be inspected through the air intake at the case bottom side.
- Allow for a minimum **warm-up time of 30 minutes** at ambient temperature.
- Carry out all **internal adjustments** (see operating manual, chapter 4, section "Internal Adjustment - Setup-System").
- Perform Preset to establish a defined **initial** state before configuring a new measurement.

The following sections describe the **procedures** for checking the rated values. The **values** are specified in the **data sheet.** Additional uncertainties introduced by the measurement equipment must be taken into account when checking the rated values.

The following table lists the important internal switch point frequencies and the recommended measurement frequencies derived from these frequencies. We recommend measurements at these frequencies unless particular test frequencies are specified. In the following, RF_{max} is the maximal settable RF (6 GHz).

For full calibration, the R&S SGT100A must be measured for RF output frequencies up to 6 GHz. To enable the full frequency range, instruments without option KB106 require installation of the service K0 key during the calibration procedure.

Table 1-2 Range limits, main test frequencies for CW Mode

Range	Frequency	Hardware switching points	Recommended test frequencies
Direct DDS Synthesis	1 MHz ≤ f ≤ 80 MHz	80 MHz	1 MHz; 5.001 MHz; 10.01 MHz; 20.01 MHz, 40.01 MHz, 60.01 MHz, 80 MHz
Divider /64	80 MHz < f ≤ 93.75 MHz	93.75 MHz	80.01 MHz; 93.75 MHz
Divider /32	93.75 MHz < f ≤ 187.5 MHz	120 MHz; 187.5 MHz	93.76 MHz; 120 MHz; 187.5 MHz
Divider /16	187.5 MHz < f ≤ 375 MHz	265 MHz; 375MHz	187.6 MHz; 265 MHz; 375 MHz
Divider /8	375 MHz < f ≤ 750 MHz	530MHz; 750MHz	375.1 MHz; 530 MHz; 750 MHz
Divider /4	750 MHz < f ≤ 1500 MHz	1060MHz; 1500 MHz	750.1 MHz; 1060 MHz; 1500 MHz
Divider /2	1500 MHz < f ≤ 3 GHz	2120 MHz; 3000 MHz	1501 MHz; 2120 MHz; 3000 MHz
Base octave	3 GHz < f ≤ 6 GHz	4000 MHz, 6000 MHz	3001 MHz; 3500 MHz; 4000 MHz; 5100 MHz; 6000 MHz

For **high-resolution measurements** in the entire frequency range, a logarithmic frequency grid in 1-2-5 sequence is recommended up to 50 MHz; above this value, linear 50 MHz steps should be used up to the upper limit frequency.

The recommended **test levels** are at the upper and lower switching threshold of the attenuator. The electronic attenuator of the DUT is switched depending on frequency, modulation parameters and level according to an internal stored table in approximately 6 dB steps. The switching thresholds can be detected under **Attenuator fixed range** in the **Level** menu. After setting all other parameters, the threshold level can be detected by level variation.

The level at which the attenuator fixed range changes is the threshold. By measuring at the last level setting of one range and the first level setting of the next range, the internal setting range borders are used. In the following, P_{max} is the highest level before switching the attenuator, and P_{min} is defined as P_{max} – 7 dB for the electronic step attenuator.

1.4 Test Procedures

1.4.1 Reference Frequency

1.4.1.1 Internal Reference Mode

Important: *Allow the DUT to warm up for at least 2 hours before starting the measurement.*

Test equipment	- RF power meter, (item 8) - Frequency counter (item 1)
Test setup	➢ Connect an RF power meter to the REF OUT output (on rear panel).
Measurement	➢ Measure the output level. It should be within the data sheet specifications. DUT setting: Internal Reference, Ref Output Frequency set to 10 MHz / 1000 MHz
Test setup	➢ Connect a calibrated frequency counter to the REF OUT output (on rear panel).
Measurement	➢ Measure the frequency. DUT setting: Internal Reference, Reference output set to 10 MHz / 1000 MHz ⇨ The frequency deviation must not exceed the sum of deviations resulting from the frequency error in the rated temperature range and from aging.

1.4.1.2 External Reference mode

<table>
<tr><td>Test equipment</td><td>- Frequency counter (item 1)
- Signal generator (item 5)
- RF power meter (item 8) or RF analyzer (item 19)</td></tr>
<tr><td>Test method</td><td>The external reference input frequency of the DUT is varied according to the data sheet and the RF output signal frequency is controlled with a frequency counter to follow this variation. The Reference output level is tested.</td></tr>
<tr><td>Preparation of measurement</td><td>➢ Connect the signal generator RF output to the REF IN input for the external reference (on rear panel) of the DUT. Connect a calibrated frequency counter to the RF output. Synchronize the signal generator and the frequency counter.
Setting on DUT:
- RF on
- Level: 0 dBm (suitable level for the frequency counter)
- Frequency: 1 GHz
- Setup ⇨Reference Oscillator
⇨ Source: External
⇨ Ext Ref Frequency: 10 MHz
⇨ REF/LO Output: REF
⇨ Output Frequency: 10 MHz
Setting on signal generator:
- RF on
- Level: 0 dBm</td></tr>
<tr><td>Measurement</td><td>➢ Set the generator frequency to the nominal Ext Ref frequency +/- 10 ppm. Measure the output frequency of the DUT.
There must be no relative frequency error and no error message in the display of the DUT.
➢ Connect the frequency counter to the DUT Ref Out connector. Measure the Ref Out frequency. There must be no relative frequency error compared to the Ext Ref frequency delivered to the DUT.
➢ Connect a RF power meter or a RF analyzer to the DUT Ref Out connector. The Ref Out level shall be within the data sheet specifications.
➢ Repeat the measurement for following combinations:
<table>
<tr><th>Ext Ref Frequency</th><th>Ext Ref Level</th><th>Ref Output Frequency</th><th>Ref Out Level Limit</th></tr>
<tr><td>10 MHz</td><td>0 dBm</td><td>10 MHz</td><td>see data sheet</td></tr>
<tr><td>10 MHz</td><td>0 dBm</td><td>1000 MHz</td><td>see data sheet</td></tr>
<tr><td>13 MHz</td><td>0 dBm</td><td>13 MHz</td><td>see data sheet</td></tr>
<tr><td>13 MHz</td><td>0 dBm</td><td>1000 MHz</td><td>see data sheet</td></tr>
<tr><td>100 MHz</td><td>0 dBm</td><td>100 MHz</td><td>see data sheet</td></tr>
<tr><td>100 MHz</td><td>0 dBm</td><td>1000 MHz</td><td>see data sheet</td></tr>
<tr><td>1000 MHz</td><td>0 dBm</td><td>1000 MHz</td><td>see data sheet</td></tr>
</table>
</td></tr>
</table>

1.4.2 Frequency

1.4.2.1 Frequency Setting

Test method	The frequency setting is tested by running the internal synthesizer adjustments to check the frequency overlap of the VCOs
Measurement	Run: Setup ⇨ Internal Adjustments ⇨ Adjust Synthesis There must be no error message.

1.4.2.2 Setting Time

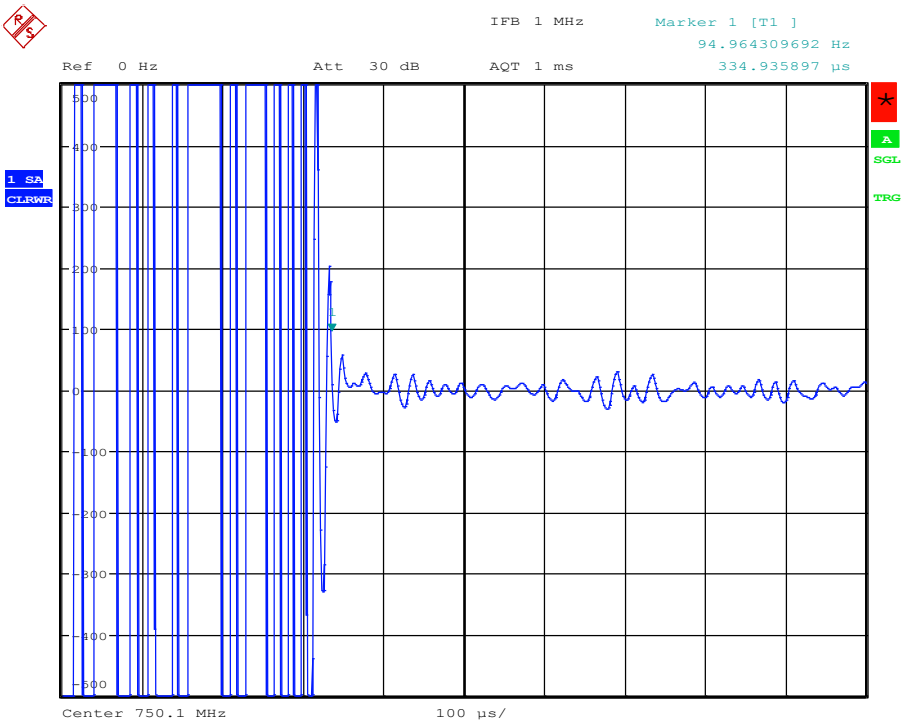
Test assembly	See section "*Test Assembly for Setting Time*", page 10.
Test method	The spectrum analyzer operates as an FM demodulator. A controller transmits the start and the stop frequency via the LAN interface by a special remote command. The DUT USER2 connector on the rear panel is programmed as trigger pulse output. The analyzer is triggered by the signal generated on the DUT USER2 output. At switch over from start to stop frequency, the settling procedure is displayed on the screen of the analyzer.
Preparation of measurement	➢ Synchronize the reference frequencies of the DUT and the analyzer. ➢ Make LAN and RF connections. ➢ Connect spectrum analyzers USER2 connector to DUT trigger output ➢ Open DUT Protection Levels 1 and 2 Settings on DUT: - **:CONNector:USER2:OMODe MLATency** - **Frequency**: start frequency unmodulated, - **Level Settings/Setting Characteristic**: Auto, - **Level:** 0 dBm, Settings on spectrum analyzer: - AMPT/REF LEVEL 0 dBm - FREQ/CENTER/STOP FREQUENCY - FM DEMOD ON - DEMOD BW 100 kHz - RANGE /DEVIATION PER DIV 200 Hz - MEAS TIME 2 ms - TRIGGER EXTERN - External triggering by positive edge at 1.4 V.

Measurement	➢ Settings on analyzer: - Set the analyzer to the stop frequency ➢ Set the DUT to the start frequency f_{start} ➢ Send the stop frequency f_{stop} from the controller to the DUT by using the command **:TEST:SPEED** Stop frequency, Test level ⇨ The externally triggered analyzer displays the settling curve. The setting time is defined as the time required making the frequency deviation from the stop frequency less than the specified deviation in the data sheet. ➢ Switch on external analog IQ-Modulation: **I/Q Settings** menu: **Source** Analog Wideband I/Q Input **State** On and supply 0.5 V DC to the I_{ext} Input Repeat the measurement. ➢ Switch on internal IQ-Modulation: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On Repeat the measurement

Recommended test frequencies and modes

f_{start}	f_{stop}	Mode
79.9 MHz	6000 MHz	CW, int IQ
6000 MHz	79.9 MHz	CW, int IQ
93.7 MHz	93.8 MHz	CW, IQ, int IQ
93.8 MHz	93.7 MHz	CW, IQ
187.4 MHz	187.6 MHz	CW, IQ
187.6 MHz	187.4 MHz	CW, IQ
374.9 MHz	375.1 MHz	CW, IQ
375.1 MHz	374.9 MHz	CW, IQ
749.9 MHz	750.1 MHz	CW, IQ
750.1 MHz	749.9 MHz	CW, IQ
1499.9 MHz	1500.1 MHz	CW, IQ
1500.1 MHz	1499.9 MHz	CW, IQ
2999.9 MHz	3000.1 MHz	CW, IQ
3000.1 MHz	2999.9 MHz	CW, IQ
3000.1 MHz	6000 MHz	CW, IQ
6000 MHz	3000.1 MHz	CW, IQ

Example of Measurement:



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The marker is set to the time when the trace enters the specified interval of 750.1 MHz ± 150 Hz. The setting time is 335 µs.

1.4.3 Spectral Purity

1.4.3.1 Harmonics

Test equipment	RF analyzer (item 19)
Test setup	➢ Connect the RF analyzer to the RF output of the DUT. ➢ Synchronize the reference frequencies of analyzer and DUT.
Measurement	Settings on analyzer: Reference level = 20 dBm, 10 dB/div. Span 0 Hz, Resolution bandwidth 10 kHz Settings on DUT: - **Frequency:** test frequencies, unmodulated - **Level:** test levels ➢ First measure the level of the fundamental P_f at the test frequency f as a reference. Then measure the signal levels P_{2*f} and P_{3*f} at twice and three times the carrier frequency f. ⇨ The harmonic spacing is the measured harmonic level referred to the fundamental: HD2 = P_f - P_{2*f} HD3 = P_f – P_{3*f} (in dBc = referred to the carrier)

Recommended test frequencies and levels	Test frequencies: 1 MHz; 5.001 MHz; 10.01 MHz; 20.01 MHz; 40.01 MHz; 60.01 MHz; 80 MHz; 80.01 MHz; 93.75 MHz; 93.76 MHz; 120 MHz; 187.5 MHz; 187.6 MHz; 265 MHz; 375 MHz; 375.1 MHz; 530 MHz; 750 MHz; 750.1 MHz; 1060 MHz; 1500 MHz; 1501 MHz; 1700 MHz; 1900 MHz; 2120 MHz; 2300 MHz; 2500 MHz; 2600 MHz; 2700 MHz; 2800 MHz; 2900 MHz; 3000 MHz; 3001 MHz; 3100 MHz; 3300 MHz; 3500 MHz; 4000 MHz; 5100 MHz; 6 GHz Test level: +8 dBm ➢ Repeat the measurement with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** Off and supply 0.5 V DC to the I_{ext} Input Test frequencies: 80 MHz; 80.01 MHz; 93.75 MHz; 93.76 MHz; 120 MHz; 187.5 MHz; 187.6 MHz; 265 MHz; 375 MHz; 375.1 MHz; 530 MHz; 750 MHz; 750.1 MHz; 1060 MHz; 1500 MHz; 1501 MHz; 1700 MHz; 1900 MHz; 2120 MHz; 2300 MHz; 2500 MHz; 2600 MHz; 2700 MHz; 2800 MHz; 2900 MHz; 3000 MHz; 3001 MHz; 3100 MHz; 3300 MHz; 3500 MHz; 4000 MHz; 5100 MHz; 6 GHz Test level: +8 dBm ➢ Repeat the measurement with internal IQ-Modulation switched on: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On Test frequencies: 1 MHz; 2 MHz; 5.001 MHz; 10.01 MHz; 20.01 MHz; 40.01 MHz; 60.01 MHz; 80.01 MHz; 100.01 MHz; 120 MHz; 1000 MHz; 2000 MHz; 3000 MHz; 4000 MHz; 5000 MHz; 6000 MHz; Test level: +8 dBm

1.4.3.2 Subharmonics

Test equipment	RF analyzer (item 19)
Test setup	➢ Connect the spectrum analyzer to the RF output of the DUT. ➢ Synchronize the reference frequencies of analyzer and DUT.
Measurement	➢ First the level of the fundamental is measured as reference, then a signal is searched for at 0.5*test frequency and 1.5*test frequency. ⇨ The subharmonic spacing is the measured level referred to the reference level (dBc = referred to the carrier).
Recommended test frequencies and levels	125 MHz to 6000 MHz in 125 MHz steps level: P_{min}

1.4.3.3 Nonharmonics

Test equipment	RF analyzer (item 19)
Test setup	➢ Connect the RF analyzer to the RF output of the DUT. ➢ Synchronize the reference frequencies of analyzer and DUT.
Measurement	Setting on DUT Level = 0 dBm ➢ First the carrier level P_f is measured at the test frequency f as reference and then the signal level P_{search} is measured at the analyzer search frequency. ⇨ The nonharmonic spacing D is the measured level referred to the reference level: $D = P_f - P_{search}$ (in dBc = referred to the carrier)
	Note: *Some of the nonharmonics suppression values to be measured might be outside analyzer specifications. In case of doubt, repeat the measurement with a 3 dB attenuator pad at the analyzer input. If the nonharmonics suppression changes the nonharmonics are due to the analyzer. Because of the bell-shaped noise of the analyzer near the carrier, smaller resolution bandwidths may have to be used. To exclude amplitude independent nonharmonics of the analyzer, use a second generator with different synthesis architecture.*

Recommended settings and search frequencies:

DUT Frequency	Analyzer search frequency
75 MHz	25 MHz
75 MHz	50 MHz
80 MHz	40 MHz
52.638421053 MHz	f_c + 130 kHz
55.562777778 MHz	f_c + 130 kHz
58.831176471 MHz	f_c + 260 kHz
62.508125000 MHz	f_c + 260 kHz
66.675333333 MHz	f_c + 260 kHz
71.437857143 MHz	f_c + 130 kHz
1000.050000000 MHz	f_c + 200 kHz
2000.150000000 MHz	f_c + 75 kHz
3000.150000000 MHz	f_c + 50 kHz
3000.150000000 MHz	f_c + 150 kHz
4000.065000000 MHz	f_c + 65 kHz
4017.915178571 MHz	f_c + 130 kHz
4056.893522727 MHz	f_c + 130 kHz
4400.132000000 MHz	f_c + 240 kHz
4419.760714286 MHz	f_c + 240 kHz
4454.698181818 MHz	f_c + 240 kHz
4480.134400000 MHz	f_c + 240 kHz
4500.065000000 MHz	f_c + 130 kHz
4613.689090909 MHz	f_c + 80 kHz
5091.003636364 MHz	f_c + 130 kHz
5142.931428571 MHz	f_c + 130 kHz
5250.115500000 MHz	f_c + 154 kHz
5409.137272727 MHz	f_c + 60 kHz
5625.081250000 MHz	f_c + 260 kHz
5920.177600000 MHz	f_c + 240 kHz
5946.587142857 MHz	f_c + 240 kHz
5966.113636364 MHz	f_c + 240 kHz
5999.740000000 MHz	f_c + 130 kHz

Repeat the measurement for frequencies >80 MHz with external analog IQ-Modulation switched on:
I/Q Settings menu:
State On
I/Q Wideband On
and supply 0.5 V DC to the I_{ext} Input

Repeat the measurement with internal IQ-Modulation switched on:
Baseband menu:
Load I/Q DC Full Scale Waveform into the ARB
Switch the ARB on
I/Q Settings menu:
Source Internal Baseband
State On

Perform the measurement for following frequencies

DUT Frequency	Analyzer search frequency
100 MHz	12.5 MHz
100 MHz	25 MHz
100 MHz	50 MHz
100 MHz	62.5 MHz
100 MHz	87.5 MHz

1.4.3.4 Non-systematic nonharmonics

Measurement	Settings on DUT: Test frequencies: 25 MHz, 60 MHz, 100 MHz, 170 MHz, 320 MHz, 560 MHz, 1000 MHz, 1900 MHz, 2900 MHz, 3000 MHz, 4500 MHz, 6000 MHz Test level 0 dBm unmodulated Recommended settings on analyzer: - Max peak detector - Filter Type: FFT - Ref-Level 0 dBm ➢ Set analyzer center frequency to 1 GHz, span to 40 MHz and resolution bandwidth to 2 kHz - Measure carrier level P - all signals other than the carrier must be below specified value ➢ Set analyzer span to 100 kHz and resolution bandwidth to 200 Hz - all signals other than the carrier must be below specified value ➢ Repeat the measurement for frequencies >80 MHz with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** On and supply 0.5 V DC to the I_{ext} Input ➢ Repeat the measurement with internal IQ-Modulation switched on: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On Test frequencies: 25.01 MHz; 60.01 MHz; 100.01 MHz; 120 MHz
	Note: *Some of the nonharmonics suppression values to be measured might be outside analyzer specifications. In case of doubt, repeat the measurement with a 3 dB attenuator pad at the analyzer input. If the nonharmonics suppression changes the nonharmonics are due to the analyzer. Because of the bell-shaped noise of the analyzer near the carrier, smaller resolution bandwidths may have to be used. To exclude amplitude independent nonharmonics of the analyzer, use a second generator with different synthesis architecture.*

1.4.3.5 Wideband Noise

Test equipment	RF analyzer (item 19)
Test setup	➢ Connect the RF analyzer to the RF output of the DUT. ➢ Synchronize the reference frequencies of analyzer and DUT.
Test method	The carrier power is measured first. Then the center frequency of the analyzer is increased by 10 MHz and the noise power in a small bandwidth is measured. The difference of the carrier power and the noise power in 1 Hz bandwidth, which is calculated from the measurement, is defined as wideband noise. Because wideband noise degrades with lower electronic levels at the output step attenuator input, the output level of the generator has to be set to the lowest level before switching the step attenuator.
Measurement	➢ Settings: - frequency: test frequency - Level: 12 dBm - determine Att-fixed range upper Level P_{upper}: - ⇨ RF ⇨ Level⇨ Att fixed range ⇨ upper - **ATT MODE** fixed - set level to P_{upper} – 7 dB ➢ Settings on analyzer: - center: test frequency - reference level DUT Level + 1 dB - Attenuator D_{min} = DUT Level - P_{1dBM} + 5 dB ⇨ round to next larger available Attenuation of the analyzer (P_{1dBM} = analyzer P1dB level at test frequency) - span 110 kHz - Detector RMS - Sweep Time Manual 1s - switch on channel power measurement with 100 kHz bandwidth ➢ Determine the channel power with the center frequency of the analyzer set to the test frequency and note it down as P_{ref}. ➢ Increase the analyzer center frequency by 10 MHz (9.9 MHz for carrier frequencies up to 100 MHz). ➢ Inhibit the switching of the attenuator with AMPT RF ATTEN MANUAL without entering a value so that the input mixer is not overdriven. ➢ Lower the reference level of the analyzer by 20 dB, read the new channel power P_{noise}. ➢ Minimize the output level on the DUT by means of RF OFF, read the channel power P_{res}.

Evaluation	➢ If the power $P_{res} < P_{noise}$ - 0.41 dB the inherent noise power of the analyzer can be subtracted: $W\_Noise = -P_{ref} + 10 * \log 10(10^{Pnoise/10} - 10^{Pres/10}) - 50dB$ ➢ If the power $P_{res} > P_{noise}$ - 0.41 dB the analyzer resolution is not sufficient for a precise measurement. The true result is in such case certainly more than 10 dB below the measured value. The result then is at least: $W\_Noise = -P_{ref} + P_{noise} - 50dB - 10dB$ ⇨The difference between the (possibly corrected) power P_{noise} in dBm and the power P_{ref} in dBm is the broadband noise floor in dBc.
Recommended test frequencies	➢ 1 MHz; 5.001 MHz; 10.01 MHz; 20.01 MHz; 40.01 MHz; 60.01 MHz; 80 MHz; 80.01 MHz; 93.75 MHz; 93.76 MHz; 120 MHz; 120.1 MHz; 187.5 MHz; 187.6 MHz; 265 MHz; 375 MHz; 375.1 MHz; 530 MHz; 750 MHz; 750.1 MHz; 1059 MHz; 1500 MHz; 1501 MHz; 2120 MHz; 3000 MHz; 3001 MHz; 3500 MHz; 4000 MHz; 5100 MHz; 6 GHz ➢ Repeat the measurement for f > 80 MHz with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** On and supply 0.5 V DC to the I_{ext} Input ➢ Repeat the measurement with internal IQ-Modulation switched on: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On Test frequencies: 1 MHz; 5.001 MHz; 10.01 MHz; 20.01 MHz; 40.01 MHz; 60.01 MHz; 80 MHz; 80.01 MHz; 93.75 MHz; 93.76 MHz; 120 MHz; 1 GHz; 2 GHz; 3 GHz; 4 GHz; 5 GHz; 6 GHz;

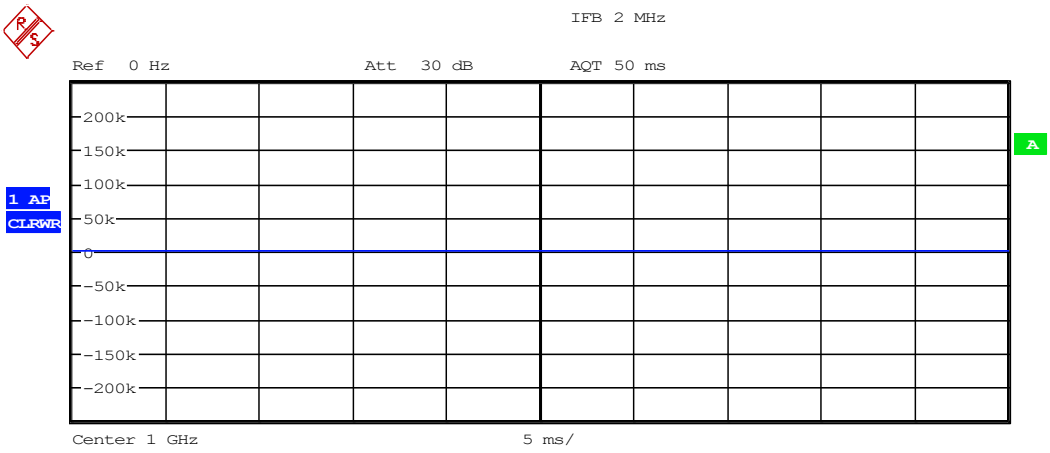
1.4.3.6 SSB Phase Noise

Test assembly	Connect Phase Noise Analyzer (item 6) to RF socket of the DUT.
Test method	The SSB phase noise of the DUT can be measured directly using a Phase Noise Test Set. An R&S FSUP or any other analyzer with phase noise option is suitable if its own phase noise is at least 6 dB less than the guaranteed DUT phase noise.
Measurement	Set the level of the DUT to 10 dBm and measure the phase noise at 20 kHz offset with the analyzer in phase noise mode.
Recommended test frequencies	➢ 1 GHz, 2 GHz, 4 GHz, 6 GHz ➢ Repeat the measurement with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** On and supply 0.5 V DC to the I_{ext} Input

1.4.3.7 Residual FM

Test assembly	Connect RF analyzer to RF socket of the DUT.
Test method	The FM demodulator of the analyzer is used to FM-demodulate the CW signal of the DUT. By setting the AF-low-pass and high-pass-filters the RMS value in the desired bandwidth can be measured. The value displayed is the sum of the analyzer residual FM and the DUT residual FM. Because both components are uncorrelated, the displayed result is worse than residual RMS of the DUT alone. Therefore, if the sum is in tolerance according to the data sheet the DUT is also in tolerance.
Measurement	➢ Settings on DUT: - Frequency: 1 GHz - Level: 0 dBm ➢ Settings on analyzer: - CENTER: 1 GHz - REFERENCE LEVEL: 1 dBm - FM DEMOD - FM DEMOD ⇨ MEAS TIME: 100 ms - FM DEMOD ⇨ DEMOD BW: 200 kHz - FM DEMOD ⇨ AF-FILTER ⇨ HIGH PASS AF FILTER: 300 Hz - FM DEMOD ⇨ AF-FILTER ⇨ LOW PASS AF FILTER: 3 kHz ➢ The Residual FM in the frequency range 300 Hz – 3 kHz is the RMS value displayed. ➢ Repeat the measurement with setting the HIGH PASS AF FILTER: to 20 Hz and the LOW PASS AF FILTER to 23 kHz.

Example:



Frequency Modulation Summary

Coupling	DC		Carrier Offset	45.639	Hz
Deviation	+peak	12.93 Hz	Carrier Power	-0.91	dBm
	-peak	-12.41 Hz	Modulation Frequency	---	Hz
	±peak/2	12.67 Hz	Sampling Rate	250	kHz
	RMS	3.465 Hz	Record Length	12501	
			Demod Bandwidth	200	kHz
			AF Filter HP	20	Hz
			LP	23	kHz

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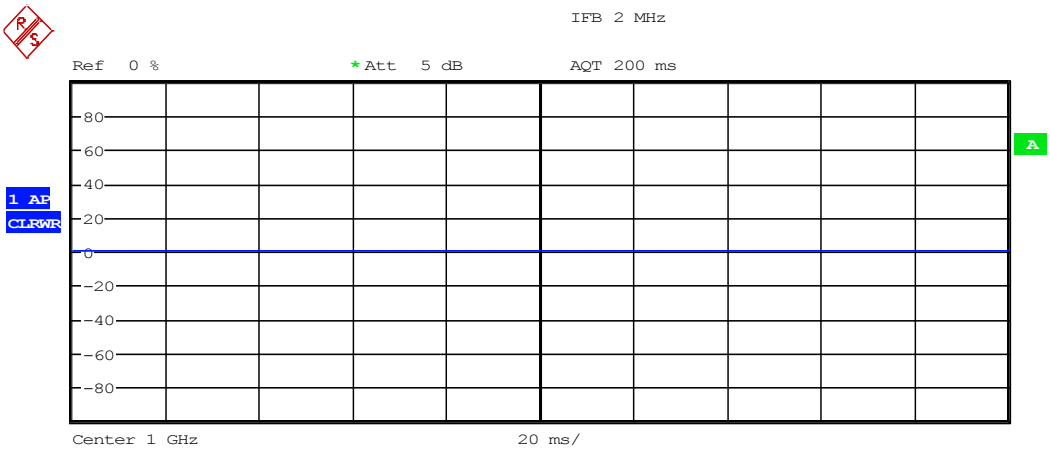
Residual FM = 3.465 Hz

1.4.3.8 Residual AM

Test assembly	Connect RF analyzer to RF socket of the DUT.
Test method	The FM demodulator of the analyzer is used to AM-demodulate the CW signal of the DUT. By setting the AF-low-pass and high-pass-filters the RMS value in the desired bandwidth can be measured. The value displayed is the sum of the analyzer residual AM and the DUT residual AM. Because they are uncorrelated, the displayed result is worse than residual RMS of the DUT alone. Therefore, if the sum is in tolerance according to the data sheet the DUT is also in tolerance.
Measurement	➢ Settings on DUT: - frequency: 1 GHz - Level: 0 dBm ➢ Settings on analyzer: - CENTER: 1 GHz - REFERENCE LEVEL: 1 dBm - AMPT ⇨ RF ATTEN MANUAL: 10 dB - FM DEMOD - FM DEMOD ⇨ RESULT DISPLAY ⇨ AM - FM DEMOD ⇨ MEAS TIME: 100 ms - FM DEMOD ⇨ DEMOD BW: 200 kHz - FM DEMOD ⇨ AF-FILTER ⇨ HIGH PASS AF FILTER: 20 Hz - FM DEMOD ⇨ AF-FILTER ⇨ LOW PASS AF FILTER: 20 kHz - SETUP ⇨ SIGNAL SOURCE ⇨ YIG FILTER: OFF ➢ The Residual AM in the frequency range 20 Hz – 23 kHz is the RMS value displayed.
Test frequencies	5 MHz, 450 MHz, 1 GHz, 2.2 GHz, 3.2 GHz, 4.5 GHz, 6 GHz

Example:



Amplitude Modulation Summary

Modulation Depth		0.022 %	Carrier Power		-0.87 dBm
Modulation +peak		0.022 %	Modulation Frequency		--- Hz
-peak		-0.023 %	Sampling Rate		250 kHz
±peak/2		0.022 %	Record Length		50001
RMS		0.005 %	Demod Bandwidth		200 kHz
			AF Filter	HP	20 Hz
				LP	23 kHz

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Residual AM = 0.005 %

1.4.4 Level Data

1.4.4.1 Level Uncertainty

Test method	The level uncertainty is measured in two steps. First, the **frequency response** is measured at a fixed level with high frequency resolution. Then the **level dependent uncertainty** is measured at fixed frequencies over the specified range.
Test equipment	- RF power meter (item 8) - RF analyzer (item 19)

Test method for levels in measurement range of power meter

Test setup	Connect power meter to RF output socket.
Measurement	➢ Setting on DUT: - Levels : test level - Level Settings⇨Setting Characteristic: Auto Measure the level $P_{absolute}$ at the recommended test frequencies up to RF_{max}. ⇨ The level error is the deviation of the measured level from the set value. ➢ Repeat the measurement with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** On and supply 0.5 V DC to the I_{ext} Input Use test frequencies according to the recommended test frequency set starting at 80 MHz up to RF_{max} ➢ Repeat the measurement with internal IQ-Modulation switched on: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On Use test frequencies according to the recommended test frequency set
Recommended test levels for frequency response measurement	➢ ALC Mode AUTO +15 dBm, 0 dBm
Recommended test frequencies for the level frequency response measurement	CW mode: 1 MHz; 5 MHz to 75 MHz in 10 MHz steps; 80 MHz; CW and external IQ mode: 80.01 MHz; 87.5 MHz to 6 GHz in 25 MHz Steps Internal IQ mode: 1 MHz; 2 MHz; 5 MHz; 10 MHz to 120 MHz in 10 MHz steps; 120.01 MHz; 212.5 MHz to 6 GHz in 100 MHz steps

Test method for low levels

Test principle	Low levels can only be measured using a frequency selective measurement instrument. Spectrum analyzers with digital IF are best suited for this measurement due to their low linearity error. The absolute accuracy of these analyzers is not sufficient for this measurement. So a relative measurement referred to the measurements performed with the power meter is used to increase the accuracy of the measurement. Only by switching the input attenuator and preamplifier (when available) of the analyzer the needed dynamic range of more than 120 dB can be reached. After switching the analyzer attenuator or preamplifier, a continuity calibration is to be carried out. It is therefore recommended to switch the attenuator not until reaching 50 dB under full scale, since the linearity errors are very small in this range.
Test setup	➢ Connect the spectrum analyzer to the RF output of the DUT with **precision RF measurement cables**.
Measurement	➢ Settings on DUT **Frequency** recommended test frequencies **Level** +15 dBm, unmodulated ➢ Setting on the analyzer Test frequency SPAN 10 Hz FILTER TYPE FFT RES BW 5 Hz set Marker to test frequency Reference level P_{ref} = +17 dBm ➢ Read the marker level P_{Marker} and calculate the correction factor $C = P_{absolute} - P_{Marker}$ with $P_{absolute}$ from the measurements performed with the power meter. ➢ Now decrease the DUT level in 5 dB steps and calculate the output power P by adding the Correction factor C to the marker readout. ➢ As soon as the marker level P_{Att1} is lower than P_{ref} -45 dB increase the sensitivity of the analyzer by reducing the input attenuation, switching on the internal preamplifier if available and reducing the resolution bandwidth to 1 Hz for levels below -90 dBm. Set the analyzer reference level to P_{Att1} + 1 dB. After switching the analyzer sensitivity read out the marker level P_{Att2} and recalculate the Correction factor: $C_{new} = C_{old} + P_{Att1} - P_{Att2}$ ➢ Continue the measurement down to -120 dBm in 5 dB steps.
Recommended test frequencies.	1.02 MHz, 77.5 MHz, 512.5 MHz, 1087.5 MHz, 2187.5 MHz, 3187.5 MHz, 4012.5 MHz, 5012.5 MHz, 5987.5 MHz

1.4.4.2 Output Impedance

Test assembly	See section "*Test Assembly for Output Impedance (VSWR)*", page 10.
Test method	For the VSWR measurement of a source the effect of the level control must be taken into account. For this purpose, an auxiliary generator is used which transmits a wave with a slightly offset carrier frequency into the DUT. The difference frequency has to be within the control bandwidth of the level control. In the case of ideal source impedance, the wave from the auxiliary generator is not reflected by the DUT. In the case of not ideal DUT source impedance, the output wave of the DUT and the reflected wave of the auxiliary generator are superimposed on one another. A directional coupler couples a part of these outgoing superimposed waves to an analyzer. The frequency offset, results in a beat of the superimposed outgoing waves. The VSWR is the ratio between the maximum and minimum amplitude of the beat.
Measurement	➢ Settings on DUT: - **Level:** test level - **Frequency**: test frequency, unmodulated - Increase the level control bandwidth using the command **CALibration:LEVel:BWIDth** HIGH ➢ Settings on spectrum analyzer: - Test frequency, span 0 Hz, test level - Resolution and video bandwidth 10 kHz - Linear level scale - Sweep time 20 ms ➢ Settings on second signal generator: - set the frequency to the test frequency – 100 Hz, - set minimum level, unmodulated. ➢ Vary the reference level to bring the line displayed on the screen of the spectrum analyzer approximately into the middle of the screen. Measure the voltage of the signal V_{ref}. ➢ Unscrew the VSWR bridge from the DUT and let the test port open. Increase the level of the second signal generator until the voltage on the analyzer is V_{ref} ± 0.5 %. ➢ Screw the VSWR bridge onto the DUT again. ➢ Measure the maximum voltage Vmax and minimum voltage Vmin of the sinusoidal trace. Calculate the VSWR: VSWR = Vmax/Vmin

Recommended test frequencies and levels	➢ Test frequencies: from 1 MHz every 50 MHz up to RF_{max}. ➢ Note: The DUT passive attenuator stage numbers range from 0 (lowest attenuation) to 19 (highest attenuation), the active attenuator stage numbers range from -1 (highest gain) to -4. The command :sour:pow:att:stag? delivers the actual attenuator stage number. ➢ Test levels: Vary the DUT level such that the attenuator stage 5 is activated and perform the VSWR measurement. Increase the level until the attenuator stage is switched and perform the next measurement. Repeat the procedure until the measurement has been performed at a negative attenuator stage number.

1.4.4.3 Setting Time

Test assembly	See section "*Test Assembly for Setting Time*", page 10.
Test method	The RF analyzer is operated as a fast level meter in zero span. A controller transmits the start and the stop level via the LAN interface by a special remote command. The DUT USER2 connector on the rear panel is programmed as trigger pulse output. The analyzer is triggered by the signal generated on the DUT USER2 output. At switch over from start to stop level, the settling procedure is displayed on the screen of the analyzer.
Preparation of measurement	➢ Synchronize the reference frequencies of the DUT and the analyzer. ➢ Make LAN interface and RF connections. ➢ Connect the spectrum analyzer trigger input to the DUT USER2 output ➢ Open DUT Protection Levels 1 and 2 ➢ Setting on DUT: - **:CONNector:USER2:OMODe MLATency** - **Frequency**: test frequency - **Level:** start level ➢ Settings on spectrum analyzer: - REFERENCE LEVEL: target level + 3 dB - AMPLITUDE LOG RANGE 10 dB - RESOLUTION BANDWIDTH 200 kHz - VIDEO BANDWIDTH 2 MHz - SPAN 0 Hz - SWEEP TIME: 1 s / 2 ms - TRIGGER EXTERN - External triggering by positive edge at 1.4 V.

Measurement	➢ Send the stop level from the controller to the DUT by using the command **:TEST:SPEED** Test frequency, Stop level. ⇨ The externally triggered analyzer displays the settling curve. The setting time is defined as the time from which on the level deviation from the final level (1 second after switch over) is less than the specified deviation in the data sheet. ➢ Measure the following steps with Level Characteristic: Auto (ALC state Table&On) ➢ Measure the following steps with ALC state On ➢ Measure the following steps with external analog IQ-Modulation switched on: **I/Q Settings** menu: **State** On **I/Q Wideband** On, ALC state Table&On and supply 0.5 V DC to the I_{ext} Input ➢ Repeat the measurement with internal IQ-Modulation switched on: **Baseband** menu: Load I/Q DC Full Scale Waveform into the ARB Switch the ARB on **I/Q Settings** menu: **Source** Internal Baseband **State** On ALC state Table&On
Recommended test frequencies and levels	**Frequencies**: 1 MHz, 30 MHz, 375 MHz, 1.1 GHz, 2.2 GHz, 3.2 GHz, 6 GHz Start level: -120 dBm; Stop level: +15 dBm Start level: -35 dBm; Stop level: -5 dBm

1.4.5 Pulse Modulation (R&S SGT-K22)

1.4.5.1 ON/OFF Ratio

Test equipment	- RF analyzer (item 19) - Pulse generator (item 11)
Test setup	To determine the ON/OFF ratio, connect the RF analyzer to the RF output and leave the USER2 connector of the DUT unconnected.
Measurement	➢ Setting on DUT: **RF On** **Level** 0 dBm **Frequency** recommended test frequencies **Pulse Modulation** menu: **Source External** **State** On **Polarity** Inverse ➢ Setting on Analyzer **FREQ/CENTER** test frequency **SPAN** 0 Hz **AMPT/REF LEVEL** 0 dBm **BW ⇨ RES BW MANUAL** 3 kHz **SWEEP ⇨ SWEEP TIME MANUAL** 100 ms **MEAS ⇨ TIME DOM POWER** on ➢ Determine the output level of the DUT at the recommended test frequencies with **Pulse Modulation ⇨ Polarity** Inverse and **Pulse Modulation ⇨ Polarity** Normal. ⇨ The level difference between the output level with Polarity Inverse and Polarity Normal is the ON/OFF ratio.
Recommended test frequencies	20 MHz, 80 MHz, 200 MHz to 6 GHz in steps of 200 MHz

1.4.5.2 Rise/ Fall Time and Pulse Overshoot

Test assembly	See section "*Test Assembly for Pulse modulation*", page 11.
Test method	The RF signal is down converted to 0 Hz in phase. Thus, the IF output reproduces the RF amplitude vs. time.
Measurement	➢ Setting on pulse generator: For adjustment statically high level, for measurement square wave pulse sequence with a frequency of 1 MHz, TTL level ➢ Setting on DUT: **RF** On **Level** 0 dBm **Frequency:** recommended test frequencies **Pulse Modulation** menu: **Source** External **State** On ➢ Setting on Signal Generator: **RF** On **Level:** recommended LO-Level of Mixer **Frequency:** same as DUT ➢ Setting on oscilloscope: Adjust V/div according to the mixer in use Time base 20 ns/div Trigger: - for adjustment free running, - for measurement 50 % of signal amplitude, rising and falling edge. ➢ Adjustment: At each test frequency adjust phase using menu **Frequency/Phase / Delta Phase**. Vary the **Delta Phase** to obtain maximum signal output at the mixers IF port. The voltage at maximum corresponds to 100 % of RF amplitude. ➢ Measurement: Evaluate the down converted pulse-modulated signal on the oscilloscope: **Rise time** = time between 10% and 90% of signal amplitude **Fall time** = time between 90% and 10% of signal amplitude **Pulse Overshoot**: Determine the peak value of demodulated signal V_{peak} and the signal level of settled pulse $V_{settled}$ Pulse Overshoot [in %] $= 100 * \frac{V_{Peak} - V_{settled}}{V_{settled}}$
Recommended test frequencies	➢ 700 MHz, 1 GHz to 6 GHz in steps of 1 GHz

1.4.5.3 Video Crosstalk

Test equipment	- Oscilloscope (item 7) - Pulse generator (item 11)
Test setup	➢ To determine the video crosstalk, connect the oscilloscope input to the RF output socket of the DUT via a 50 Ω feed through termination, connect the pulse generator output to the USER2 connector of the DUT and connect the trigger input of the oscilloscope.
Measurement	➢ Setting on pulse generator: Square wave pulse sequence with a frequency of 100 kHz, TTL level ➢ Setting on DUT: **RF On** **Frequency:** recommended test frequencies **Level:** recommended test levels **Pulse Modulation** menu: **State** On **Source** Extern ➢ Settings on the oscilloscope **Amplitude** 150 mV/Div **Sweep Time** 10 ns/Div **Bandwidth** 500MHz **Trigger Offset** -20 ns **Trigger Source** Trigger Input **Trigger Level** 1.4 V **Trigger Slope** positive ➢ Measure the peak to peak signal level at the rising edge of the pulse. Set trigger slope to negative and measure the peak to peak signal level at the falling edge of the pulse. ⇨ The peak to peak value at the rising and the falling edge have to be below the guaranteed video crosstalk.
Recommended test frequencies and levels	➢ Test frequencies 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz ➢ Test levels 5 dBm, 10 dBm

1.4.5.4 Pulse Video Signal

Test equipment	- Oscilloscope (item 7)
Test setup	➢ Connect the USER2 connector of the DUT to the oscilloscope.
Measurement	➢ Setting on DUT: **Pulse Modulation** menu: **State** On **Source** Pulse Generator **Pulse Generator** Menu: **Pulse Mode** Single **Pulse Width** 50 ns **Pulse Period** 100 ns **Connector / Trigger Settings** Menu: **Connector Mode** Video Out ➢ Settings on the oscilloscope **Amplitude** 1 V/Div **Time base** 25 ns/Div **Trigger Level** 1.4 V **Input impedance** 50 Ω ➢ Check the signal for a symmetric square wave with 100 ns pulse period and 1.65 V ± 0.3 V amplitude.

1.4.6 I/Q modulation

1.4.6.1 Input Impedance (VSWR)

Test equipment	See section "*Test Assembly for Output Impedance (VSWR)*", page 10.
Test method	Same as for the output impedance of the DUT.
Test setup	Connect the test port of the VSWR bridge to the I or Q input instead of the RF output.
Measurement	➢ Settings on DUT: **Frequency** 1 GHz **RF** on **Level** 0 dBm (PEP) **I/Q Settings** menu: **State** On **I/Q Wideband** On, ➢ Settings on signal generator: - **Level:** 10 dBm - **Frequency:** test frequencies Let the measuring port of the VSWR bridge unconnected and measure the level P_{ref} as reference level. Connect the VSWR bridge to the I input and measure the level P_I. Calculate the VSWR: $VSWR = \frac{1+\sqrt{P_I / P_{ref}}}{1-\sqrt{P_I / P_{ref}}}$ Repeat the measurement for the Q input.
Recommended test frequencies	1 MHz, 10 MHz, 20 MHz, 40 MHz, 60 MHz, 80 MHz, 100 MHz, 150 MHz to 500 MHz in steps of 50 MHz

1.4.6.2 Error Vector

Test assembly	See section "*Test Assembly for I/Q Modulation*", page 11.
Measurement	Instead of a static measurement, an equivalent dynamic measurement with a low symbol rate is carried out. ➢ Settings on DUT: **RF On** **Level** 0 dBm (PEP) **I/Q Settings** menu: **State** On **I/Q Wideband** Off ➢ Generate a modulation signal on the ARB generator using the controller and the simulation program: - Modulation 16QAM - No coding - SQR COS filter with α = 0.5 - PRBS-9 data sequence - Pulse width and over sampling 32 - Length 100 symbols - Symbol clock 10 kHz ➢ Check if the channels on the ARB generator are equal and adjust if necessary. ➢ Make the corresponding settings on the demodulator. Result length 80 symbols. ➢ Measure the error vector magnitude (peak and rms) at the recommended test frequencies.
Recommended test frequencies	80.01 MHz, 250 MHz to 6 GHz in steps of 250 MHz

1.4.6.3 Residual Carrier and Leakage

Test equipment	RF analyzer (item 19)
Test setup	➢ Connect the RF analyzer to the RF output of the DUT.
Measurement	➢ Settings on DUT: **RF On** **Frequency** test frequency **Level** 0 dBm **Level menu:** **ALC State** Off(Table) **I/Q Settings** menu: **State** Off **I/Q Wideband** Off ➢ Settings on analyzer: FREQ/CENTER = test frequency, SPAN 1 MHz, AMPT/REF LEVEL = test level ➢ First measure the unmodulated level P_{ref} as a reference. ➢ Then switch on I/Q modulation with 50 Ohm terminated I- and Q-inputs (**I/Q Settings** menu: **State** On, **Source** Analog) and measure the residual carrier level $P_{carrier}$. ⇨ The carrier suppression in dBc is: $D_{carrier} = P_{ref} - P_{carrier}$ in dBc = referred to the carrier. ➢ Set **Impairments State** to On and **Leakage** to 2 % on the DUT. Starting from 100 MHz and then every 100 MHz measure the residual carrier. ⇨ The residual carrier should increase to 2 % (-34 dBc).
Recommended test frequencies	87.5 MHz to 5987.5 MHz in 25 MHz steps

1.4.6.4 Adjacent Channel Power for 3GPP FDD

Test equipment	RF analyzer (item 19) Arbitrary waveform generator (item 14) Lowpass filter (item 21)
Test setup	➢ Connect the IQ-modulation source to the Lowpass filter inputs. ➢ Connect the Lowpass filter outputs to the I/Q-inputs of the DUT. ➢ Connect RF analyzer to RF output of DUT.
Test method	➢ Set standard 3GPP FDD Test Model 1-64 in the modulation source baseband and feed the I/Q signal into the DUT I/Q-inputs. Perform the measurements with the 3GPP measurement setting of the R&S FSQ. Use lowpass filtering of the I/Q signals to avoid degradation of the ACPR measurement by baseband generator noise.
Measurement	➢ Settings on DUT **Level:** 10 dBm (PEP) **Frequency:** Test frequency **I/Q Settings** menu: **State** On **I/Q Wideband** Off ➢ Settings on DUT or signal generator **3GPP FDD:** **Test Setups** Test_Model_1_64channels **State** ON ➢ Settings on analyzer **FREQ CENTER**: test frequency **MEAS → CHAN PWR ACP** → **CP /ACP STANDARD** WCDMA 3GPP FWD → **SWEEP TIME** 1 sec → **NOISE CORR ON** → **ADJUST REF LVL** ➢ Measure ACP: Read out Adjacent Channel and Alternate Channel (take the larger of the two measurement values UPPER/LOWER)
Recommended test frequencies	1800 MHz, 2000 MHz, 2200 MHz

1.4.6.5 Frequency Response of Baseband Bypass path

Test equipment	- RF Power meter (item 8) - Signal generator (item 5)
Test setup	➢ Connect the RF output of the DUT to the power meter and connect the signal generator to the **I** input of the DUT.
Test method	In the Baseband Bypass mode, the DUT operates like a controllable gain amplifier with I and Q as input connectors and RF OUT as output connector. By applying a sinewave AC voltage of variable frequency to the I (or Q) input and measuring the RF OUT level, the frequency response can be determined.
Measurement	➢ Settings on DUT: **RF On** **:SOURce:OPMode |BBBYpass** **Level** 10 dBm (PEP) **ATT MODE** fixed ➢ Setting on signal generator: Level 4 dBm corresponding to 0.5 V (Vpeak) ➢ Measure the level at RF OUT at the recommended test frequencies ⇨ The modulation frequency response is the difference between the highest and the lowest measured sideband level.
Recommended test frequencies	1 MHz, from 10 MHz to 150 MHz in steps of 10 MHz

1.4.6.6 Level linearity of Baseband Bypass path

Test equipment	- RF analyzer (item 19) - Signal generator (item 5)
Test setup	➢ Connect the RF output of the DUT to the power meter, and connect the signal generator to the I input of the DUT.
Test method	In the Baseband Bypass mode, the DUT operates like a controllable gain amplifier with I and Q as input connectors and RF OUT as output connector. By applying signal to the I (or Q) input, varying the DUT level setting and measuring the RF OUT level, the level linearity can be determined.
Measurement	➢ Settings on DUT: **RF On** **:SOURce:OPMode |BBBYpass** **Level** Test level **ATT MODE** fixed ➢ Setting on signal generator: Level 4 dBm corresponding to 0.5 V (Vpeak) Frequency: Test frequency ➢ Setting on the analyzer Test frequency Reference level = 25 dBm SPAN 10 Hz FILTER TYPE FFT RES BW 5 Hz set Marker to test frequency ➢ Read the marker level P_{ref} ➢ At all test levels, read the marker level P_{Marker} and calculate the level error referred to P_{ref}.
Recommended test frequencies	1 MHz, 20 MHz, 80 MHz
Recommended test levels	Test levels: Set level to 0 dBm and determine P_{max}. Use test levels from P_{max} down to P_{max} – 20 dB in steps of 1 dB.

1.4.7 Internal Baseband

1.4.7.1 Modulated RF Frequency Response over the Complete Unit

Test equipment	Signal analyzer R&S FSQ (Item 19)
Test setup	➢ Connect the RF output of the DUT to the signal analyzer.
Test method	A single sideband signal is generated using a DC Test-Waveform. The test frequency is set with the **Frequency Offset** function in the Baseband menu. Test frequencies are set one after the other, 0 Hz is the reference. The modulation frequency response is determined by measuring the sideband power as a function of the frequency of the applied AC voltage. The difference between the highest and lowest sideband level, found by varying the modulation frequency, is the frequency response to be measured.

Measurement	➢ Settings on DUT **RF On** **Frequency:** measurement frequencies **Level:** 0 dBm **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **I/Q Mod:** On **I/Q Wideband**: ON **Optimization Mode**: High Quality **Automatic Level Control: State:** Off (Table) ➢ Settings on analyzer FREQ CENTER measurement frequency + test frequency AMPT/REF LEVEL 5 dBm, SPAN 5 MHz ➢ For all measurement frequencies with the specified frequency offset measure the sideband level. For the reference check the absolute level (0dBm ± 1dB). The modulation frequency response is the difference from the highest to the lowest sideband. **Test frequencies:** 0Hz(reference), ±1MHz, ±3MHz, ±10MHz, ±20MHz, ±30MHz, Additional with option K521: ±40MHz, ±50MHz, ±60MHz, Additional with option K522: ±80MHz, Additional with option K523: ±100MHz, ±120MHz **Measurement frequencies**: 850 MHz, 1750 MHz, 2200 MHz, 5000 MHz Additionally for low frequency I/Q mode: **Test frequencies:** 0Hz(reference), ±1MHz, ±3MHz, ±10MHz, ±20MHz, ±30MHz, Additional with option K521: ±40MHz, ±50MHz, ±59,5MHz **Measurement frequencies**: 60,5MHz

1.4.7.2 Image Rejection over the Complete Unit

Test equipment	Signal analyzer R&S FSQ (Item 19)
Test setup	➢ Connect the signal analyzer to the RF output of the DUT.
Test method	A single sideband signal is generated using a DC Test-Waveform. The offset is set with the **Frequency Offset** function in the Baseband menu. The image rejection is the difference between the shifted signal and its mirror on the opposite side of the center frequency.
Measurement	➢ Settings on DUT **RF On** **Frequency:** 1 GHz **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **I/Q Wideband**: ON **Optimization Mode**: High Quality ➢ **Frequency Offset:** **±**10 kHz, **±**10 MHz, **±**20 MHz, **±**30 MHz Additional with option K521: **±**40 MHz, **±**50 MHz, **±**60 MHz, Additional with option K522: **±**70 MHz, **±**80 MHz Additional with option K523: ±90 MHz, ±100 MHz, ±110 MHz, ±120 MHz ➢ Settings on analyzer FREQ CENTER 1 GHz SPAN = 3 x offset frequency BW COUPLING RATIO SPAN / RBW MANUAL 300 AMPT/REF LEVEL 5 dBm MKR /MARKER 1 set to peak ➢ In the displayed spectrum, use MARKER DELTA to measure the image rejection.

1.4.7.3 Aliasing Filter – D/A Converter, Interpolation Spectra

Note: *Make sure that the measured spurious signal does not come from the analyzer. The following tests can be performed for this purpose:*

- *Switch off the signal from the DUT and repeat the measurement; if the signal remains, it may come from the analyzer.*
- *Output the signal from the DUT with a slight frequency offset; if the signal remains, it may come from the analyzer.*

Test equipment	Signal analyzer R&S FSQ (Item 19)
Test setup	Connect the signal analyzer to the RF output of the DUT. Synchronize the reference frequencies of the DUT and the analyzer.
Test method	A single sideband signal is generated using a DC Test-Waveform. The test frequency is set with the Frequency Offset function in the Baseband menu. The level measured at the measurement frequency gives the value for the suppression of the interpolation.
Measurement	➢ Settings on DUT **RF On** **Frequency:** 1GHz **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **I/Q Mod:** On **I/Q Wideband**: ON **Optimization Mode**: High Quality ➢ **Frequency Offset**: test frequency Settings on analyzer: FREQ CENTER: measurement frequency SPAN 0 Hz AMPT / REF LEVEL - 10 dBm BW / RES BW MANUAL 30 kHz BW / SWEEP TIME MANUAL 200 ms TRACE / DETECTOR RMS MKR / MARKER 1 Test frequency: Measurement frequencies: 29.9 MHz 700MHz + Test frequency 29.9 MHz 1300MHz – Test frequency Additional with option K521: 59.9 MHz 700MHz + Test frequency 59.9 MHz 1300MHz – Test frequency Additional with option K522: 79.9 MHz 700MHz + Test frequency 79.9 MHz 1300MHz – Test frequency Additional with option K523: 119.9 MHz 700MHz + Test frequency 119.9 MHz 1300MHz – Test frequency

1.4.7.4 USER Connector Test

Test equipment	one SMA cable
Test setup	Make the following SMA connections on the instrument: from: USER1 to: USER2
Test method	Self-test by means of connection test
Measurement	➢ Start selftest via remote control with commands `TEST:BB:CONN?`

1.4.7.5 DIGITAL IQ IN/OUT Connector

Test equipment	➢ Signal generator (Item 5), equipped with Digital Output (B18) ➢ Cable for Digital-Baseband IO (Item 22)
Test setup	➢ 1. Connect signal generator Digital Output to the DIGITAL IQ IN/OUT of the DUT with the Mini D Ribbon cable.
Test method	Connect generator and read device name via Digital I/O interface. (e.g. "smu200a (104970) out a")
Measurement	Send DUT command "SOURce:BBIN:CDEVice?", the response string must be the connected generator (e.g. "smu200a (104970) out a"). In case of fault the string “No device connected ()” returns.

1.4.7.6 GSM and GSM Normal Burst

The equipment layout for generating GSM/EDGE signals includes the option R&S SGT-K240 (Digital Standard GSM/EDGE).

Test equipment	Signal analyzer R&S FSQ including options R&S FSQ-K70 (Vector Signal Analysis) and R&S FS-K5 (GSM/EDGE) (Item 19)
Test setup	➢ Connect signal analyzer to RF output of DUT.
Measurement method	1. Load Waveform with a GSM-Signal. Perform the measurements with the GSM measurement setting of the R&S FSQ. 2. Load Waveform with a GSM-Signal with one GSM-Slot. Perform the measurements with the GSM measurement setting of the R&S FSQ.
Measurement 1	➢ Settings on DUT **Level:** +13 dBm PEP **Frequencies:** 910 MHz, 1850 MHz and 5 GHz **ARB:** **Load Waveform** /var/user/UCS2010/GSM.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer VSA FREQ CENTER: 910 MHz, 1850 MHz and 5 GHz DIGITAL STANDARD GSM/EDGE GSM_NB ADJUST REF LVL ➢ Check **phase error** in Modulation Accuracy Table ➢ Settings on analyzer FREQ CENTER: 910 MHz, 1850 MHz and 5 GHz MEAS CHAN PWR ACP CP /ACP CONFIG NO. OF ADJ CHAN 3 CHANNEL BANDWIDTH 30 kHz (all entries) CHANNEL SPACING 200 kHz (all entries) ADJUST SETTINGS MEAS CHAN PWR ACP ADJUST REF LVL NOISE CORR ON ➢ Check ACP (take the smaller of the two measurement values UPPER/LOWER in each case): Adjacent Channel, Alternate Channel, 2nd Alternate Channel

Measurement 2	➢ Settings on DUT: **Level:** +13 dBm PEP **Frequencies:** 910 MHz, 1850 MHz and 5 GHz **ARB:** **Load Waveform** /var/user/UCS2010/GSM_Burst.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer GSM/EDGE FREQ CENTER 910 MHz, 1850 MHz and 5 GHz Settings on analyzer GSM/EDGE TRANSIENT SPECTRUM START REF MEAS LIMIT CHECK PASSED has to be indicated on the analyzer. ➢ Settings on analyzer GSM/EDGE MODULATION SPECTRUM START REF MEAS LIMIT CHECK PASSED or MARG has to be indicated on the analyzer.

1.4.7.7 GSM Edge and GSM Edge Burst

The equipment layout for generating GSM/EDGE signals includes the option R&S SGT-K240 (Digital Standard GSM/EDGE).

Test equipment	Signal analyzer R&S FSQ including options R&S FSQ-K70 (Vector Signal Analysis) and R&S FS-K5 (GSM/EDGE) (Item 19)
Test setup	➢ Connect signal analyzer to RF output of DUT.
Measurement method	1. Load Waveform with a GSM Edge-Signal. Perform the measurements with the GSM measurement setting of the R&S FSQ. 2. Load Waveform with a GSM Edge-Signal with one GSM Edge-Slot. Perform the measurements with the GSM measurement setting of the R&S FSQ.
Measurement 1	➢ Settings on DUT **Level:** +13 dBm PEP **Frequencies:** 910 MHz, 1850 MHz and 5 GHz **ARB:** **Load Waveform** /var/user/UCS2010/GSM_Edge.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer VSA FREQ CENTER: 910 MHz, 1850 MHz and 5 GHz DIGITAL STANDARD GSM-EDGE EDGE_NB ADJUST REF LVL ➢ Check **EVM** in Modulation Accuracy Table ➢ Settings on analyzer FREQ CENTER: 910 MHz, 1850 MHz and 5 GHz MEAS CHAN PWR ACP CP /ACP CONFIG NO. OF ADJ CHAN 3 CHANNEL BANDWIDTH 30 kHz (all entries) CHANNEL SPACING 200 kHz (all entries) ADJUST SETTINGS MEAS CHAN PWR ACP ADJUST REF LVL NOISE CORR ON ➢ Check ACP (take the smaller of the two measurement values UPPER/LOWER in each case): Adjacent Channel, Alternate Channel, 2nd Alternate Channel

Measurement 2	➢ Settings on DUT: **Level:** +13 dBm PEP **Frequencies:** 910 MHz, 1850 MHz and 5 GHz **ARB:** **Load Waveform** /var/user/UCS2010/GSM_Edge_Burst.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer GSM/EDGE FREQ CENTER 910 MHz, 1850 MHz and 5 GHz GSM/EDGE DEMOD SETTINGS MODULATION EDGE AUTO LEVEL&TIME Settings on analyzer GSM/EDGE TRANSIENT SPECTRUM START REF MEAS LIMIT CHECK PASSED has to be indicated on the analyzer. ➢ Settings on analyzer GSM/EDGE MODULATION SPECTRUM START REF MEAS LIMIT CHECK PASSED or MARG has to be indicated on the analyzer.

1.4.7.8 Adjacent Channel Power for 3GPP FDD

The equipment layout for generating 3GPP FDD signals includes the option R&S SGT-K242 (Digital Standard 3GPP FDD).

Test equipment	Signal analyzer R&S FSQ including option R&S FSQ-K70 (Vector Signal Analysis) (Item 19)
Test setup	➢ Connect signal analyzer to RF output of DUT.
Test method	Load Waveform with a 3GPP TM1-64 Signal. Perform the measurements with the 3GPP measurement setting of the R&S FSQ.
Measurement	➢ Settings on DUT: **Level:** 0 dBm **Frequencies:** 2160 MHz **ARB:** **Load Waveform** /var/user/UCS2010/3GPP_TM1_64.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer **FREQ CENTER**: 2160 MHz **MEAS → CHAN PWR ACP** → **CP /ACP STANDARD** WCDMA 3GPP FWD → **SWEEP TIME** 1 sec → **NOISE CORR ON** → **ADJUST REF LVL** ➢ Measure ACP: Read out Adjacent Channel and Alternate Channel (take the larger of the two measurement values UPPER/LOWER)

1.4.7.9 Modulation error for WCDMA - 3GPP

The equipment layout for generating 3GPP FDD signals includes the option R&S SGT-K242 (Digital Standard 3GPP FDD).

Test equipment	Signal analyzer R&S FSQ including option R&S FSQ-K70 (Vector Signal Analysis) (Item 19)
Test setup	➢ Connect signal analyzer to RF output of DUT.
Test method	Load Waveform with a 3GPP Signal. Perform the measurements with the 3GPP measurement setting of the R&S FSQ.
Measurement	➢ Settings on DUT **Level:** +13 dBm PEP **Frequencies:** 2160 MHz and 5 GHz **ARB:** **Load Waveform** /var/user/UCS2010/3GPP_1CH.wv **State On** **I/Q Mod:** On ➢ Settings on analyzer VSA FREQ CENTER: 2160 MHz and 5GHz DIGITAL STANDARD 3G-WCDMA 3G WCDMA_FWD ADJUST REF LVL ➢ Check EVM in Modulation Accuracy Table

1.4.7.10 Additive White Gaussian Noise (R&S SGT-K62)

Test equipment	Signal analyzer R&S FSQ (Item 19)
Test setup	➢ Connect signal analyzer to RF output of DUT.
Test method	A digital modulated signal is generated and noise is added. Using the channel power measurement facility of the spectrum analyzer, the carrier power and the power of a section of the noise spectrum is determined. By expanding the result to the system bandwidth, the carrier to noise ratio can be reconstructed. The noise generator is a firmware option, realized in a FPGA. The functionality of this FPGA is tested with one measurement, data are guaranteed by design.
Measurement	➢ Settings on DUT **Level:** 0 dBm **Frequency:** 1 GHz **RF:** State ON ➢ Settings on DUT **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **I/Q Mod:** On **AWGN/IMP AWGN** Additive Noise, System Bandwidth 1 MHz Carrier/Noise Ratio 20.00 dB State ON ➢ Settings on analyzer **FREQ** CENTER: 1 GHz **MEAS** CHAN PWR ACP CP /ACP CONFIG CHANNEL BANDWIDTH 100 kHz **AMPT** REF LEVEL 10 dBm **BW** RES BW MANUAL 30 kHz VIDEO BW MANUAL 300 kHz **TRACE** DETECTOR RMS **SWEEP** SWEEP TIME MANUAL 2 sec ➢ Measure carrier power and denote as a reference. ➢ Now retune center frequency of the analyzer to 1.0003 GHz. ➢ Measure the noise power. ➢ Since the measurement bandwidth is a tenth of the system bandwidth, the result is to be corrected by 10 dB. ⇨ The result is carrier power – noise power – 10 dB.

1.4.8 IQ Output (R&S SGT-K16)

For the analog IQ Outputs the ARB_COBO2 is needed. The ARB_COBO does not support analog IQ Outputs.

1.4.8.1 Frequency Response and Imbalance

Important:
Before the measurement, Signal Analyzer R&S FSQ must be calibrated as follows by means of a reference measurement at the measurement frequency in question:

Connect the RF output of the DUT to the power meter and measure the output level.

1. Include the measured level as a reference value/calibration value in the R&S FSQ.

Test equipment	Signal analyzer R&S FSQ (Item 19).
Test setup	Connect the signal analyzer to the I, IN, Q, QN-output of the DUT.
Test method	A single sideband signal is generated using a DC Test-Waveform. The test frequency is set with the **Frequency Offset** function in the Baseband menu. The test frequencies are set one after the other. 1 MHz is the reference. The level of the reference must be checked (3,979dBm±0,1dBm). The imbalance is obtained from the level differences between I and Q at a particular frequency.
Measurement	➢ Settings on DUT **Frequency:** 100 MHz **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **Frequency Offset:** measurement frequency ➢ Settings on analyzer FREQ CENTER measurement frequencies SPAN 0 Hz AMPT/REF LEVEL – 10 dBm BW /RES BW MANUAL 100 kHz ➢ Measure the frequency response at the measurement frequencies in I, IN, Q and QN and check the deviation. **Test frequencies:** 1MHz(reference), 3MHz, 10MHz, 20MHz, 30MHz, Additional with option K521: 40MHz, 50MHz, 60MHz, Additional with option K522: 80MHz, Additional with option K523: 100MHz, 120MHz

1.4.8.2 Offset, Wideband Noise

Test equipment	Signal analyzer R&S FSQ (Item 19), Multimeter (Item 15)
Test setup	➢ Connect the signal analyzer to the I-output of the DUT.
Test method	First a reference measurement is performed with a DC Test-Waveform. and with the **Frequency Offset** of 10 MHz. Subsequently, the noise power (state off) is measured at 11 MHz.
Measurement	➢ Settings on DUT **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **Frequency Offset:** 10 MHz ➢ Settings on analyzer FREQ CENTER 10 MHz SPAN 0 Hz AMPT/REF LEVEL 5 dBm BW /RES BW MANUAL 100 kHz MKR / MARKER 1 ➢ Measure carrier at 10 MHz (reference measurement) ➢ Settings on DUT **State Off** ➢ Settings on analyzer FREQ CENTER 11 MHz AMPT/REF LEVEL - 40 dBm AMPT/RF ATTEN MANUAL 0 dBm TRACE / DETECTOR RMS BW /SWEEP TIME MANUAL 50 ms MKR FCT / NOISE MEAS ➢ Measure the noise power at 11 MHz and calculate the wideband noise. **Calculation:** Wideband noise = noise power / reference value + 3 dB. (add +3 dB, as it is sine)
Test setup	➢ Connect the multi meter to the I and Q-output of the DUT.
Measurement	➢ Check offset

1.4.8.3 Spurious Free Dynamic Range (SFDR)

Note: *Make sure that the measured spurious signal does not come from the analyzer. The following tests can be performed for this purpose:*

- *Switch off the signal from the DUT and repeat the measurement; if the signal remains, it may come from the analyzer.*
- *Output the signal from the DUT with a slight frequency offset; if the signal remains, it may come from the analyzer.*

Test equipment	Signal analyzer R&S FSQ (Item 19)
Test setup	➢ Connect the signal analyzer to the I- and subsequently to the IN, Q and QN-output of the DUT.
Test method	A single sideband signal is generated using a DC Test-Waveform. The test frequency is set with the **Frequency Offset** function in the Baseband menu. The next highest signal in the spectrum outside the carrier is measured.
Measurement	➢ Settings on DUT **Frequencies:** 100 MHz **Level:** 0 dBm **ARB:** **Load Waveform** /var/user/UCS2010/IQ_DC_OUT.wv **State On** **Frequency Offset:** test frequency **Test frequencies**: 2MHz / 5MHz / 10MHz / 20MHz / Additional with option K521: 40MHz / 60MHz Additional with option K522: 80MHz, Additional with option K523: 120MHz ➢ Settings on analyzer: FREQ CENTER: 61 MHz SPAN 120 MHz AMPT / REF LEVEL 5 dBm AMPT / RF ATTEN MANUAL 25 dB BW / RES BW MANUAL 300 kHz BW / SWEEP TIME MANUAL 50 ms TRACE / DETECTOR RMS MKR / MARKER 1 MKR -> / PEAK MKR / MARKER 2 MKR -> / NEXT PEAK ➢ If a delta occurs, read off the spacing of the spurious signals on the R&S FSQ.

1.4.8.4 Bias voltage

Test equipment	Multimeter (Item 15)
Test setup	➢ Connect the multimeter to the I/(and Q)-output of the DUT.
Test method	The bias voltage is measured for different values.
Measurement	➢ Settings on DUT **I/Q Out Settings…:** **I/Q Output Type:** Single Ended **Mode:** Variable **I/Q Level Vp (EMF): 0.1 V** **Couple I/Q Bias:** On **Bias EMF**: measurement bias ➢ Settings on multimeter COUPLING DC
Measurement	➢ Check bias: -3.6, -1, -0.3, -0.1, -0.03, -0.01, 0, +0.002, 1 and 3.6 V

1.4.8.5 Offset voltage

Test equipment	Multimeter (Item 15)
Test setup	➢ Connect the multimeter to the I and I Bar (Q and Q Bar)-output of the DUT.
Test method	The I and I Bar (or Q and Q Bar) voltage are measured for different offset values. The differential offset is obtained from the differences between I and I Bar (or Q and Q Bar) at a particular offset.
Measurement	➢ Settings on DUT **I/Q Out Settings…:** **I/Q Output Type:** Differential **Mode:** Variable **I/Q Level Vp (EMF): 1 V** **Couple I/Q Bias:** On **Bias EMF**: 0 V **Offset EMF**: measurement offset ➢ Settings on multimeter COUPLING DC
Measurement	➢ Check offset : -300, -150, -30, -10, -3, -1, 0, +0.1, 30, 150 and 300 mV

1.4.9 Phase Coherence Levels (Option R&S SGT-K90)

Test assembly	The second Signal generator (item 5) is connected to the LO IN-connector and the RF power meter (item 8) is connected to LO OUT-connector.
Test method	A LO-Signal from the second signal generator is fed into the LO input. With LO-Coupling set to external and the LO-output switched on the power at the LO-out SMA-connector is measured with the power meter.
Measurement	➢ Settings on DUT: **RF:** State ON **Level:** -30 dBm **Frequency:** recommended test frequencies **Frequency/Phase** menu: **LO Coupling** ⇨ **Source** Ext **LO Coupling** ⇨ **REF/LO Output** LO ➢ Setting on second signal generator: - **Level:** + 7 dBm / + 13 dBm - **Frequency:** recommended test frequencies - **RF:** State ON ➢ Set the frequency of the second generator to the recommended test frequencies. Set the level of the second signal generator to +7 dBm and measure the level $P_{+7\ dBm}$. Set the level of the second signal generator to +13 dBm and measure the level $P_{+13\ dBm}$ ⇨ The level $P_{+7\ dBm}$ and $P_{+13\ dBm}$ should be +10 dBm ± 3 dB
Recommended test frequencies	80.01 MHz, from 150 MHz every 100 MHz up to 6 GHz

1.4.10 PCI Express Interface

Test equipment	- PCIe test port (item 24) - PCIe cable (item 23)
Test assembly	External device with PCI express Interface is connected to R&S SGT100A PCI express connector
Measurement	➢ Check if external PCI express device can be identified by R&S SGT100A

2 Adjustment

Preliminary Remark

Setting a defined **initial** state by performing the PRESET operation prior to adjustments is recommended. In addition, a valid reference frequency is required, either by setting the instrument to internal reference or by applying an appropriate external reference signal. To ensure that the internal adjustments are valid at operating temperature, at least **30 minutes warm-up time** at this temperature must be observed.

2.1 Procedures after Module Replacement

This chapter describes the necessary measures to restore the performance of the R&S SGT100A after module replacement.

There are no manual adjustments to be performed. Internal adjustment routines are implemented for this purpose. In case external adjustment is required, contact your local Rohde & Schwarz representative.

All spare part boards are tested at Rohde & Schwarz with calibrated working standards according to the performance test. All measurement values are within the specified values including the measurement uncertainty as a minimum guard band.

After replacing an assembly, check the following table to see which service procedure is required.

Changed module	**Required action/adjustment/correction**	**Recommended Test Procedure** (refer to chapter 1 "*Performance Test*").
ARB_COBO	SIM card transfer Restore Ethernet MAC Adress (see chapter 2.1.1) Perform Factory Preset (sets instrument default hostname) FW update Setup/Internal Adjustments/Adjust All	Instrument Selftest
RF Mainboard	Setup/Internal Adjustments/Adjust All Absolute Level Correction (external)* Attenuator Correction (external)* Attenuator Switchover Correction (external)*	Instrument Selftest Level uncertainty Reference Frequency / Internal Reference mode (for instruments without option R&S SGT-B1)
Step Attenuator	Setup/Internal Adjustments/Adjust All Absolute Level Correction (external)* Attenuator Correction (external)*	Instrument Selftest Level uncertainty
OCXO	Setup/Internal Adjustments/Adjust All	Instrument Selftest Reference Frequency / Internal Reference mode
Power Supply	Setup/Internal Adjustments/Adjust All	Instrument Selftest
Fan	None	Functional Test

Changed module	**Required action/adjustment/correction**	**Recommended Test Procedure** (refer to chapter 1 "*Performance Test*").
Front panel unit	None	Keyboard Test (see chapter 3.2.3) Functional Test
Cables W300A, W310A	Setup/Internal Adjustments/Adjust All Absolute Level Correction (external)* Attenuator Correction (external)*	Level uncertainty

* In case external adjustment is required, contact your local Rohde & Schwarz representative.

2.1.1 Restore Ethernet MAC Address

Each SGT100A has a unique, fixed MAC Address to allow the identification in an Ethernet network. The MAC Address is assigned during the instrument production process and must not be changed afterwards.
The SGT100A utilizes the MAC Address that is stored on the ARB_COBO. A backup of the MAC Address number is stored on the SIM Card. When replacing an ARB_COBO, the SIM Card has to be transferred to the new ARB_COBO and the MAC Address number has to be copied from the SIM Card to the new ARB_COBO using the following procedure:

- Connect the DUT to a PC via USB. Avoid using a LAN connection, because the instrument hostname has changed after replacing the ARB_COBO. In addition, the network IP-Address may change after the reboot step, if it is set to Auto (DHCP).
- Start the instrument and open a remote control connection.
- Send the command: DIAGnostic:PRODuct:MACaddress:RESTore SIM
- Reboot the DUT and connect with SGMA GUI
- Check the MAC Address under Setup -> Network Settings...
- Compare the MAC-Address to the 12 digit hex number printed on the label on the bottom side of the DUT.

2.2 Adding Hardware Options

This chapter describes the necessary measures to obtain the extended performance of the R&S SGT100A after installing an additional Hardware Option.

Following Hardware Modules are available:

- R&S SGT-B1 OCXO

First install the respective Hardware modules according to the step by step instruction given in chapter 3.

When the hardware installation is fully completed, switch on the instrument and check the detection of the added modules.

- Setup Menu
  - Hardware Config… Now the available Hardware is displayed.

To activate the Hardware Option, the appropriate Hardware Option Key must be installed on the instrument SIM Card.

- Setup Menu
  - Install Option…
    - Option Key: Type the Option Key Number delivered with your HW Option

Restart the instrument and perform the adjustments and tests according to the following table.

Installed module	**Required action/adjustment/correction**	**Recommended Test Procedure** (refer to chapter 1 "*Performance Test*").
OCXO	Setup/Internal Adjustments/Adjust All	Instrument Selftest Reference Frequency / Internal Reference mode

2.3 Internal Adjustments

All internal adjustments are available in the **Setup/Internal Adjustments** menu (see operating manual).

Performing **Setup/Internal Adjustments/Adjust All** activates all internal adjustments in a reasonable order.

2.4 External Adjustments Requiring Measurement Equipment

The external adjustments have to be performed, if the recommended calibration interval is exhausted or RF modules or cables have been replaced.

The external adjustments require calibrated equipment and special software. Data sheet specifications of the unit are concerned. If required, contact your local Rohde & Schwarz representative.

To ensure full calibration of the SGT100A, level adjustment must be performed for RF output frequencies up to 6 GHz. To enable the full frequency range, instruments without option KB106 require installation of the service K0 key during the External Adjustment procedure.

2.5 Adjustment of internal Reference Frequency

When set to internal reference mode, the frequency accuracy of the synthesizer is determined by a 10 MHz VTCXO or a highly stable OCXO (Option R&S SGT-B1). The internal frequency source is set to a calibrated frequency standard at the R&S factory. This oscillator is subject to ageing and hence its output frequency can be adjusted.

2.5.1 Adjustment

Important: *Allow the DUT to warm up for at least 20 minutes before adjustment is executed*

Test equipment
- External frequency counter (1 Hz to RF_{max}, resolution 0.1 Hz)

Test setup
➢ Connect a calibrated external frequency counter to the reference output at the rear panel.

Adjustment
➢ Setting on DUT:

PRESET

Setup Menu

Protection

Protection Level 2 = 901185 ENTER

➢ Setting on spectrum analyzer (external frequency counter):

MKR SIGNAL COUNT

MKR / NEXT CNT RESOL 0.1 Hz

➢ Adjust the TCXO/ OCXO Calibration Value (Reference Oscillator – Adjustment - DAC Value) for an external frequency counter reading of 10 MHz, with minimal error.

➢ Set the found value as TCXO/OCXO Custom Calibration Value in the Service menu (Service – Ext. Adjustment – TCXO/OCXO Adjustment - Calibration Value).

➢ Press **Write Value to Eeprom** to permanently save the calibration value.

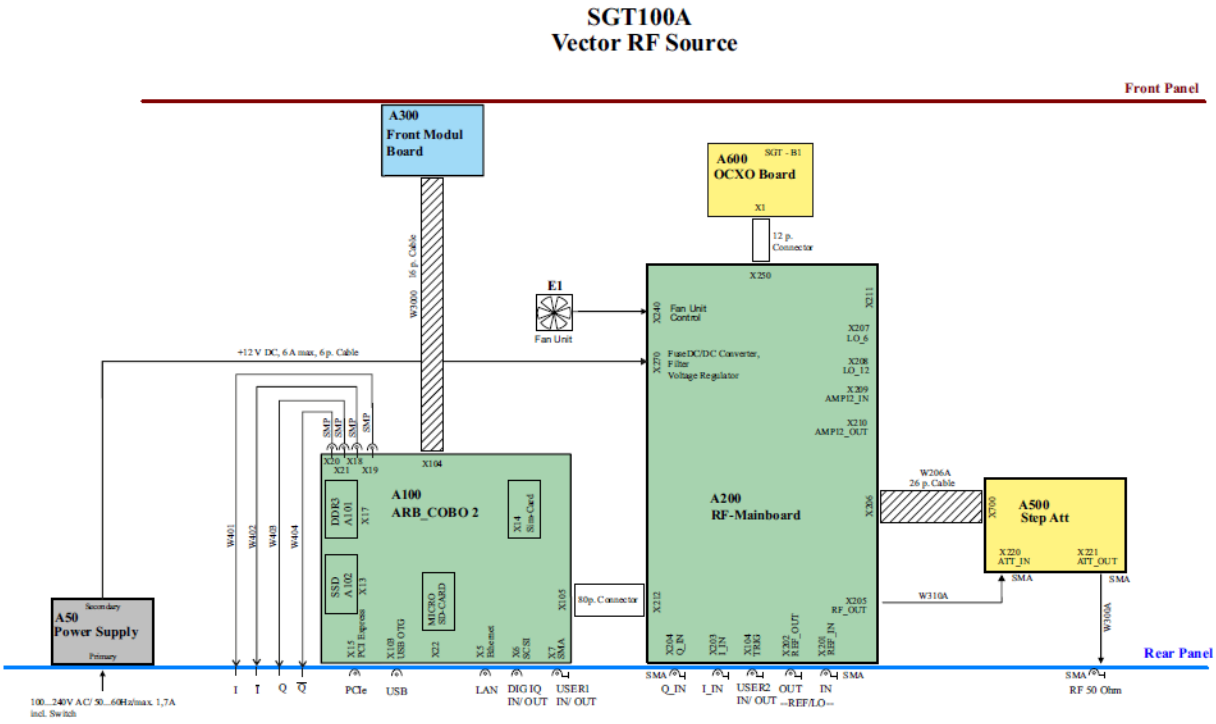
2.6 Internal Self-Test

After each module replacement, it is recommended to perform the internal self-test (refer to chapter 3). The self-test checks the instrument by measuring internal diagnostic points and verifies whether the generator is operating properly.

If a self-test failure occurs, check again whether all cables are properly connected. If the self-test fails continuously, contact your local service center.

3 Repair

A schematic of the signal generator's design is presented below as block diagram at module level



The R&S SGT100A consists of very few main modules and very few connections between these modules. The main units are:

- Power Supply
- ARB_COBO which includes all digital external interfaces, the main CPU, the digital baseband, the hardware drivers for the front panel and the Interface to the RF Mainboard.
- Front Unit consisting of the switch board with keys and LED indicators
- RF Mainboard containing the basic RF functionality, the instrument analog and RF connectors and interfaces to all other modules and HW options.
- Step Attenuator containing RF circuitry to extend the level dynamic range.
- Reference Oscillator (Option R&S SGT-B1) which is plugged directly onto the RF Mainboard.
- Fan Unit for forced cooling of the instrument modules

A detailed description of these modules is given in section "*Functional Description*" on page 70.

3.1 Functional Description

3.1.1 Power Supply Module

The power supply module provides a single 12 V supply voltage for the operation of the signal generator. It can be switched on and off by means of the power switch on the rear panel.

The power supply works over a wide input voltage range from 100 V to 240 V (±10 %) and AC supply frequencies form 50 Hz to 60 Hz (±5 %). The power factor correction meets EN 61000-3-2.

The secondary voltage is open-circuit-proof and short-circuit-proof.

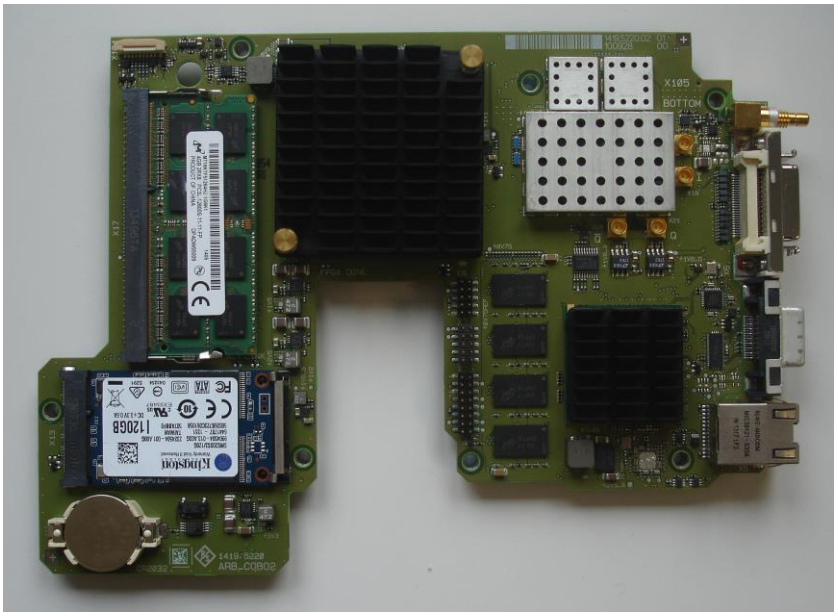
The primary fuses are located inside the power supply module and cannot be replaced.

Further fuses are fitted on the RF Mainboard as a means of fire protection.

3.1.2 ARB Controller Board (ARB_COBO/ARB_COBO2)

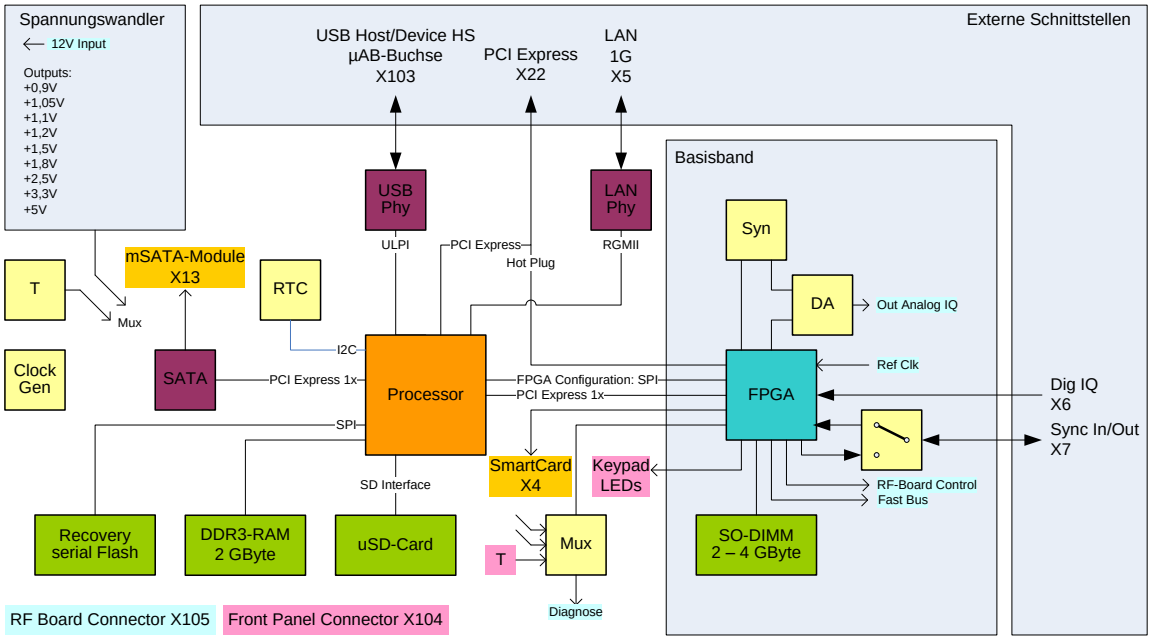
ARB_COBO2:

- installed in SGT100A with serial number ≥ 102000
- supports Analog IQ-Outputs SGT-K16



3.1.2.1 Block diagram

The ARB_COBO/ARB_COBO2 of the signal generator involves the following components and modules:



3.1.2.2 Switching regulators

The switching regulator modules generate the internal supply voltages from the 12 V supply voltage.

3.1.2.3 Controller

Central Controller of the R&S SGT100A including all memory devices and external interfaces.

3.1.2.4 FPGA

The SGT_FPGA includes the complete baseband:

- Interface to the SODIMM for I/Q waveforms.
- Conversion of the clock rate at the sample level to the clock rate of the DA-converter
- Bi-direction interface for digital IQ signals.
- Frequency compensation of the internal baseband- and RF frequency responses.
- Additional signal processing (awgn, impairments, frequency- and phase offset).

Also performs data processing for the serial buses, which send setting data to the modules. It also contains the controllers for the Smartcard, the Keyboard and LEDs. The SGT_FPGA is configured via an SPI-Interface of the processor.

3.1.2.5 SODIMM (DDR3)

The SODIMM-Module is used for storing I/Q waveforms and marker lists.

3.1.2.6 Clock-Synthesis

An integrated PLL-Chip generates the clock signals for the DA converter and the FPGA. This chip realizes the clock synchronization with other R&S-Generators (e. g. SMW).

3.1.2.7 DA-Converter (DAC)

Conversion of the digital I/Q signal to an analog I/Q signal. The analog I/Q signal is filtered by an anti-aliasing filter and then routed directly to the vector modulator of the RF Mainboard. The ARB_COBO2 has a second I/Q signal that is routed to 4 SMB-Connectors at the rear.

3.1.2.8 Diagnostic Multiplexer

The diagnostic multiplexer is used for measuring the supply voltages of the ARB_COBO during failure diagnostic and for calibrating the analog I/Q signals.

3.1.2.9 EEPROM

The following data is stored here: Serial number of the instrument, header line data of the board.

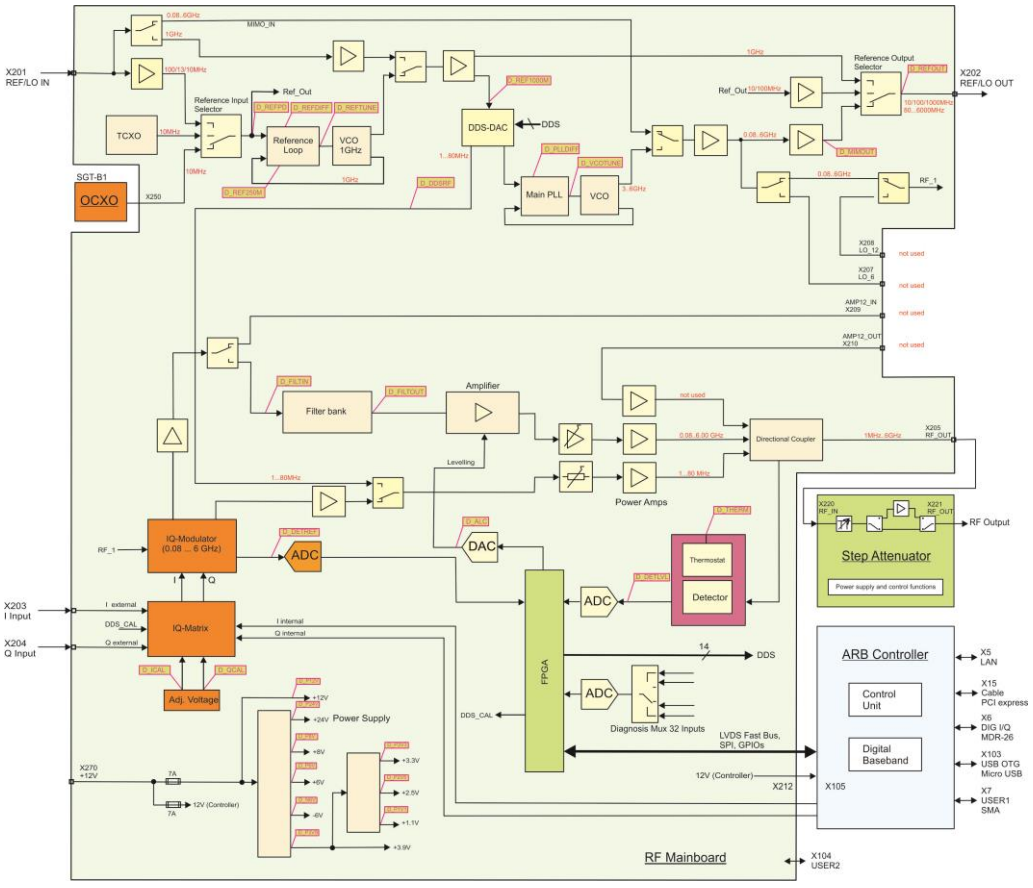
3.1.2.10 Temperature sensor

A temperature sensor mounted on the ARB_COBO monitors the temperature. If a defined temperature above the guaranteed maximum operating temperature is exceeded, the modules in the instrument are switched off. So the R&S SGT100A secures itself against damage due to overheating.

3.1.3 RF Mainboard

The RF Mainboard contains the basic analog hardware of the instrument. The RF signal is generated by a synthesizer that can be locked to internal or external reference frequency sources. I/Q signals from the instrument internal baseband generator or from the external wideband I/Q input connectors can be fed to the I/Q modulator unit. The output level is controlled by a level control loop controlling the level driving the step attenuator. The RF Mainboard is controlled by the ARB_COBO via a serial bus and additional control signals.

3.1.3.1 Block diagram



3.1.3.2 Implemented functions

- Reference crystal oscillator and reference frequency switch
- Synthesizer
- DDS module
- Vector modulator
- Phase coherent input / output (Option)
- Harmonics filter
- RF amplifiers
- Pulse modulator (Option)
- Level control
- Diagnostics
- Power supply for connected RF modules
- Control interface for connected RF modules

3.1.3.3 Internal and external reference

The instrument reference frequency is determined either by the signal supplied by the built-in 10 MHz TCXO or 10 MHz OCXO (A600 OCXO Board) or by an external reference signal that is fed to the input X201 REF/LO IN. The external reference frequency can be set to 10 MHz / 13 MHz / 100 MHz / 1000 MHz. The output X202 REF/LO OUT provides a buffered reference frequency signal, which has been derived from the active reference source. In internal reference mode, the frequency of the TCXO / OCXO can be adjusted by a DAC.

3.1.3.4 Main 1000 MHz oscillator

A built-in 1000 MHz Oscillator delivers the internal reference signal for the DDS based Synthesizer. This source is synchronized to the selected reference signal (internal TCXO / OCXO or external applied signal) with a PLL. When using an external 1000 MHz reference signal, the internal 1000 MHz source is switched off.

3.1.3.5 RF Synthesizer/ DDS module

The 1000 MHz signal of the main oscillator provides the system clock for the DDS module. The RF output signal in the frequency range from 1 MHz to 80 MHz is generated directly by the DDS. The analogue RF signal is then low pass filtered, amplified and fed to the module RF output.

For RF output frequencies above 80 MHz the DDS generates a signal with high resolution, which is applied as reference signal to the main PLL of the RF frequency synthesizer. In the synthesizer a VCO is locked to the reference frequency using a fractional-n-PLL. The VCO output signal is then fed to fixed frequency dividers which are set to appropriate divider ratios to generate the RF signal from 80 MHz to 6 GHz. The synthesis signal can also be switched to the REF/LO OUT connector in phase coherent LO operation mode.

3.1.3.6 Vector modulator

The synthesizer / doubler board signal can be routed directly to the following RF chain or the vector modulator, which can multiply the signal by the external analogue I/Q signals or the internal baseband signal. The vector modulator LO signal can also be taken from the REF/LO IN connector in phase coherent LO operation mode.

3.1.3.7 Harmonics filters

The output signal of the frequency dividers is a square wave signal. To reach the guaranteed harmonic performance (see datasheet) the harmonics of the RF signal have to be suppressed. Due to the wide RF frequency range multiple filters are needed. The different filters are selected according to the RF output frequency and their cut off frequency. They are inserted into the RF signal path by the means of RF switches.

3.1.3.8 Automatic Level control

With the means of a directional coupler a small part of the output signal of the power amplifier is fed to an RF detector. The output signal of this RF detector is fed to the Automatic Level Control (ALC) unit. The ALC sets the level control voltage controlling the variable attenuators to reach the desired output level.

3.1.3.9 Fan Controller

The fan for cooling the RF modules is connected to the RF Mainboard and controlled according to the temperatures of the ARB_COBO, RF Mainboard and Step Attenuator. The highest observed temperature determines the fan speed.

3.1.3.10 Supply voltage control and filtering

The supply voltages required for the RF Mainboard and the additional HW modules are generated by switched mode converters and filtered by means of passive filtering and additional active voltage regulators. Linear regulators with very good noise and distortion suppression characteristics have been implemented based on operational amplifier circuitry.

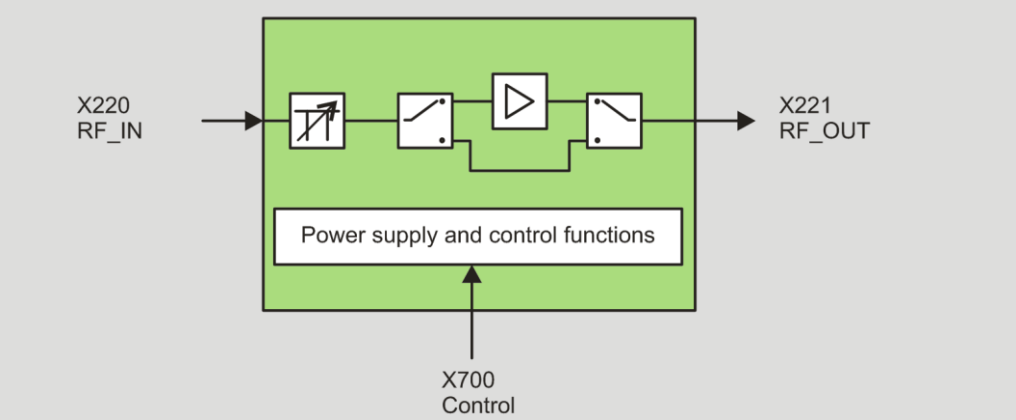
3.1.4 Step Attenuator

3.1.4.1 Step Attenuator architecture

The dynamic range of output power from the RF Mainboard is limited due to several technical restrictions. To achieve very high and extremely low output levels an attenuator with high dynamic range is required at the output of the instrument. The attenuation can be switched in 6 dB steps from -114 dB to 0 dB nominal. To overcome the attenuator loss, an amplifier in the attenuator module output stage can be activated. The module includes an Eeprom to store specific data, a temperature sensor and a diagnosis system. Control and power supply is provided by the RF Mainboard.

3.1.4.2 Step Attenuator diagram

The following diagram shows the functional equivalent of the module:



3.1.4.3 Power Amplifier

To offer high output power levels despite of the insertion loss of the switching matrix an amplifier can be switched into the path at the output of the board. The amplifier covers the frequency band from 1 MHz to 6 GHz.

3.1.4.4 Voltage Regulators and filtering

There are two voltage regulators located at the board connector as the Step Attenuator is used in multiple instruments with different supply voltages. On the board itself great efforts have been spent to effectively filter all control voltages to ensure the required dynamic range.

3.1.5 R&S SGT-B1 Reference Oscillator

The option incorporates a highly stable 10 MHz OCXO. When attached to the RF Mainboard, the OCXO determines the reference frequency stability of the R&S SGT100A synthesizer in internal reference mode. The module includes an Eeprom to store specific information such as the frequency adjustment data. The Reference Oscillator module is plugged directly onto the RF Mainboard. Control and power supply is provided by the RF Mainboard.

3.2 Troubleshooting

The purpose of these troubleshooting instructions is to help to trace down malfunctions to board level. The instrument can thus be made ready for use again by means of board replacement.

If error tracing doesn't show clear results, we recommend that you ship your instrument to our experts in the service centres (*see* address list) for module replacement and further error elimination. Some module replacements involve calibration procedures requiring calibrated equipment and appropriate software.

DANGER **Danger of shock hazard**

For module replacement, ensure that the instrument is switched off and disconnected from the power supply by removing the plug from the AC and DC power connector.

Read all safety instructions at the beginning of this manual carefully before module replacement!

NOTICE **Risk of damage to the boards**

Be careful not to cause short circuits when measuring voltages at pins placed close together!

The following utilities are provided in the signal generator for easy diagnosis and can be controlled by the R&S SGMA GUI software:

- Internal self test
- Internal diagnosis test points
- Internal adjustments
- Info line with error messages and history of messages displayed in R&S SGMA GUI software

Note: *When problems occur, first check whether any connections (cables, plug-in connections of boards, etc.) are damaged or wrongly connected.*

3.2.1 Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S order No.
1	Multimeter			
2	Spectrum analyzer	Frequency range 0 to 26 GHz	R&S FSQ	1155.5001.26
3	Oscilloscope	Bandwidth ≥ 500 MHz	R&S RTM1052 or similar	1305.0008.52

3.2.2 Switch-On Problems

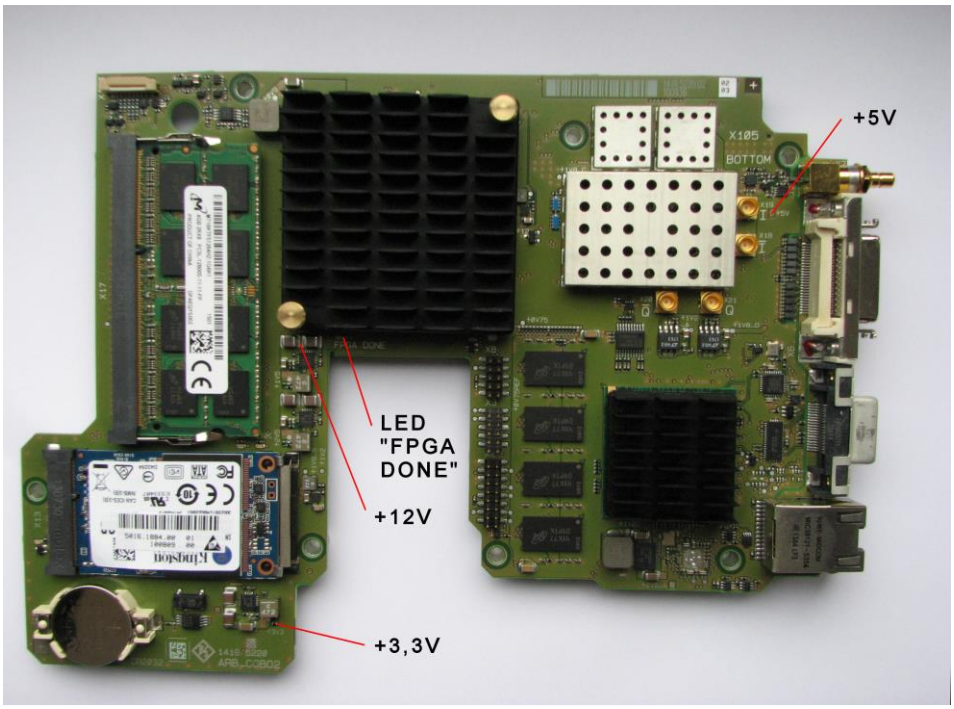
After switching on the AC power supply via the switch on the rear panel of the instrument, the following steps happen during the boot process:

Step	Visible Effect	Operational Requirements
1	Green power LED lights up without flashing	➢ AC Power supply ok, ➢ 12 V Fuse on RF Mainboard ok, ➢ Connection from RF Mainboard to ARB_COBO ok, ➢ Connection of Front Module Board to ARB_COBO ok.
2	After 1 second: Green power LED starts flashing, LED on ARB_COBO lights up.	➢ switching regulators for internal voltages on ARB_COBO ok, ➢ Controller operational and starts booting, ➢ Successful loading of FPGA configuration.
3	After 40 seconds: Green power LED again lit steadily	➢ Firmware installation intact ➢ Booting successful
4	Device can be accessed from SGMA-GUI via any of the remote control ports.	➢ Used port intact and operational

- **Error: boot process step 1 not reached**

Action	Possible error causes and further steps
Check voltage on power supply module output (12.0 V … 12.3 V). ⇓	Short circuit on secondary side. Disconnect power supply module from RFMainboard and recheck voltage on power supply module. If it still does not match the rated value, replace power supply module. If voltage is correct now, reconnect boards and fan one by one and search this way for the module, which causes the short circuit.
Check fuses on RF Mainboard. ⇓	If fuses are blown, proceed as described in section "*Fuses*" on page 93.
Check 12 V supply voltage on ARB_COBO ⇓	Most probably the RF Mainboard is defect. Possibly there is a short circuit on the ARB_COBO or RF Mainboard.
Check 5.0 V (4.80 V…5.20 V) and 3.3 V (3.10 V…3.50 V) supply voltages on ARB_COBO. ⇓	If voltages do not match the rated value, replace ARB_COBO.
Check green LED “FPGA DONE” on ARB_COBO	If LED is lit, then green Front Panel keypad foil is defect or not connected properly to ARB_COBO.

3.2.2.1 Test Points on ARB_COBO



Note: *The screws attaching the ARB_COBO to the RF Mainboard shield may be used as ground potential for the measurements.*

- **Error: boot process step 2 or 3 not reached**

Action	Possible error causes and further steps
Try to reinstall Firmware via Recovery System.	If not possible: It is possible to reinstall the factory default Firmware by writing a raw firmware image to the µSD Card, which is located on the lower side of the ARB_COBO. In case this is required, contact your local Rohde & Schwarz representative. Otherwise, replace ARB_COBO.

- **Error: boot process step 4 not reached**

Action	Possible error causes and further steps
Try different remote control port (USB, Ethernet, PCI Express).	If only one port is not working, check your cabling and look out for LAN related problems. If no other reason is found, replace ARB_COBO.

3.2.3 Keyboard and LED Test

- This **utility** allows you to check for proper operation of all front panel elements

Normal action	Error, possible causes and corrective action
Test called by SGMA-GUI with Diagnostic/Test – Other Tests - Keyboard Test - On or by remote command :TEST:KEYBoard[:STATe] ON	
All LEDs except the Power/Standby indicator change to orange.	If the LEDs except the Power/Standby indicator do not light in orange color, the front panel is defective. Change the front panel.
Pressing the keys in the order RF ON – LAN - ID changes the color of all LEDs except the Power/Standby indicator simultaneously to Red – Off -Green.	If the color does not change according to the description, a malfunction has occurred. If the color remains unchanged after actuation, the key is defective. In either case: Change the front panel.
Exit the test mode by SGMA-GUI with Diagnostic/Test – Other Tests - Keyboard Test - Off or by remote command :TEST:KEYBoard[:STATe] OFF	***Note:*** *The test cannot output internally generated pass/fail information. The user must decide whether a malfunction has occurred.*

3.2.4 USB Cable Test

USB cables of good quality are required for EMI suppression and stable connections. However, according to our experience USB cables are of varying and often poor quality. This concerns the connection between the cable shield and the shield contacts of the connectors.

Cables of poor quality may cause EMI interference and poor connection quality. EMI interference, among other things, may ultimately lead to measurement errors. Poor connection quality may create problems like increased latencies that are due to retransmissions because of data corruption or may even lead to a complete loss of data connection.

Therefore, we recommend checking every USB cable using the following easy method:

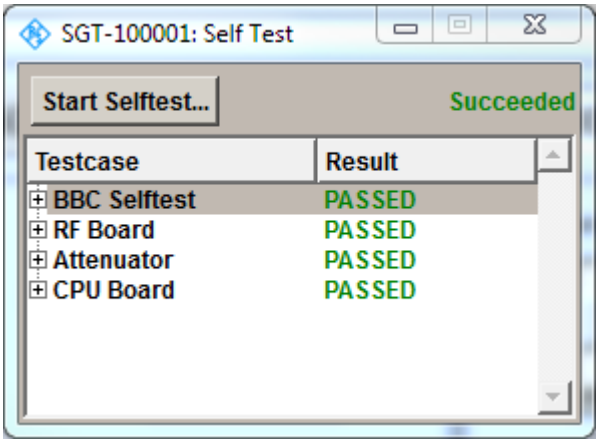
Measure the electrical resistance from the shield contact of one connector to the shield contact of the other connector. For correct measurement results, consider the contact resistance at your probe tips. Good cables have a value of less than 0.6 Ω according to USB standards.

Also check, whether the resistance is stable when you bend the cable.

3.2.5 Troubleshooting with Internal Self-Test

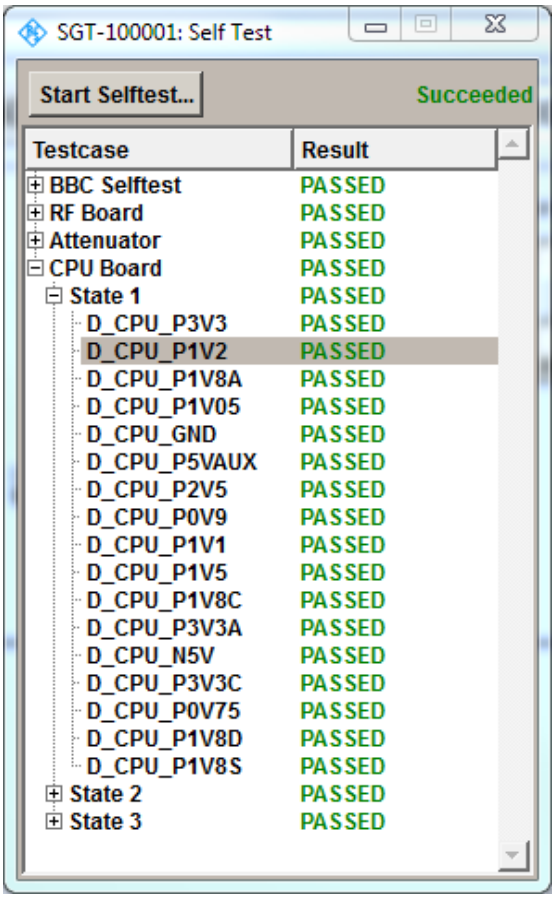
The internal self-test checks the instrument by setting different internal states and measuring internal diagnostic points.

Execute **Diagnostic/Test - Selftest- Selftest**. The self-test reports the modules failing the test:



The Tests “BBC Selftest” and “CPU Board” apply to the ARB_COBO.

To see the details of the self-test open the corresponding branch of the result tree:



3.2.6 Troubleshooting with Internal Adjustments

Various internal adjustments are necessary for correct operation of the instrument. The failure of a certain adjustment can shorten troubleshooting considerably. The affected module is the RF Mainboard and the ARB_COBO.

Note: *Failed internal adjustments can also be queried on the info page -> History.*

Normal action	Error, possible causes and corrective action
Internal adjustments call: **Setup - Internal Adjustments - Adjust All** Internal adjustment of the RF Mainboard and the ARB_COBO is executed.	Abort during adjustment: The synthesis, level and analog vector modulator adjustments in the frequency range up to 6 GHz are carried out exclusively on the RF Mainboard using the diagnostic A/D converter on the module. Adjustments concerning the digital baseband on the ARB_COBO use the diagnostic system of the ARB_COBO and the diagnostic A/D converter on the RF Mainboard. If the synthesis or level adjustment fails most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*). If the I/Q modulation adjustment fails most probably the RF Mainboard or the ARB_COBO is defective. Check the RF Mainboard being supplied correct (see page *95*). Perform the instrument self-test (see page 68).

3.2.7 Instrument Faults

The following table lists R&S SGT100A faults. Perform the recommended action to determine the defective module.

Fault	Test	Action if test fails
RF Output Level is wrong	R&S SGT100A settings: • Instrument Preset • Reference Oscillator ➡ Source Int • RF on • Mod off • Level = 15 dBm Measure the output level with a power meter across the frequency range. The difference between set and measured level has to be lower than guaranteed in the datasheet.	Check the connection of ribbon cable W206A. Check the mating torque of the SMA-connectors at cables W100A and W110A being 60 Ncm. Perform internal adjustments. If level is still wrong, perform external level adjustment. If fault still appears, most probably the RF Mainboard or the Step Attenuator is defective. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
RF Output Frequency is wrong	R&S SGT100A settings: • Instrument Preset • Setup ➡ Internal Adjustment ➡ 'Adjust all' • Reference Oscillator ➡ Source Ext • Reference Oscillator ➡ Ext Ref Input Frequency 10 MHz • RF on • Mod off • Level: 0 dBm • Frequency = 1 GHz Supply an external 10 MHz reference signal meeting the level and frequency specification given in the datasheet. Measure output frequency with a spectrum analyzer or a frequency counter synchronized to the same reference. The frequency error has to be < 0.1 Hz.	Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*).
	R&S SGT100A setting: • Reference Oscillator ➡ Source Int • Reference Oscillator ➡ Output Frequency 10 MHz • Reference Oscillator ➡ REF/LO Output REF Measure the 10 MHz reference output signal with spectrum analyzer or frequency counter and power meter. Output frequency and level have to meet the specifications given in the data sheet.	When Reference Oscillator R&S SGT-B1 is not equipped most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*). If the R&S SGT100A is equipped with Reference Oscillator R&S SGT-B1 remove the unit (see page 116) and perform this test again. If it works most probably the Reference Oscillator B1 is defective. Check the Reference Oscillator being supplied correct (see page *99*).

Fault	Test	Action if test fails
Poor Harmonic Distortion	R&S SGT100A settings: • Instrument Preset • Reference Oscillator ➡ Source Int • RF on • Mod off • Level ➡ Mode Normal • Level ➡ Setting Characteristic ➡ Auto • Level = Maximum guaranteed level for harmonic distortion (see datasheet) Measure the level of the fundamental frequency with a spectrum analyzer. The level of every harmonic has to be at least 30 dB lower than the level at the fundamental frequency. Repeat this test over the frequency range of the instrument.	Most probably the RF Mainboard or the Step Attenuator is defective. Check the connection of ribbon cable W206A. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
Slow Settling times	Settling times are defined for PCI express remote control only. The settling time is the time-delay after the remote control command arrives at the R&S SGT100A until level and frequency are within the given tolerance from their final values. Be careful not to measure with an instrument drifting on its own due to applying the RF from the R&S SGT100A.	Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
10 MHz / 13 MHz / 100 MHz / 1000 MHz Reference Input faulty	Check the 10 MHz / 13 MHz / 100 MHz / 1000 MHz reference signal fed into the R&S SGT100A with a spectrum analyzer or frequency counter and power meter. If level and frequency of this signal is matching the specification in the datasheet set the R&S SGT100A to: • Instrument Preset • Reference Oscillator ➡ Source Ext • Reference Oscillator ➡ Ext Ref Input Frequency 10 MHz / 13 MHz / 100 MHz / 1000 MHz • RF on • Mod off • Frequency = 1 GHz • Level = 0 dBm Check for error Messages. No “External Reference Errors” are allowed to occur. Measure output frequency with a spectrum analyzer or a frequency counter synchronized to the same reference. The frequency error has to be < 0.1 Hz.	Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
10 MHz / 1000 MHz Reference Output faulty	R&S SGT100A setting: • Instrument Preset • Reference Oscillator ➡ Source Int • Reference Oscillator ➡ Output Frequency 10 MHz / 1000 MHz Measure 10 MHz / 1000 MHz reference output signal with spectrum analyzer or frequency counter and power meter. Output frequency and level have to meet the specifications given in the data sheet.	*R&S SGT100A without Reference Oscillator R&S SGT-B1:* Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*). *R&S SGT100A with Reference Oscillator R&S SGT-B1:* Remove the Reference Oscillator B1 (see page 116) and perform this test again. If still failing most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*). If the 10 MHz / 1000 MHz reference signal is in tolerance most probably the Reference Oscillator B1 is defective. Check this module being supplied correct (see page *99*).

Fault	Test	Action if test fails
I/Q ext Input Faulty	R&S SGT100A settings: • Instrument Preset • Reference Oscillator ➡ Source Int • RF on • External I/Q Modulation on Measure the input resistance of the I/Q Input SMA connector with a multimeter. The input resistance should be 50 Ω ± 10 %.	Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
Vector Modulation faulty	The vector modulation performance is specified only up to the Peak Envelope Power (PEP) noted in the datasheet. Ensure the internal IQ adjustment was performed successfully. The vector modulation performance has to match the values given in the datasheet. Measure with a vector signal analyzer with sufficient performance, i.e. an R&S FSQ spectrum analyzer.	Most probably the RF Mainboard is defective. Check the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
USER1 Input / Output faulty	This signal is driven from the ARB_COBO FPGA. The USER1 Input / Output SMA connector is directly fitted onto the ARB_COBO as well.	Most probably the ARB_COBO is defective. Check the ARB_COBO being supplied correct (see page 82).

Fault	Test	Action if test fails
USER2 Input / Output faulty	This signal is driven from the ARB_COBO FPGA. The USER2 Input / Output SMA connector is directly fitted onto the RF Mainboard.	Most probably the ARB_COBO is defective. Check the ARB_COBO and the RF Mainboard being supplied correct (see page *95*).

Fault	Test	Action if test fails
Faulty remote interface PCI express, USB or LAN	All remote interfaces including the interface connectors are fitted directly on the ARB_COBO.	Most probably the ARB_COBO is defective. Check the ARB_COBO being supplied correct (see section "*Switch-On Problems*" on page 80).

Fault	Test	Action if test fails
Instrument switches off, error message “Emergency shutdown” appears	Check if fan operates during instrument boot procedure. Check if fan operation is constrained by dust etc.	Remove and clean the fan unit. If necessary, replace the fan (see page 122).
	Check ambient temperature.	Ensure proper cooling of the instrument and do not limit the air flow. Operate the instrument inside the ambient temperature specifications.

3.2.7.1 Fuses

Switch on the R&S SGT100A and measure the voltage at fuse F2800.2. If the voltage is less than 12 V, change the power supply.

If the voltage is correct, measure the voltage at fuse F2800.1. If the voltage is much lower than 11.9 V, then fuse F2800 is blown and most probably the ARB_COBO (1416.1330) is faulty. Replace the fuse with the correct type given by the table below and check the ARB_COBO (see section "*Switch-On Problems*" on page 80).

Measure the voltage at fuse F2801.1. If the voltage is much lower than 11.9 V, then fuse F2801 is blown. The fuse might be blown due to a defective module other than the RF Mainboard. If the fuse is blown, replace the fuse with the correct type given below. Remove the connections to the step attenuator ASATT (X206A). If the RF Mainboard is equipped with the Reference Oscillator R&S SGT-B1, remove this unit as well (see section Replacing the Reference Oscillator OCXO on page 119). Switch on the R&S SGT100A and after two minutes check the voltage drop across fuse F2801 again. If the fuse is blown again, the RF Mainboard is defective and should be replaced.

If the fuse is o.k., switch off the R&S SGT100A and connect the step attenuator ASATT. Switch on the R&S SGT100A again. If the fuse is blown after two minutes, the step attenuator module ASATT (1412.5360) is defective and has to be replaced (see page 115).

If the R&S SGT100A is equipped with a Reference Oscillator R&S SGT-B1, then switch off the R&S SGT100A and insert the reference oscillator.
Switch on the R&S SGT100A again. If the fuse is blown after two minutes the reference oscillator module (1416.2508) is defective and must be replaced (see page 119).

After replacement of defective modules don't forget to replace fuse F2800 and/or F2801 too!

Fuse	Type	R&S Part Number	Manufacturer Part Number
F2800	FF7A	2079.5994.00	Littlefuse R451.007 NRL (MRL)
F2801	FF7A	2079.5994.00	Littlefuse R451.007 NRL (MRL)

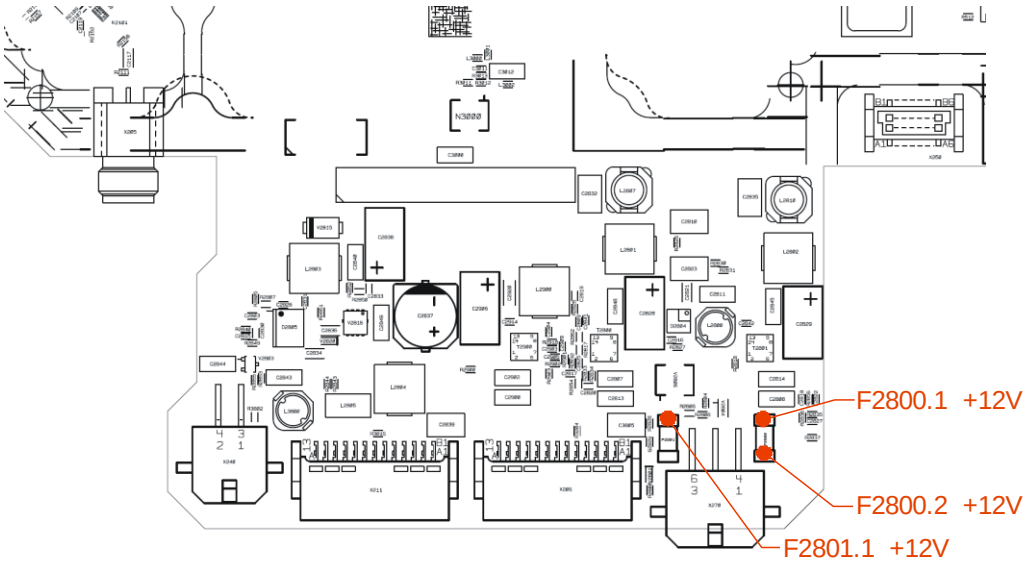


Figure 3-1: Position of the fuses on the RF Mainboard

3.2.8 Troubleshooting − RF Mainboard

The tests listed below ensure that an assumed error on the RF Mainboard is not caused by a defective or incorrectly connected cable, incorrect adjustment or another module.

3.2.8.1 Internal Adjustment “Adjust All”

A comprehensive test of the module is to run the internal adjustment.

Normal action	Error, possible causes and corrective action
Internal adjustments call: **Setup – Internal Adjustments… - Adjust Synthesis** Internal adjustment of the synthesizer on the RF Mainboard is executed. As result “Pass” is displayed.	Abort during adjustment: The adjustments are all carried out exclusively on the RF Mainboard. Most probably the RF Mainboard is defective. Check the board being supplied correctly (see page 95).
Internal adjustments call: **Setup – Internal Adjustments… - Adjust Level** Internal adjustment of the ALC Loop on the RF Mainboard is executed. As result “Pass” is displayed.	Abort during adjustment: If the adjustment fails, most probably the RF Mainboard is faulty.
Internal adjustments call: **Setup – Internal Adjustments… - Adjust IQ Modulator** Internal adjustment of the IQ-Modulator on the RF Mainboard and adjustment of the digital baseband on the ARB_COBO is executed. As result “Pass” is displayed	Abort during adjustment: The adjustments are all carried out on the RF Mainboard and the ARB_COBO. The error message displayed in the SGMA GUI may help to identify the defective module. Check the boards being supplied correctly (see page 95).

3.2.8.2 Input and Output Signals

Connector, system	Signal name	Setting on signal generator	Frequency	Level	Signal flow
X205, SMA	RF	RF on	1 to 6000 MHz	-120 to +25 dBm	To RF connector at rear panel or step attenuator
X201, SMA	REF/LO IN	Ref External	Ref: 10/100/1000 MHz LO: 80 to 6000 MHz	0 to 16 dBm	External Reference or LO-Input
X202, SMA	REF/LO OUT	Ref/LO Output on	Ref: 10/100/1000 MHz LO: 80 to 6000 MHz	6 to 12 dBm	Reference or LO-Output
X203, SMA	I_IN	IQ-Modulation on	0 to 1000 MHz	-0.5 to +0.5 V	I-Input for external Vector Modulation
X204, SMA	Q_IN	IQ-Modulation on	0 to 1000 MHz	-0.5 to +0.5 V	Q-Input for external Vector Modulation
X207, SMA		not used			
X208, SMA		not used			
X209, SMA		not used			
X210, SMA		not used			
X104, SMA	USER2	---	---	LVC logic	Bidirectional trigger input/output

See also Figure 3-2.

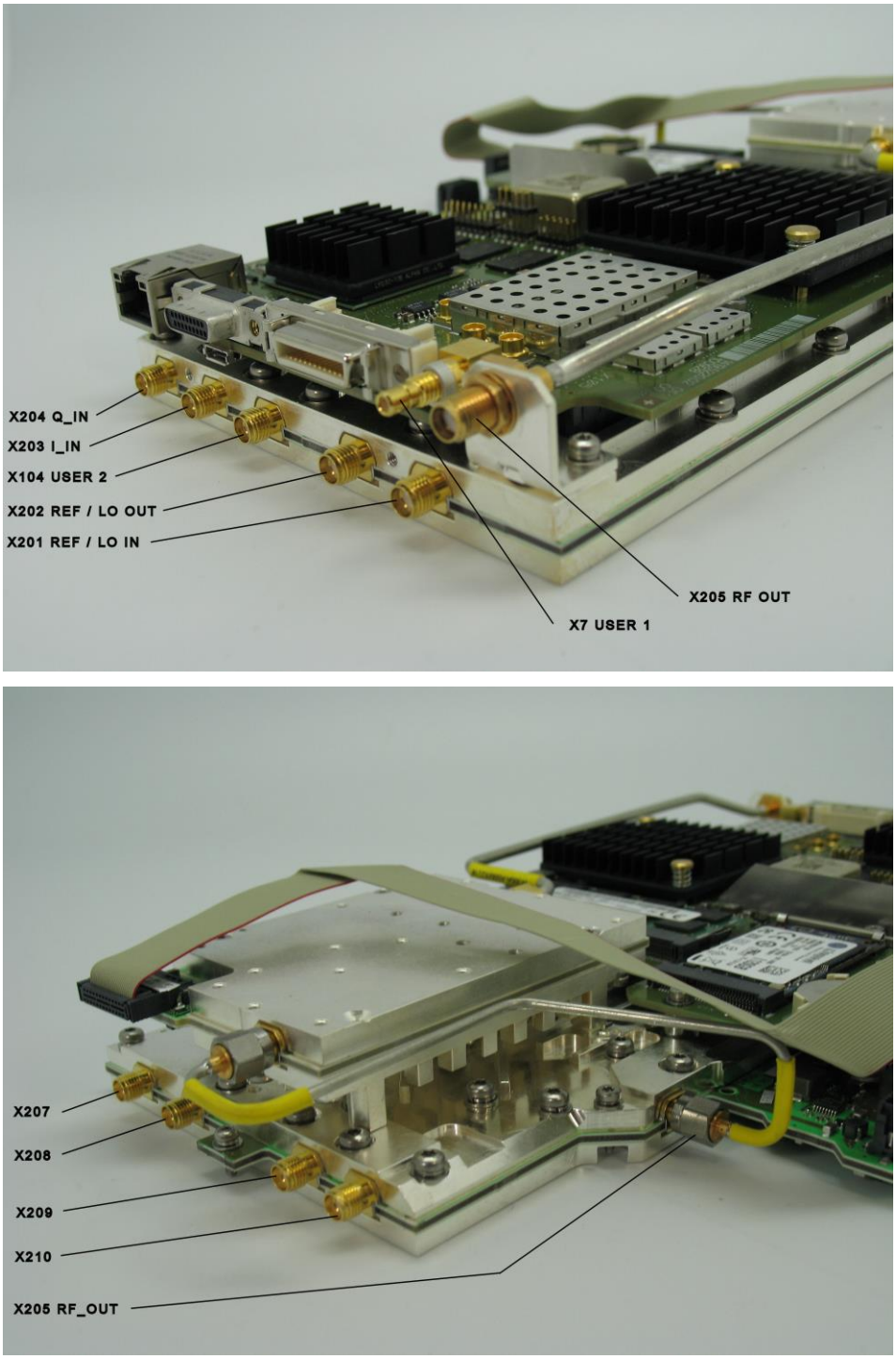


Figure 3-2: Connectors

3.2.8.3 Error Messages Concerning the RF Mainboard

Error message	Error correction
“ALC unlocked”	➢ Execute Internal Adjustment "Adjust Level". ➢ Check if the output level is higher than the specified maximum output level. Reduce the output level. ➢ Set attenuator mode “Auto”.
"Synthesis main-loop PLL unlocked"	➢ Execute Internal Adjustment "Adjust Synthesis". ➢ If the error message does not disappear change the module.
“Reference PLL unlocked”	➢ In case that the reference source is set to “external”, check if the external reference is connected to the REF/LO Input. Are the level and the frequency error of the external reference signal as specified in the data sheet? ➢ If the reference source is set to “internal” troubleshoot the RF Mainboard with the internal diagnosis and check the OCXO R&S SGT-B1 (see section "*Troubleshooting − Reference Oscillator option R&S SGT-B1*" on page 99).
"Synthesis adjustment failed"	➢ Execute Internal Adjustment "Adjust Synthesis". ➢ If error message does not disappear, check the diagnosis (see section "*Troubleshooting with Internal Self-Test*" on page 85).
"Synthesis adjustment data invalid"	➢ Execute Internal Adjustment "Adjust Synthesis". ➢ If the error message does not disappear, check the diagnosis (see section "*Troubleshooting with Internal Self-Test*" on page 85).

3.2.8.4 Warnings Concerning the RF Mainboard

Warnings	Warning correction
"Pep value exceeds defined limit"	➢ The peak envelope power (PEP) is higher than the set upper limit. ➢ Reduce the output level.

3.2.8.5 Frequency Error

Error	Error correction
Internal reference frequency: Frequency error greater than limit given in datasheet	➢ Check if the error message “Reference PLL Unlocked” appears (see page 96). ➢ The frequency accuracy of the synthesizer is determined (set to internal reference) by a highly stable 10 MHz crystal oscillator that is set to a calibrated frequency standard at the R&S factory. This oscillator is subject to ageing and hence its output frequency can be adjusted (see chapter 2, "*Adjustment of internal Reference Frequency*"). ***Note**: The internal reference can be impaired under the menu - **Reference Oscillator…** - **Adjustment**. This setting does not affect the factory adjustment and can be reset at any time by means of deactivation. If the tuning range is insufficient to reach the frequency error given in the datasheet the TCXO or OCXO on the RF Mainboard is defective. Replace the RF Mainboard if the R&S SGT comes without option R&S SGT-B1 otherwise see page 119 (“Replacing the Reference Oscillator OCXO ”).*

3.2.9 Troubleshooting − Reference Oscillator option R&S SGT-B1

3.2.9.1 Input and Output Signals

The Reference Oscillator has only one connector (X1) and is directly plugged into the RF Mainboard (X250, see *Figure 3-3*). All signals and the supply voltage are fed to the module through this connector. Turn off the instrument and remove the OCXO board. Turn on the instrument and check the following voltages:

Measuring Point	Voltage (V)
Shielding enclosure	0 (GND)
X250.B1	+ 3.3 to 3.4
X250.A1	+ 10.75 to + 11.25

If one or more of the voltages are out of tolerance, the RF Mainboard is faulty.

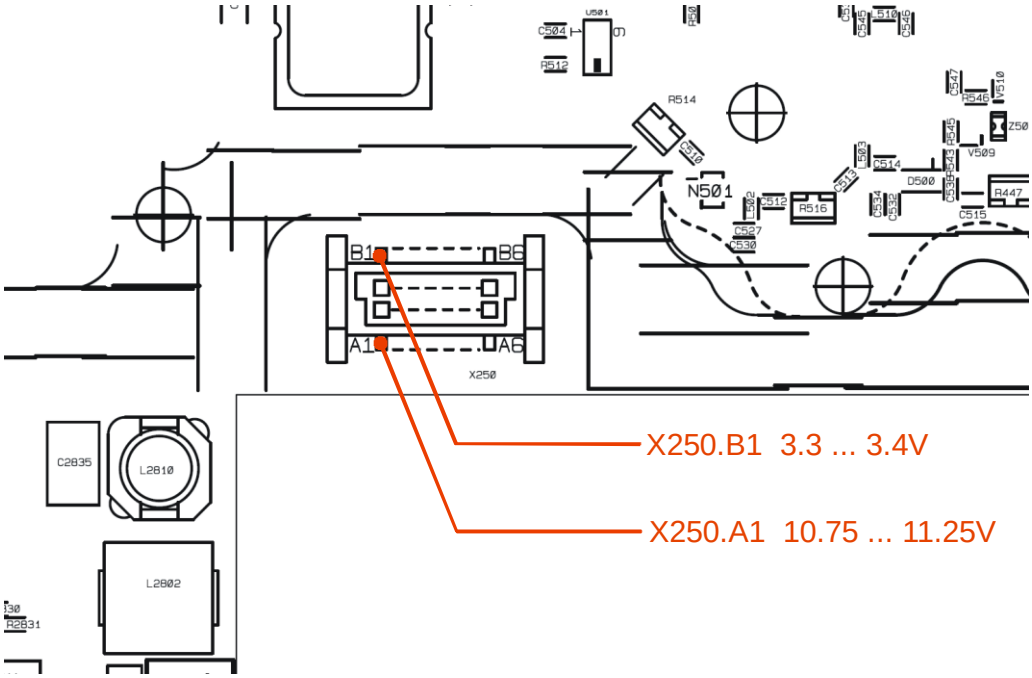


Figure 3-3: Pin locations X250 on RF Mainboard

Turn off the R&S SGT100A, plug in the OCXO board and power up the R&S SGT100A. Set reference source to “internal”.

The enable signal at G1.6 must have high-level (5.6 V to 5.8 V).

In the list under **setup – hardware config** should be the entry “OCXO”.

At pin G1.1 the output signal of the reference oscillator can be measured (10 MHz, 1 Vpp). If you notice a different behavior, try a new tested OCXO board. If this still does not work, troubleshoot the RF Mainboard.

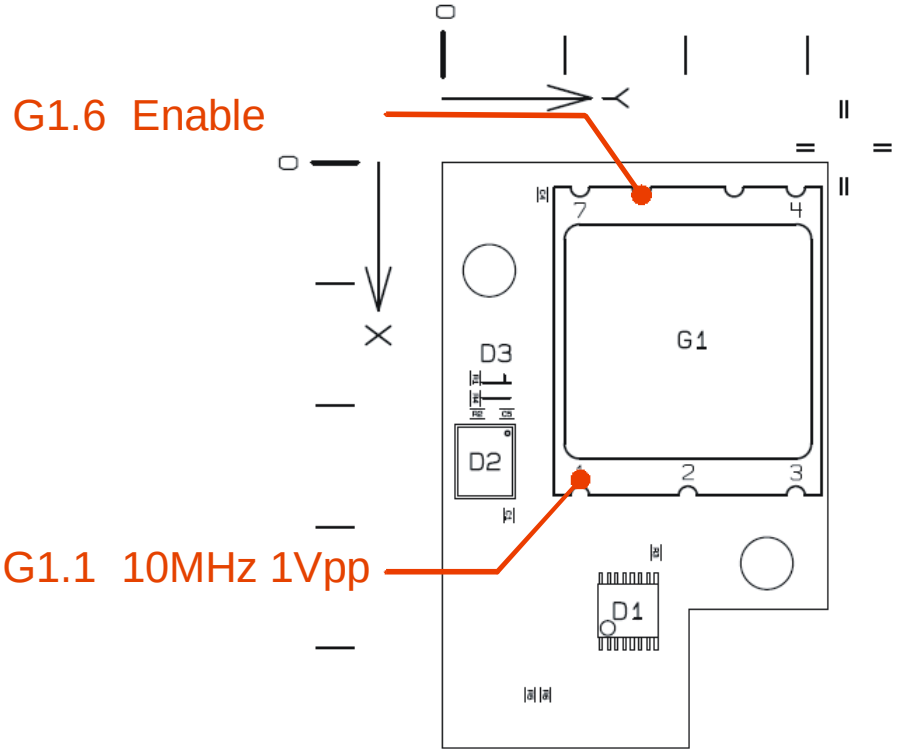


Figure 3-4: Pin locations on OCXO

3.2.9.2 Error Messages Concerning the Reference Oscillator Module

Error message	Error correction
" Reference oscillator oven cold”	➢ Check the supply voltages of the module (see section "*Input and Output Signals*"). ➢ If the supply voltages are correct and this message does not disappear after 10 minutes, OCXO is defective. Change the module.
"Reference PLL unlocked"	➢ Switch the R&S SGT100A to external Reference and supply a 10 MHz 10 dBm signal to the Ref/LO Input of the RF Mainboard. If the error message disappears and the R&S SGT100A is working correctly, the OCXO is defective, change the module.
"OCXO: cannot read EEPROM data" "OCXO: cannot store adjustm. data"	➢ This indicates problems concerning the data transfer from and to the EEPROM of the module. If changing the module does not help, change the RF Mainboard.

3.2.9.3 Frequency Error, Reference Oscillator Adjustment

Error	Error correction
Internal reference frequency: Frequency error greater than limit given in datasheet	➢ Check if the error message “Reference PLL Unlocked” appears (see page 96). ➢ The frequency accuracy of the synthesizer is determined (set to internal reference) by a highly stable oven controlled 10 MHz quartz oscillator that is set to a calibrated frequency standard at the R&S factory. This oscillator is subject to ageing and hence its output frequency can be adjusted (see chapter 2, “*Adjustment of internal Reference Frequency*”). ***Note**: The internal reference can be tuned by up to approx. ±10^{-7} under the menu **Reference Oscillator… - Adjustment**. This setting does not affect the factory adjustment and can be reset at any time by means of deactivation. If the tuning range is insufficient to reach the frequency error given in the datasheet the OCXO is defective.*

3.2.10 Troubleshooting − Active Step Attenuator

3.2.10.1 Supply Voltages

Remove the RF cables W100A, W110A from the Step Attenuator. Remove the Step Attenuator from the instrument and connect the module to the RF Mainboard using cable W206A. Switch on the R&S SGT100A and measure the supply voltages of the Step Attenuator at the capacitors near its power supply connector (X700, see *Figure 3-5*).

CAUTION

Danger of hot surfaces

Do not run the Step Attenuator longer than 5 minutes without cooling.

The measured voltages have to meet the values given in the table below. If one or more voltages are not of the required level, check the ARB_COBO (see section "*Switch-On Problems*" on page 80).

Measuring Point	R&S SGT100A switched On
Shielding enclosure	GND
C600	+7.3 V to +8.5 V
C605	+11.5 V to +12.8 V
Z701	-8 V to -5.5 V

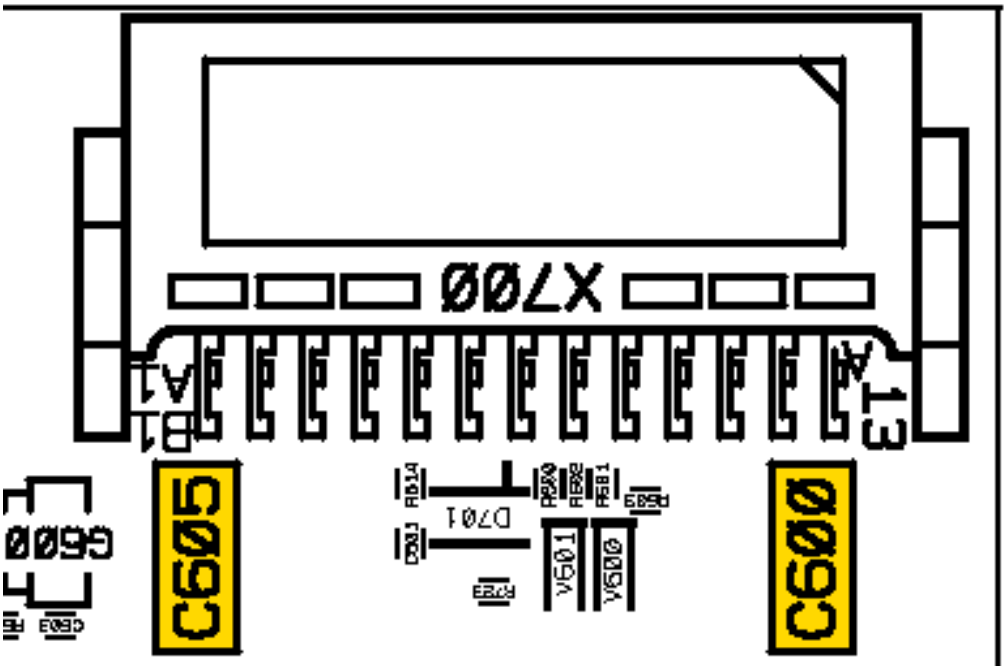


Figure 3-5: Power Supply Connector of Active Step Attenuator (top view)

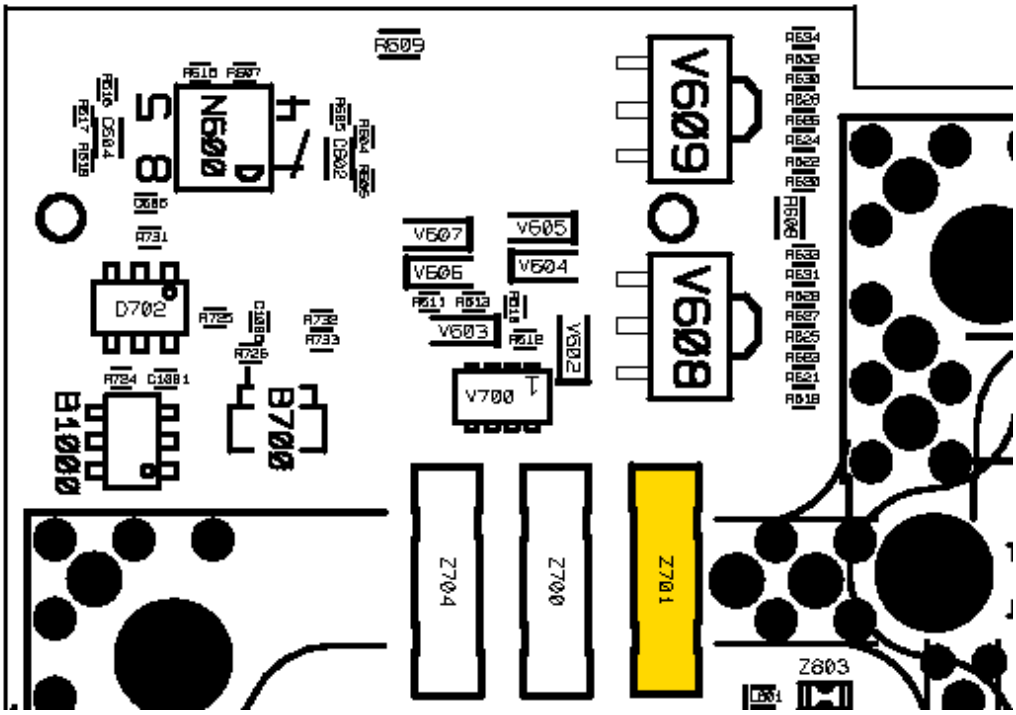


Figure 3-6: Power Supply Connector of Active Step Attenuator (bottom view)

If the supply voltages do not comply with the given values in the above table, change the connector cable and test again. If the supply voltages still do not comply, change the module.

3.3 Module Replacement and Upgrade

This section describes in detail the replacement of modules. Chapter 6 "*Documents*" provides information on how to order spare parts. It contains the list of mechanical parts with order numbers and the illustrations for module replacement.

WARNING

Danger of injury during module replacement

Any adjustments, replacement of parts, maintenance or repair must be carried out exclusively by technical personnel authorized by Rohde & Schwarz.

Follow the step-by-step instructions for module replacement carefully to avoid injury and ensure safe operation.

NOTICE

Risk of electrostatic discharge

Protect the work area against electrostatic discharge to avoid damage to electronic components in the modules. For details, refer to the safety instructions at the beginning of this manual.

Protection of mechanical components

Always use a torque wrench (60 Ncm) to fasten all RF connectors. Do not use an open-end wrench.

Protection of electronic components

Always wear gloves when handling the electronic components.

Datasheet compliance

Recalibration of the instrument is required after any disconnection or connection of RF cables.

3.3.1 Required Tools

- Star screwdriver TX 8
- Star screwdriver TX 20
- Hex Nut-Driver 5 mm
- Torque wrench 60 Ncm (8 mm)

3.3.2 Module Overview

Overview - Module Replacement

Module	Designation	Instrument Part No.	Replacement Part Order No.	Page Ref.
Power Supply (AC 90 V to 264 V)	A50	1416.0870.00	1416.0870.00	108
ARB_COBO	A100	1419.5220.02	1419.5220.02	119
RF Mainboard IQ	A200	1419.5308.02	1419.5308.02	113
Front module board	A300	1419.4801.02	1419.4801.02	120
Step Attenuator	A500	1412.5360.08	1412.5360.08	115
Fan Unit	E1	3584.3900.00	3584.3900.00	121
Ref Oscillator OCXO incl. in SGT-B1	A600	1416.2508.02	1416.2508.02	119

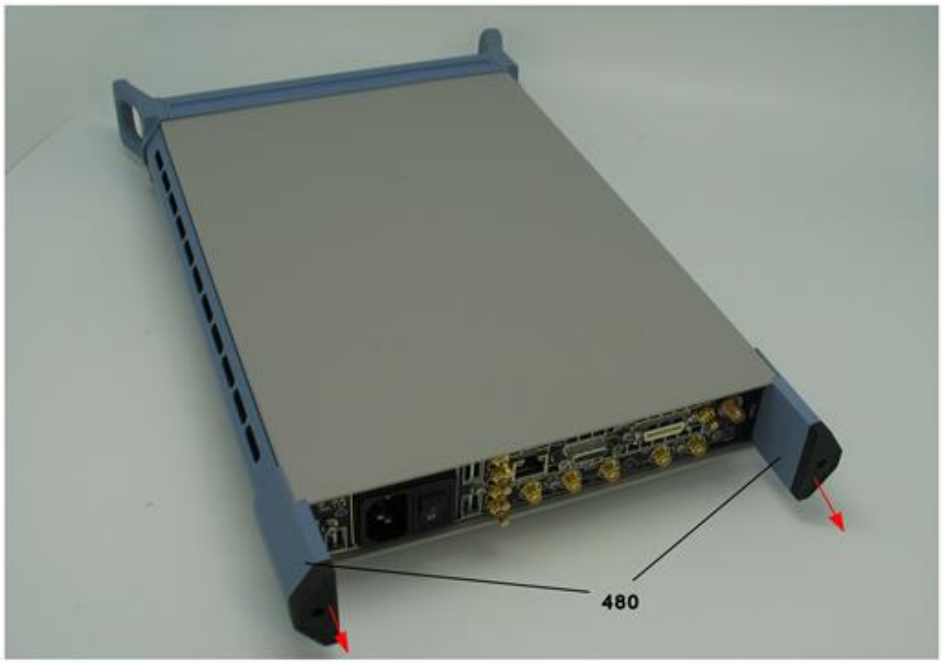
Notes: *All modules can be replaced by modules with the same part number or by replacement modules as listed above. The words "left" and "right" in the manual always refer to the front view of the instrument.*

3.3.3 After Replacing an Assembly

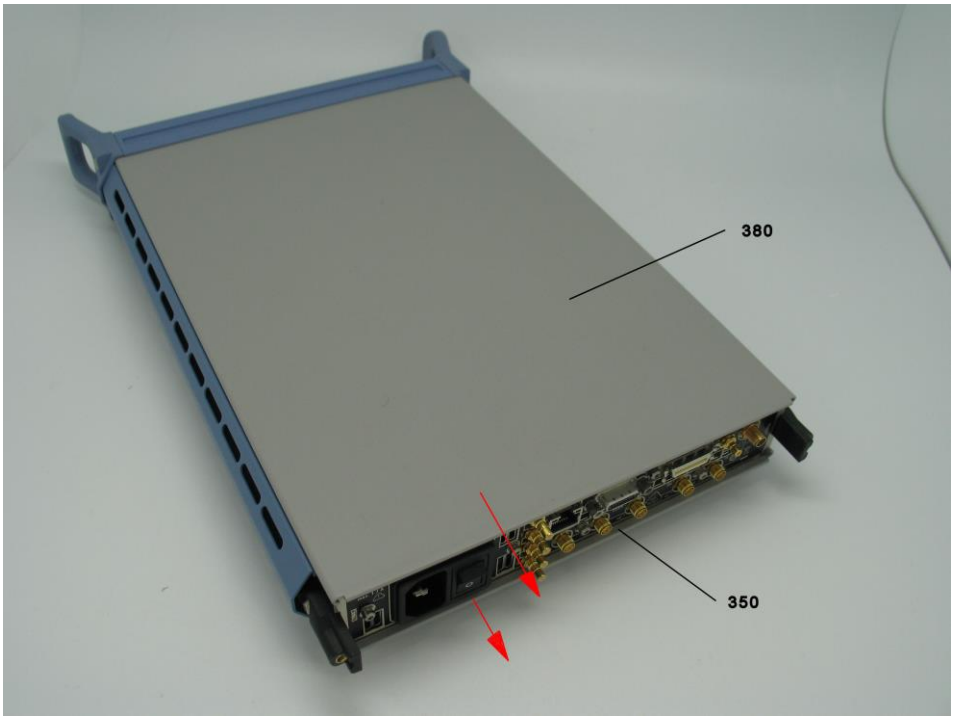
After you have replaced one of the assemblies, certain adjustments, functional checks or performance tests have to be carried out. Please refer to chapter 2 "*Adjustment*".

3.3.4 Replacing the Case

1. Unfasten the two rear feet (480) on both sides and take them off.



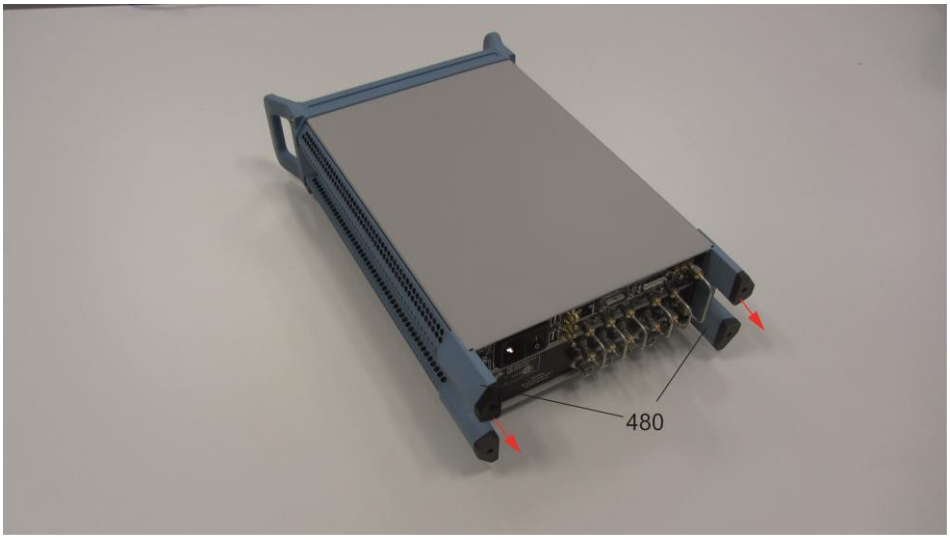
2. To remove the two covers - lower (350) and upper (380) - first push the cover backwards and then remove it.



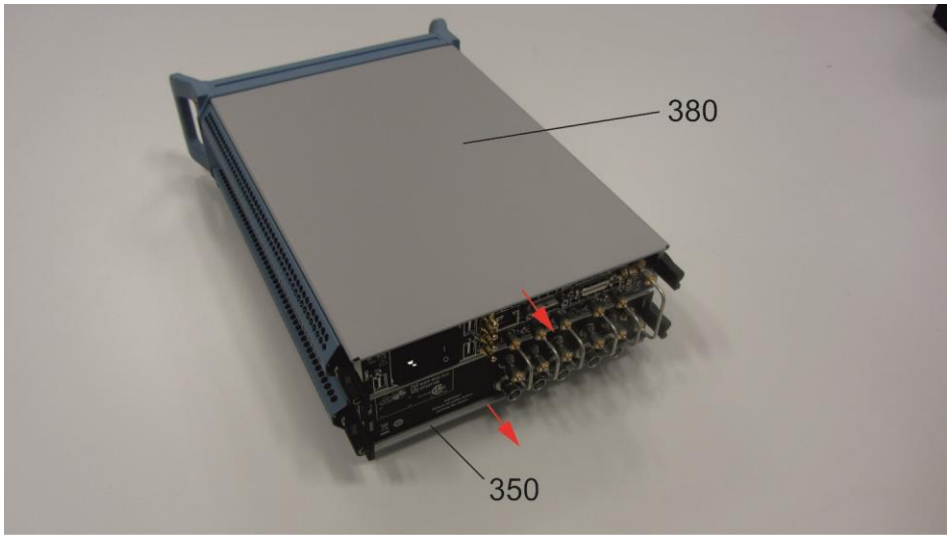
3. To install the case proceed in the reverse order.

Replacing the Case for R&S SGT100A with R&S SGT-B88

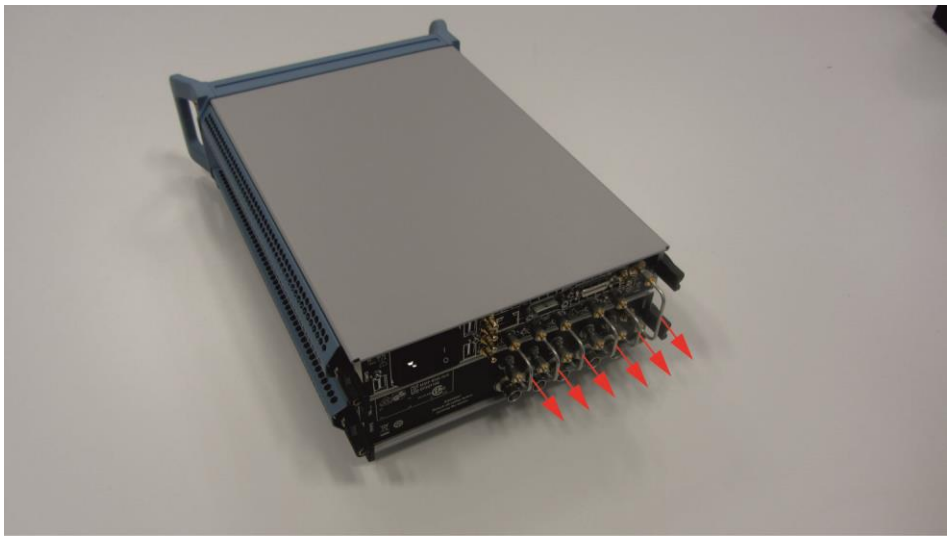
1. Unfasten the two rear feet (480) on both sides and take them off.



2. To remove the two covers - lower (350) and upper (380) - first push the cover backwards and then remove it.



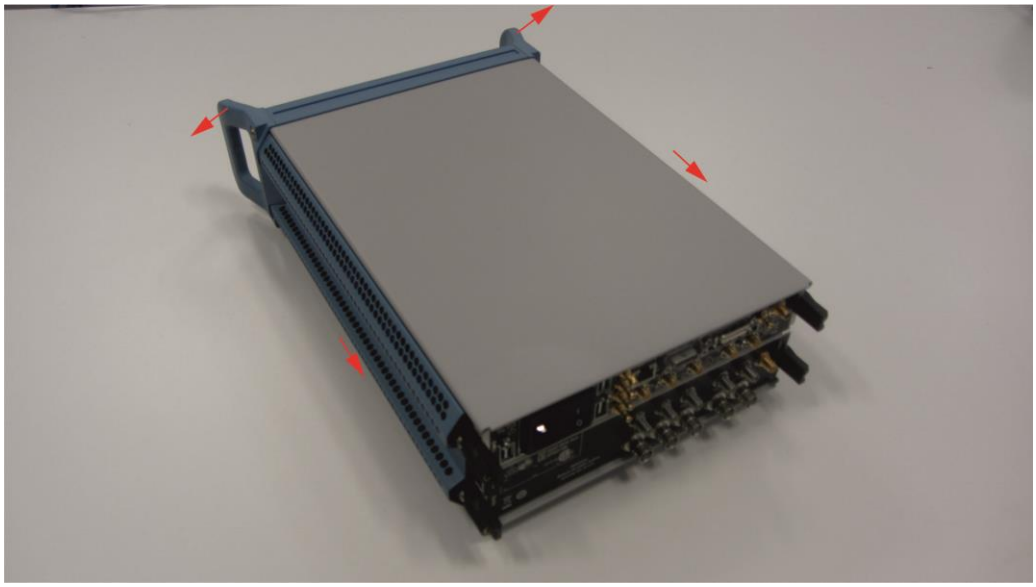
3. Detach all cables backwards.



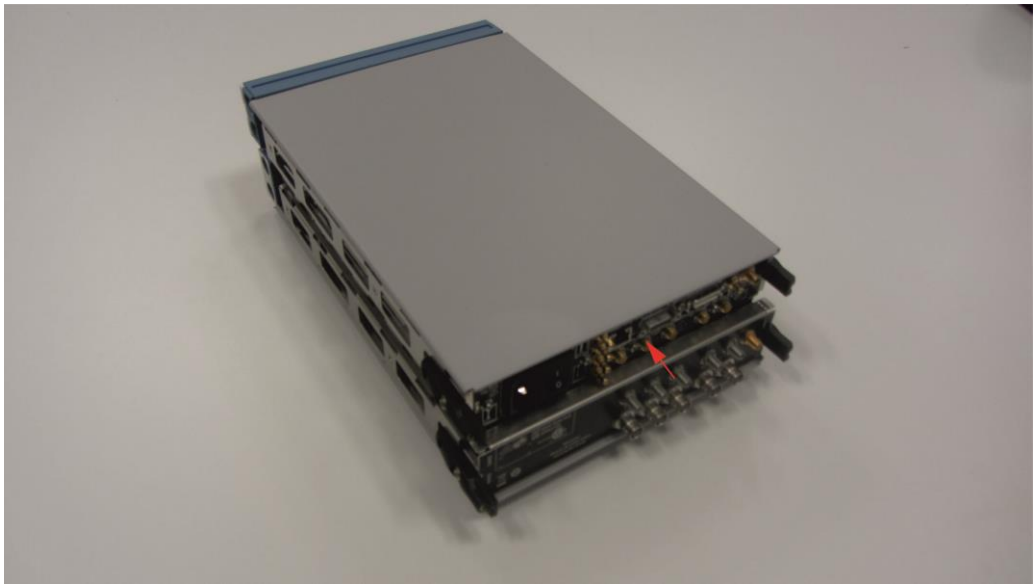
4. To install the case proceed in the reverse order.

Replacing R&S SGT-B88

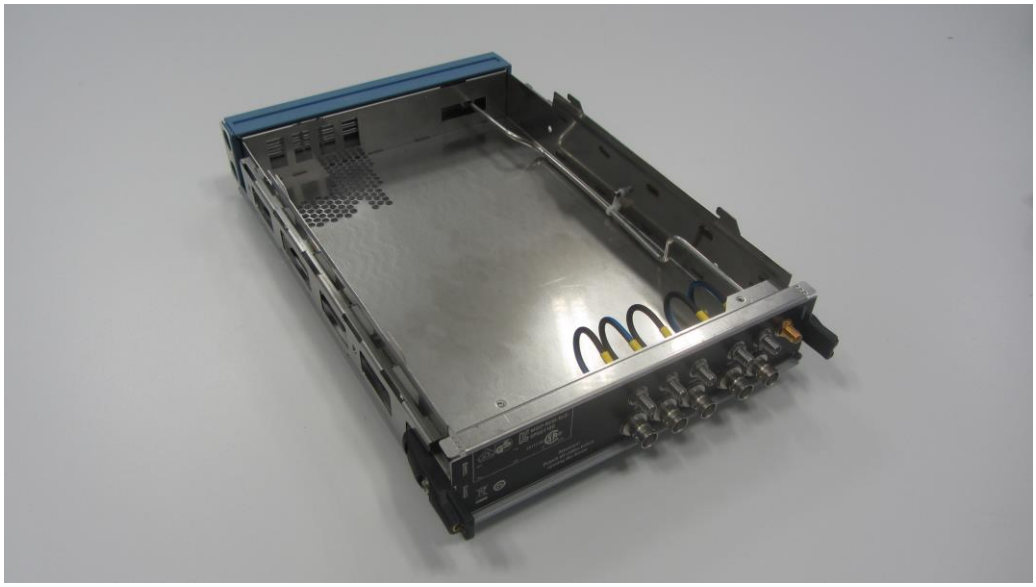
1. Unfasten both rack mount grip and the frame parts on both sides.



2. Push the R&S SGT100A forward.



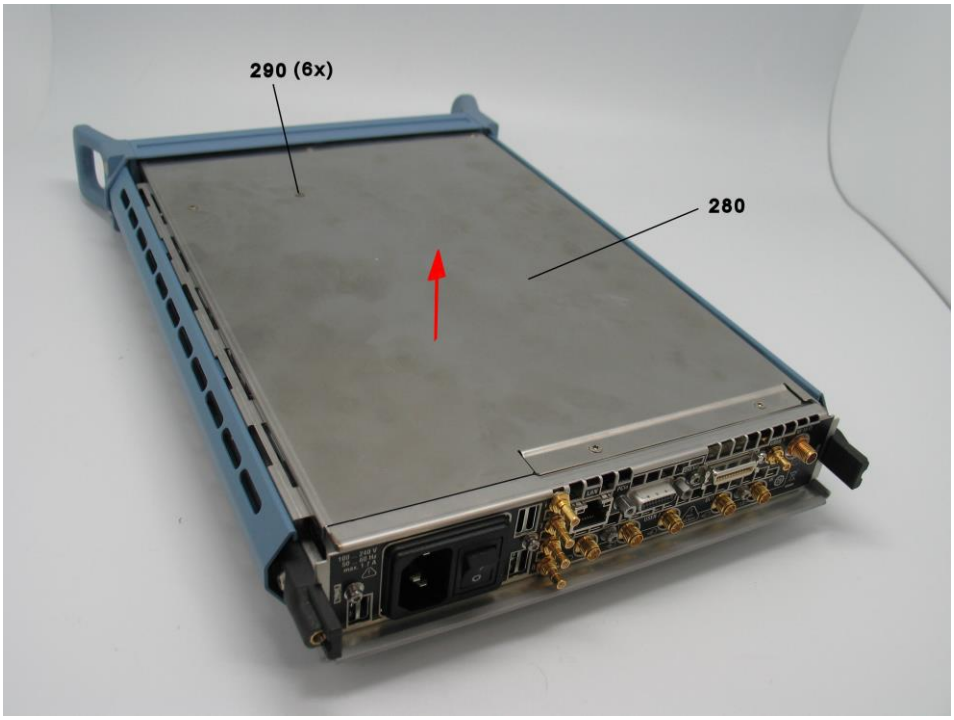
3. Lift the R&S SGT100A from the R&S SGT-B88.



4. To install the case proceed in the reverse order.

3.3.5 Replacing the EMC Panel

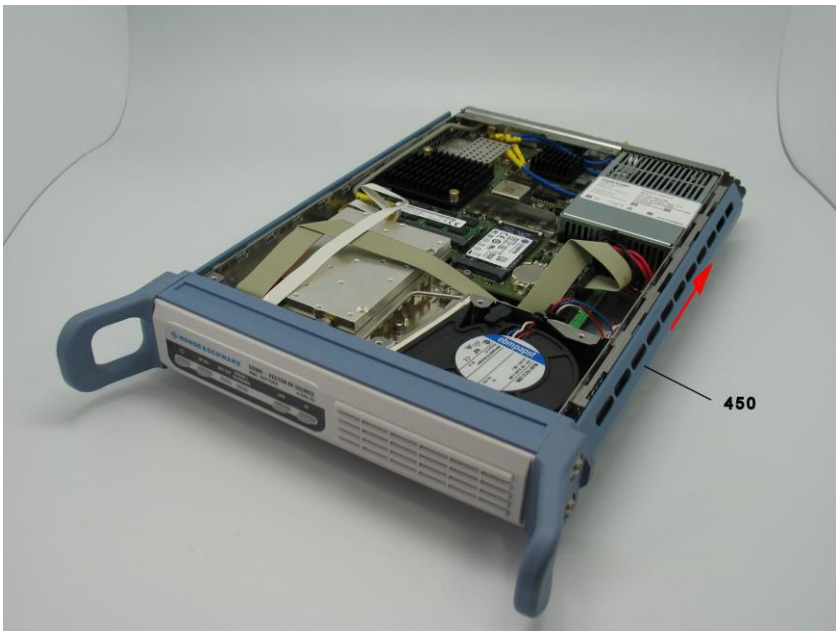
1. Remove the case (see page 107).
2. Unfasten the six screws (290).
3. Lift up the EMC panel (280) and remove it backwards.



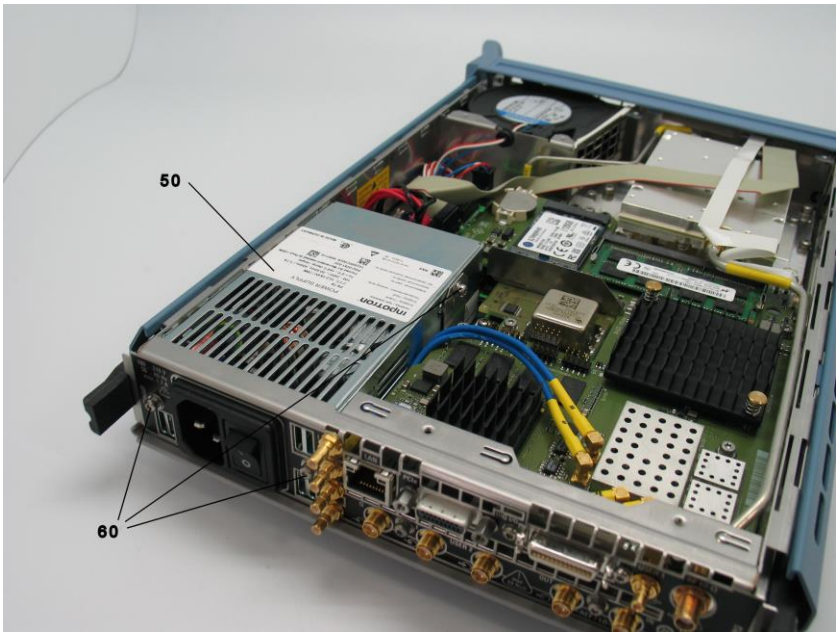
4. To install the EMC panel proceed in the reverse order.

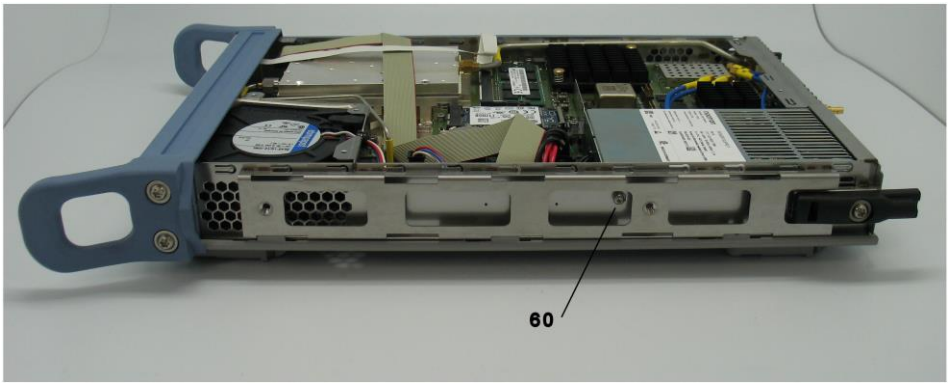
3.3.6 Replacing the Power Supply (A50)

1. Switch off the instrument.
2. Remove the case (see page 107).
3. Remove the EMC panel (see page 108).
4. Disconnect the side panel (450) by pushing it backwards.

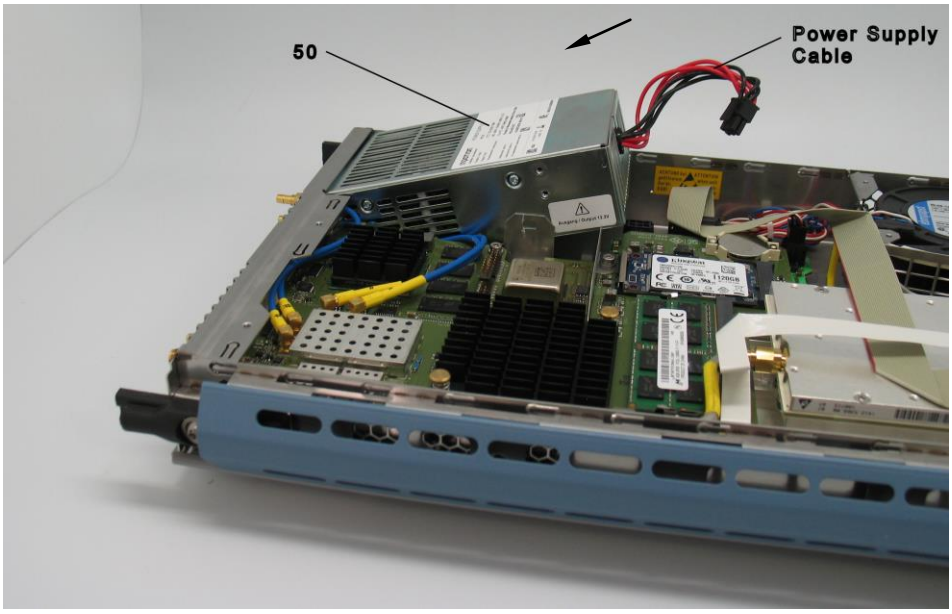


5. Unfasten the four combination screws (60) on the rear of the instrument and on both sides of the power supply (50).





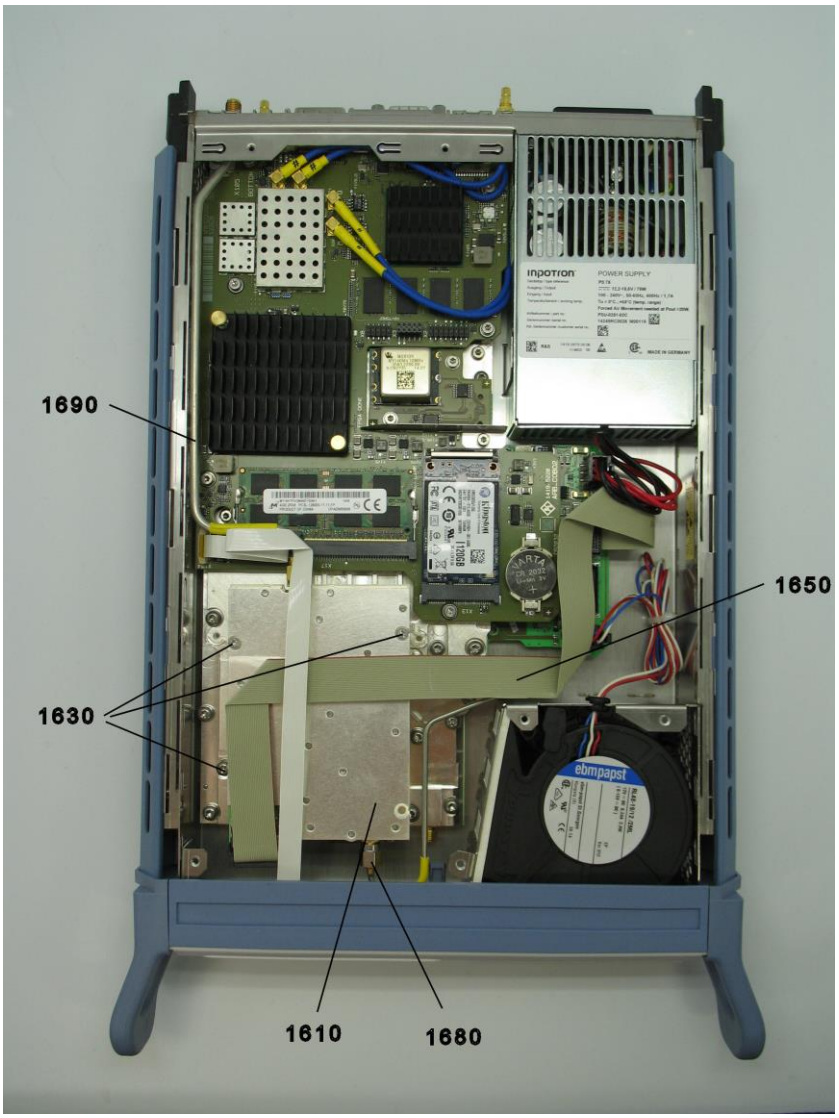
6. Disconnect the power supply cable from X270 on the RF mainboard (1020).
7. Lift up and remove the power supply (50).



8. To install the power supply (50) proceed in the reverse order.
9. Afterwards perform the necessary action described in chapter Adjustment (see page 65).

3.3.7 Replacing the Step Attenuator (A500)

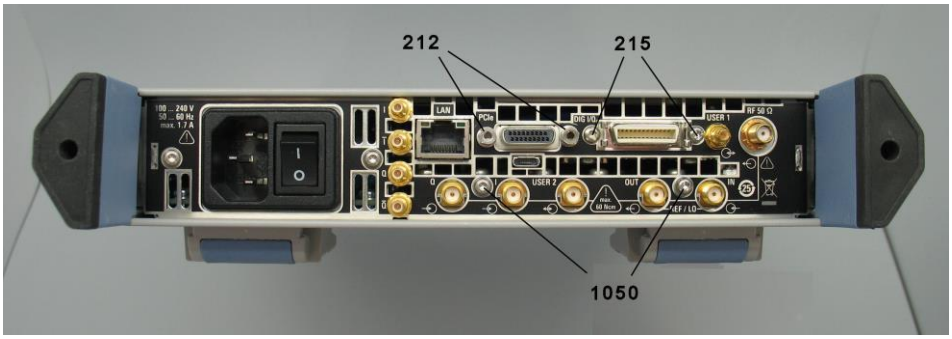
1. Remove the case (see page 107).
2. Remove the EMC panel (see page 108).
3. Disconnect the ribbon cable W206A (1650).
4. Unfasten the three screws (1630).
5. Disconnect the RF cables W310A (1680) and W300A (1690) from the Step Attenuator (1610).
6. Remove the Step Attenuator (1610) carefully.



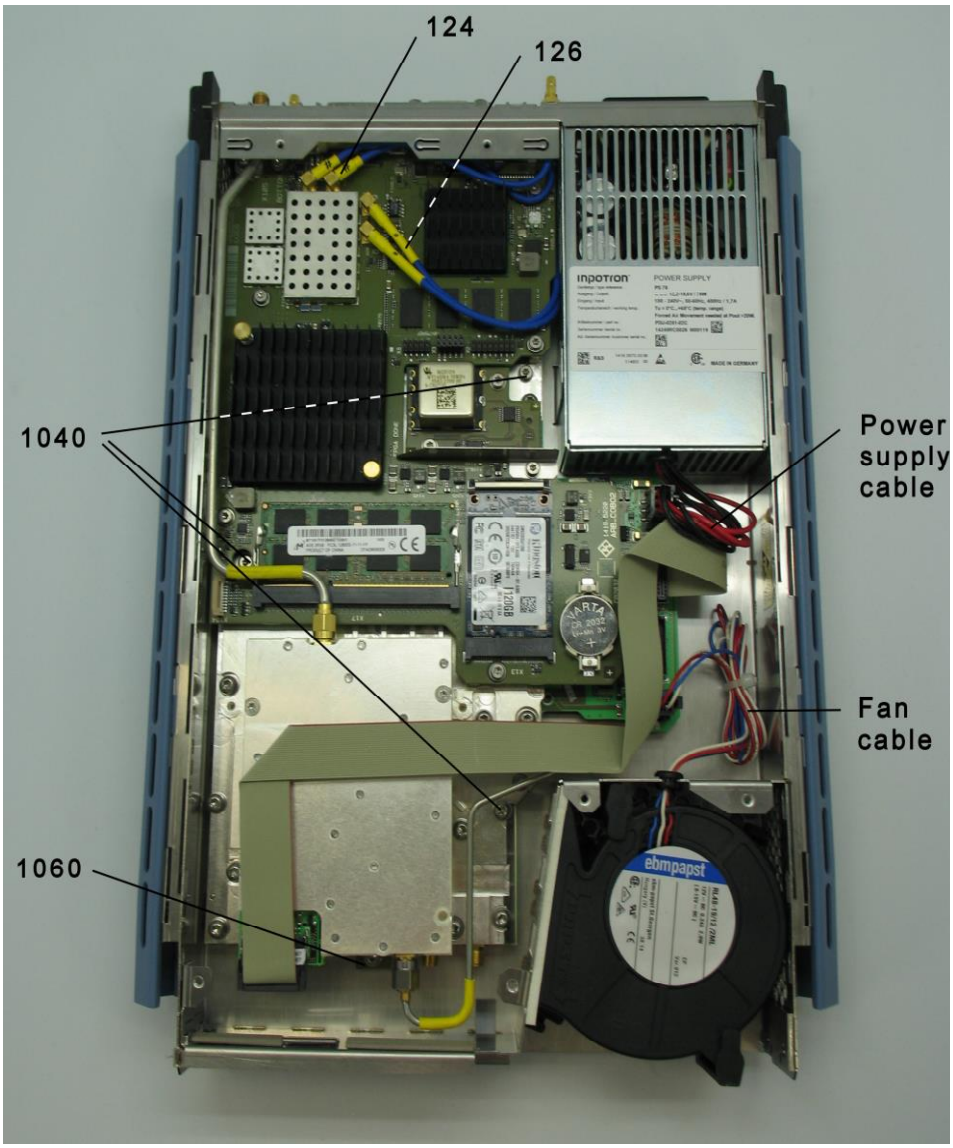
7. To install the Step Attenuator A500 proceed in the reverse order.

3.3.8 Replacing the RF Mainboard and the ARB_COBO (A200 + A100)

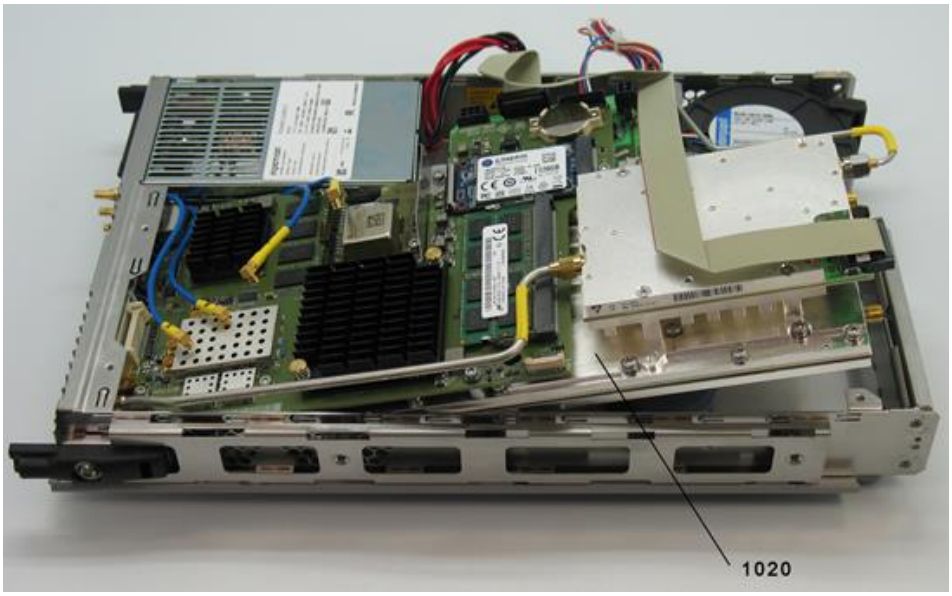
1. Remove the case (see page 107).
2. Remove the EMC panel (see page 108).
3. Remove the Front Unit (see page 120).
4. Remove the Step Attenuator A500 (see page 115).
5. Unfasten the two combination screws (1050), the two locking screws (212) and the two screws (215) on the rear of the instrument.



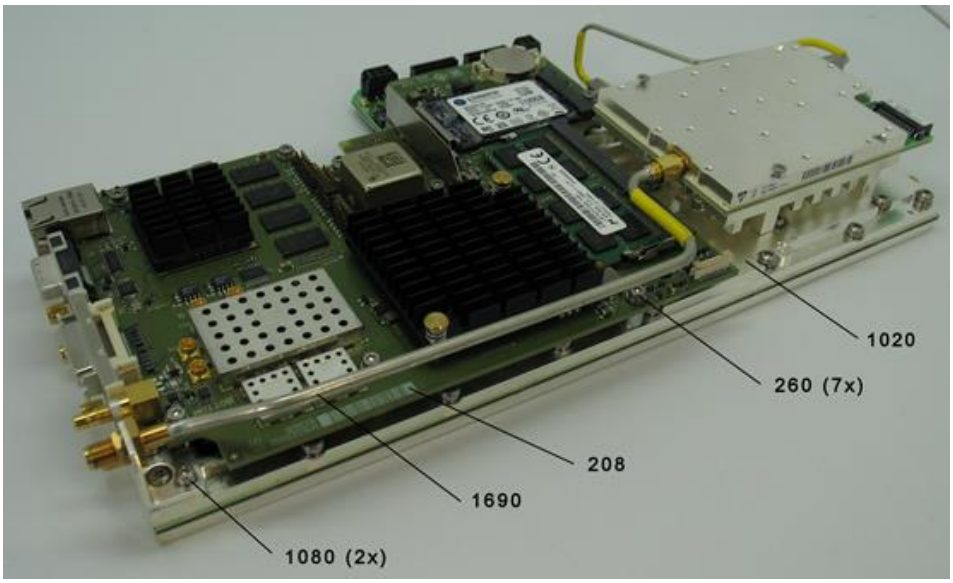
6. Disconnect the fan cable from X240 and the power supply cable from X270.
7. Disconnect the four RF Cables (124 + 126)
8. Unfasten the one combination screw (1060).
9. Unfasten the three combination screws (1040).



10. Lift up the RF Mainboard (1020) and pull it in toward the front to remove it completely with the ARB_COBO (208).



11. Disconnect the cable W300A (1690) together with the mounting bracket by unfastening the two screws (1080).
12. Unfasten the seven combination screws (260) and remove the ARB_COBO (208).
13. If there is a Reference Oscillator OCXO (1810) unfasten the two screws (1830) and remove it.



14. To Install the RF Mainboard (1020), the ARB_COBO (208) and/or the OCXO (1810) proceed in the reverse order.
15. Afterwards perform the necessary action described in chapter Adjustment (see page 65).

3.3.9 Replacing the ARB_COBO (A100)

The ARB_COBO (208) is located on the RF mainboard.

To replace it, refer to page 116 and follow the steps until 12.

3.3.10 Replacing the Reference Oscillator OCXO

The Reference Oscillator OCXO (1810) is located on the RF mainboard.

To replace it, refer to page 116 and follow the steps until 12.

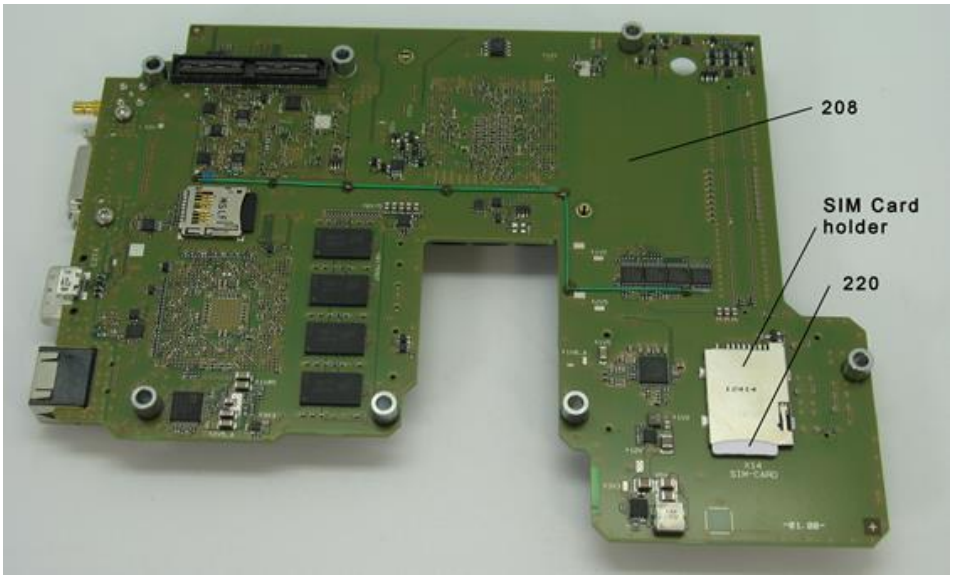
3.3.11 Replacing the SIM Card

NOTICE

If you replace the ARB_COBO (208), you have to remove the SIM card (220).
The SIM card is part of your instrument and will not be replaced by Rohde & Schwarz if it becomes lost. Always keep the SIM card with you.

The SIM card (220) is located on the bottom of the ARB_COBO (208).

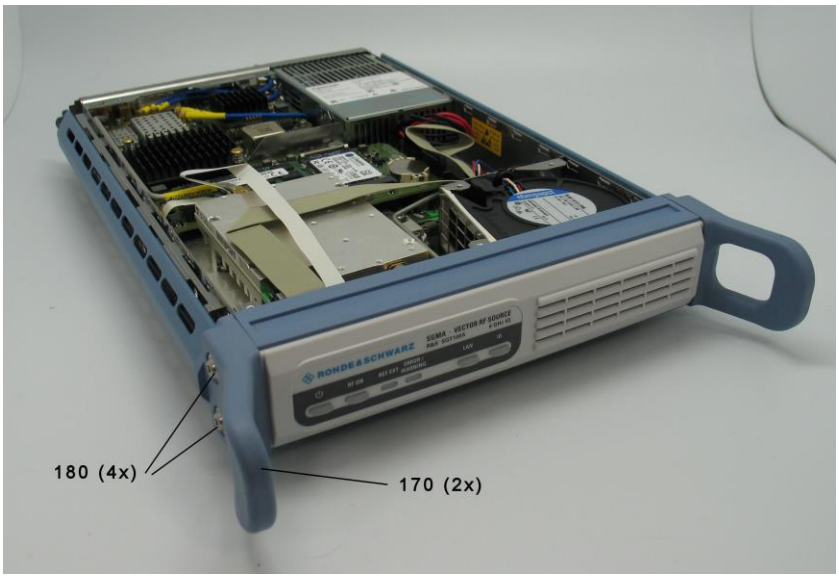
1. Remove the ARB_COBO (see page 119).
2. Push the SIM card into the holder to eject the card.



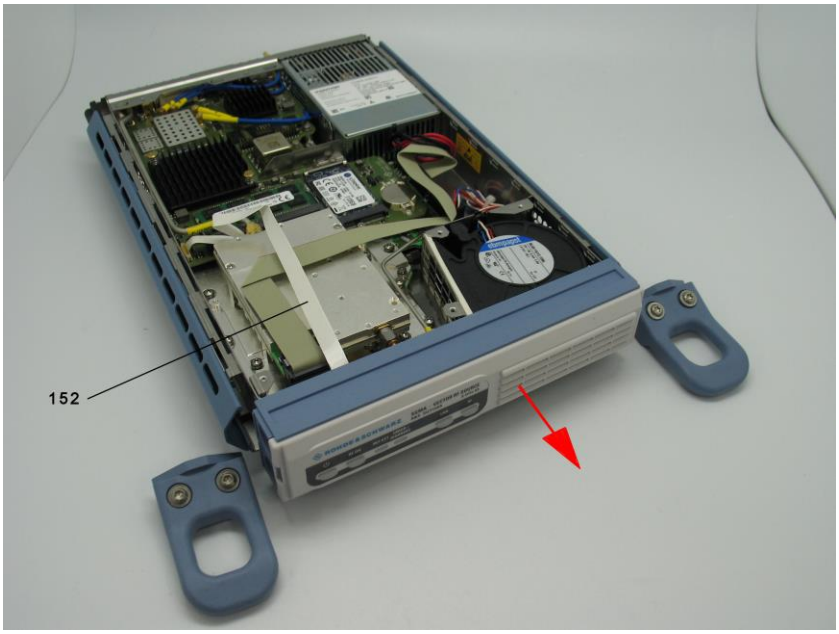
3. Pull out the SIM card (220) from the SIM card holder.
4. To install the SIM card, proceed in the reverse order.

3.3.12 Replacing the Front Unit

1. Switch off the instrument.
2. Remove the case (see page 107).
3. Remove the EMC panel (see page 108).
4. Unfasten the four screws (180) and remove the two grips (170).



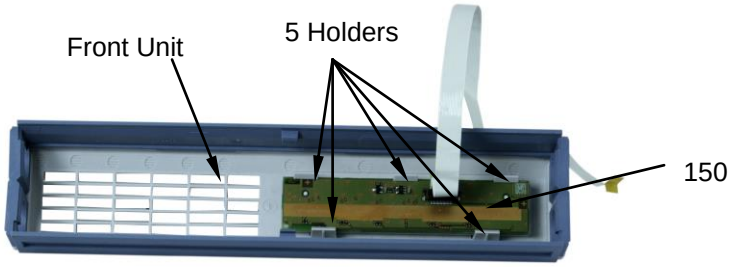
5. Disconnect the flat flexible cable (152) from the ARB_COBO (208) carefully.
6. Pull the entire Front Unit forward.



7. Put the flat flexible cable (152) carefully through the slot of the housing.
8. To install the Front Unit proceed in the reverse order.

3.3.13 Replacing the Front module board (A300)

1. Switch off the instrument.
2. Remove the case (see page 107).
3. Remove the EMC panel (see page 108).
4. Remove the Front Unit (see page 120).
5. Carefully push the five holders apart and remove the Front module board A300 (150).



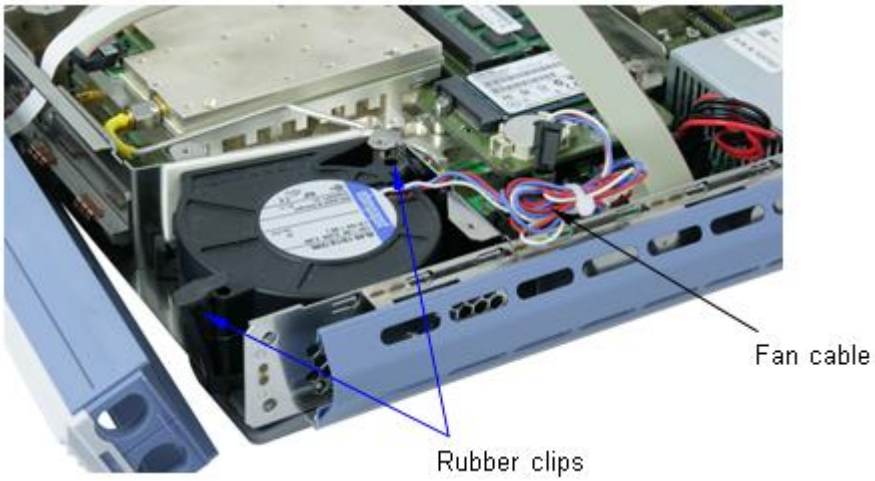
6. Remove the rubber keypad (140).

7. To install the Front module board (150) proceed in the reverse order.

3.3.14 Replacing the Fan (E1)

Note:
Always make sure the instrument fan operation is not constrained by dust etc. The fan can be inspected through the air intake at the case bottom side.

1. Switch off the instrument and disconnect the main plug.
2. Remove the case (see page 107).
3. Remove the EMC panel (see page 108).
4. Remove the Front Unit (see page 120).
5. Disconnect the fan cable from X240 on the RF Mainboard (1020).
6. Lift out the fan with the two rubber clips.



7. To install the new fan proceed in the reverse order.

4 Firmware Update

1. Select "SGMA-GUI main panel > Instrument Name > Setup > Maintenance > Operation
   > Install firmware package".
2. Press "Select Package" and navigate to the directory the new firmware is stored in.
3. Enter the "Security Password".
4. Confirm the update with "Accept".
   The software transfers the firmware file and automatically starts the update procedure. During the update, the message "Updating Firmware" is displayed in the Info line.
   Note:
   The update procedure requires restart of the instrument. The restart is performed automatically. The instrument is not accessible during that time.
5. Wait until the message "Updating Firmware" disappears and the update is completed. The green POWER ON/STANDBY LED is on.
   Tip:
   Calibration Error. If the Info line shows the message "Calibration Error", select "SGMA-GUI main panel > Instrument Name > Setup > Internal Adjustments > Adjust All" to trigger internal adjustment.
6. If required, install the new R&S SGMA-GUI.
   For detailed description, refer to the Getting Started guide, section "Installing the R&S SGMA-GUI Software on the External PC".

5 USB Firmware Installation

If the SGMA-GUI is not available, a firmware package (*.rsu file) can be installed from an USB memory stick.

1. Before starting the SGT, connect the USB memory stick to the micro USB connector on the rear panel.
2. Hold down front panel buttons ID and LAN simultaneously while switching on the instrument to start USB firmware installation.

Besides installing the firmware also the internal memory of the instrument is restored to its original state (Instrument Sanitize function).

The progress of the installation procedure is signaled by a running light on the front panel. When it is finished the lights stop and the LEDs now indicate the status.
All LEDs green: success. All LEDs red except one LED orange: failure.

The position of the one orange LED indicates the reason for the failure.

1st (leftmost) LED:	Cannot access USB stick
2nd LED:	No update package found.
3rd LED:	Update package defective.
4th LED:	System partition defective.
5th LED:	Out of flash memory
6th LED:	Update package defective
7th LED:	Flash memory write error

The LEDs stay on for 1 minute after which the instrument performs an automatic reboot.

6 Documents

6.1 Spare Parts

The stock numbers necessary for ordering replacement parts and modules can be found in the spare part list further down.

CAUTION

Risk of shock hazard and instrument damage

When replacing a module please note the safety instructions and the repair instructions given in chapter 3 and at the beginning of this service manual.

When shipping a module be careful to provide for sufficient mechanical and antistatic protection.

6.1.1 Available Power Cables

Stock No	Earthed-contact connector	Preferably used in
DS 0006.7013.00	S1363: 1967' 10 A, 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12, 10 A, 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036.00	Type 498/13, 10 A, 250 V complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 0041.4752.00	GB2099, GB1002, 10 A, 250 V approvals CCC	China
DS 0041.6232.00	JIS C 8303, 7A, 125 V AC approvals PSE (JET)	Japan
DS 0006.7107.00	Type SAA3, 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365.00 DS 0099.1456.00	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight approvals VDE, ÖVE, CEBEC, KEMA, S, D, N, FI, LCIE, IMQ, UCIEEEurope	Europe (except Switzerland)

6.2 Spare Part List and Mechanical Drawings

el.Kennz *Part*	Benennung / Hinweise *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bestellbezeichnung *Designation*	enthalten in *contained in*
	ACHTUNG EGB /ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL				
A50	NJ PSU-0251-02 PSU 1X 75W 12.2V 6.15A AC/DC POWER SUPPLY UNIT	1416.0870.00	INPOTRON	PSU-0251-02 TAZ 07.00	1419.4501.01
A100	ED ARB_COBO2 ARB_COBO2	1419.5220.02			1419.4501.01
A200	ED RF MAINBOARD IQ 2 RF MAINBOARD IQ 2	1419.5308.02			1419.4501.01
A300	ED FRONTMODULBOARD FRONTMODULBOARD	1419.4801.02			1419.4501.01
A500	ED ASATT 6GHZ ASATT 6GHZ	1412.5360.08			1419.4501.01
E1	EV LUEFTER 76X27 6.1L/S 12VDC FAN 12VDC	3584.3900.00	PAPST	PAPST-ZCHNG.959220712 AEZ.B	1419.4501.01
W401 - W402	DV HF KABEL I RF CABLE I	1419.5343.00			1419.4501.01
W403 - W404	DV HF KABEL Q RF CABLE Q	1419.5366.00			1419.4501.01
W3000	DF FLEXSTRIP 16P R= 0.5 L=270 FFC FLAT FLEXIBLE CABLE 16P 0.5MM	5705.6286.00	PANTA	ZIF-I16-P262-NW-001	1419.4501.01
W206A	DY FLACHBANDKABEL W206A (RFBOARD-ATT) RIBBON CABLE W206A (RFBOARD-ATT)	1419.5014.00			1419.4501.01
W300A	DW HF-KABEL W300A (RUECKW. ZU EICHLTG) RF CABLE W300A (REAR TO ATT)	1419.4960.00			1419.4501.01
W310A	DW HF-KABEL W310A (EICHLTG. ZU RF-B) RF CABLE W310A (ATT TO RF-B)	1419.4976.00			1419.4501.01

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Pos.-Nr. *ItemNo*	Menge *Quantity*	ME *Unit*	El.Kennz *Ref.Des.*	Benennung / Bezeichnung *Designation*	Z	Sachnummer *Stock No.*	Ersatzteil *Subst.part*	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
5	0	S		ZS ERSATZTEILLISTE VORHANDEN SPARE PARTS LIST AVAIL Sach-Nr. / Part No. 1419.4547.01 ST für/for SGT100A		0999.9684.00	X	M	O
18	1	S		KB GERAETEWANNE2 BESCHR. HOUSING TROUGH2 PRINTED	Z	1419.4653.02		M	P
50	1	S	A50	NJ PSU-0251-02 PSU 1X 75W 12.2V 6.15A AC/DC POWER SUPPLY UNIT		1416.0870.00	X	B	T
60	4	S		VS 6900/ISR M2.5 X 6 A2 COMBI SCREW 6900/ISR M2.5 X 6 A2		1148.3059.00		B	T
100	1	S	E1	EV LUEFTER 76X27 6.1L/S 12VDC FAN 12VDC		3584.3900.00	X	B	O
102	2	S		DZ KABELBI.RD 1 BIS 25 B2 CABLETIE		0015.9038.00		B	O
104	1	S		DZ HALTER KAB.BIND 4.2 HOLDER		0794.5214.00		B	O
110	2	S		EV RADIALLUEFTER-HALTERG. 27/6MM FRILL FOR FAN		1416.0970.00		B	O
120	1	S		DZ DURCHF.RD4XRD9.5X5.6 GROMMET		0062.1130.00		B	B
124	2	S	W401 W402	DV HF KABEL I RF CABLE I	Z	1419.5343.00	X	M	O
126	2	S	W403 W404	DV HF KABEL Q RF CABLE Q	Z	1419.5366.00	X	M	O
130	1	S		MM FRONTPLATTE SIGMA FRONT COVER SIGMA		1416.0828.00	X	B	B
140	1	S		SF SCHALTMATTE SIGMA RUBBER KEYPAD SIGMA		1416.0628.00	X	B	B
150	1	S	A300	ED FRONTMODULBOARD FRONTMODULBOARD	Z	1419.4801.02	X	M	P
152	1	S	W3000	DF FLEXSTRIP 16P R= 0.5 L=270 FFC FLAT FLEXIBLE CABLE 16P 0.5MM		5705.6286.00		B	O
160	2	S		MM BW2010 RAHMENTEIL 1/2 BW2010 FRAME 1/2		1174.0047.00		B	T
170	2	S		MM BW2010 1E GESTELLGRIFF BW2010 1U RACK MOUNT GRIP		1174.2940.00		B	T
180	4	S		VS SCHRAUBE M4 X 18 ISR PA SCREW M4 X 18 ISR PA		1096.4944.00		B	B
208	1	S	A100	ED ARB_COBO2 ARB_COBO2	Z	1419.5220.02	X	M	O
212	2	S		FM VERRIEGEL.BOLZEN H=5.3 LOCKING SCREW 4-40UNC H=5.3		6105.0437.00		B	O
213	2	S		VS DIN128 A3 A2 SPRING LOCK WASHER DIN128 A3 A2		0005.2499.00		B	O

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Pos.-Nr. *ItemNo*	Menge *Quantity*	ME *Unit*	El.Kennz *Ref.Des.*	Benennung / Bezeichnung *Designation*	Z	Sachnummer *Stock No.*	Ersatzteil *Subst.part*	BA	VH
215	2	S		VS 7985/ISR M2.5 X 8 A4 PA 7985/ISR M2.5 X 8 A4 PA		1148.2730.00		B	T
220	1	S		BC SMARTCARD SLE66 V4.4 SIM FORMAT SMARTCARD SLE66 V4.4 SIM FORMAT		3586.7860.00		B	A
225	.015	M		WW KLEB-BD0.025X12 PI BR ADHESIVE TAPE		0048.3968.00		B	V
260	7	S		VS HVC/ISR M2.5 X 12 A2 COMBI SCREW HVC/ISR M2.5 X 12 A2		1096.5205.00		B	B
265	1	S		MZ LUFTLEITBLECH SHEET	Z	1419.5020.00		M	P
280	1	S		ZM EMV-HAUBE MIT KONTAKTSTREIFEN EMV-COVER WITH CONNECTOR STRIPS	Z	1419.5114.00		M	P
290	6	S		VS 965/ISR M2.5 X 5 A4 PA 965/ISR M2.5 X 5 A4 PA		1148.2752.00		B	T
300	1	S		HS FIRMWARE SGT100A FIRMWARE SGT100A	Z	1419.4530.00		M	O
310	1	S		OS GERAETESCH. VECTOR RF SOURCE 3GHZ LABEL VECTOR RF SOURCE 3GHZ		1419.4776.00	X	B	B
325	1	S		OS CSA-SCHILD MIT KCC F. KOREA (SGT) CSA LABEL INCL. KCC F. KOREA (SGT)		1419.5037.00		M	P
350	1	S		ZN BW2010 1E 1/2 T350 ABD. UNTEN PERF BW2010 1E 1/2 T350 COVER LOWER	Z	1416.0911.00		M	P
360	4	S		MM BW2010 GERAETEFUSS 12MM KOMPL. BW2010 FOOT 12MM COMPL.		1174.2227.00		B	T
380	1	S		MZ BW2010 1E 1/2 T350 ABDECKUNG OBEN BW2010 1E 1/2 T350 COVER TOP		1174.0082.00		M	O
450	2	S		KN BW2010 1E T350 SEITENTEIL LINKS BW2010 1U D350 SIDE PANEL LEFT		1174.1172.00		M	O
480	2	S		MM BW2010 1E RUECKWANDFUSS KOMPL BW2010 1HU REAR FOOT COMPL	Z	1174.0024.00		B	T
720	2	S		MM BW2010 HALTER-FUSS BW2010 HOLDER BASE		1174.0353.00		B	T
730	2	S		VS SCHRAUBE M4 X 10 ISR PA SCREW M4 X 10 ISR PA		3586.3313.00		B	B
1020	1	S	A200	ED RF MAINBOARD IQ 2 RF MAINBOARD IQ 2	Z	1419.5308.02	X	M	
1040	3	S		VS HVC/ISR M2.5 X 12 A2 COMBI SCREW HVC/ISR M2.5 X 12 A2		1096.5205.00		B	B
1050	2	S		VS 6900/ISR M2.5 X 6 A2 COMBI SCREW 6900/ISR M2.5 X 6 A2		1148.3059.00		B	T
1060	1	S		VS 6900/ISR M2.5 X 8 A2 COMBI SCREW 6900/ISR M2.5 X 8 A2		0041.1653.00		B	T
1070	1	S		MZ HALTEWINKEL2 F. HF-AUSG MOUNTING BRACKET	Z	1416.0940.00		M	P
1080	2	S		VS 6900/ISR M2.5 X 6 A2 COMBI SCREW 6900/ISR M2.5 X 6 A2		1148.3059.00		B	T
1610	1	S	A500	ED ASATT 6GHZ	Z	1412.5360.08	X	M	P

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				ASATT 6GHZ					
1630	3	S		VS 965/ISR M2.5 X 25 A4 PA 965/ISR M2.5 X 25 A4 PA		1416.1547.00		B	O
1650	1	S	W206A	DY FLACHBANDKABEL W206A (RFBOARD-ATT) RIBBON CABLE W206A (RFBOARD-ATT)	Z	1419.5014.00	X	M	P
1680	1	S	W310A	DW HF-KABEL W310A (EICHLTG. ZU RF-B) RF CABLE W310A (ATT TO RF-B)	Z	1419.4976.00	X	M	P
1690	1	S	W300A	DW HF-KABEL W300A (RUECKW. ZU EICHLTG) RF CABLE W300A (REAR TO ATT)	Z	1419.4960.00	X	M	V

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Pos.-Nr. *ItemNo*	Menge *Quantity*	ME *Unit*	El.Kennz *Ref.Des.*	Benennung / Bezeichnung *Designation*	Z	Sachnummer *Stock No.*	Ersatzteil *Subst.part*	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
5	0	S		PH BEMERKUNG NOTE Spareparts for SGT100A , 1419.4501.02		0999.9610.00		B	O
30	1	S	A101	BR MT16KTF51264HZ-1G6K1 4GB DDR3 SODIM MT16JSF51264HZ 4GB DDR3 SODIMM incl. in 1416.1330.02		3587.9921.00		B	A
40	1	S	A102	NM THNSNH060GMCT3PAGA 60GB MSATA MLC 60GB MSATA CARD enth. in /		3590.1857.00		B	A
50	1	S	A50	NJ PSU-0251-02 PSU 1X 75W 12.2V 6.15A AC/DC POWER SUPPLY UNIT		1416.0870.00		B	T
100	1	S	E1	EV LUEFTER 76X27 6.1L/S 12VDC FAN 12VDC		3584.3900.00		B	O
124	1	S	W 401 W402	DV HF KABEL I RF CABLE I from SN 102000	Z	1419.5343.00		M	O
126	1	S	W 403 W 404	DV HF KABEL Q RF CABLE Q from SN 102000	Z	1419.5366.00		M	O
130	1	S		MM FRONTPLATTE SIGMA FRONT COVER SIGMA		1416.0828.00		B	B
140	1	S		SF SCHALTMATTE SIGMA RUBBER KEYPAD SIGMA		1416.0628.00		B	B
150	1	S	A300	ED FRONTMODULBOARD FRONTMODULBOARD	Z	1419.4801.02		M	P
208	1	S	A100	ED ARB_COBO2 ARB_COBO2 from SN 102000	Z	1419.5220.02		M	O
210	1	S	A100	ED ARB_COBO ARB_COBO up to SN 101999	Z	1416.1330.02		M	P
211	1	S		ZE PCI-EXPRESS TEST PORT PCI-EXPRESS TEST PORT	Z	5009.9002.02		M	W
310	1	S		OS GERAETESCH. VECTOR RF SOURCE 3GHZ LABEL VECTOR RF SOURCE 3GHZ + for the SGT100A 3GHz without frequency extension		1419.4776.00		B	B
311	1	S		OS GERAETESCH. SGVECTOR RF SOURCE 6GHZ LABEL SGMA VECTOR RF SOURCE 6GHZ + for the SGT100A 6GHz, = with frequency extension SGT-KB106		1419.4760.00		B	B
1020	0	S	A200	ED RF MAINBOARD IQ RF MAINBOARD IQ replacement by A200 1419.5308.02 ***	Z	1416.1001.02		M	P

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				Exchanges of RFMB (1416.1001) and RFMB2 (1419.5308): RFMB -> RFMB or RFMB2 RFMB2 -> RFMB2					
1025	1	S	A200	ED RF MAINBOARD IQ 2 RF MAINBOARD IQ 2	Z	1419.5308.02		M	
1100	1	S	W100	DW HF-KABEL W100 (RF-BOARD ZU RUECKW.) RF CABLE W100 (RF BOARD TO REAR)	Z	1416.0928.00		M	W
1610	1	S	A500	ED ASATT 6GHZ ASATT 6GHZ	Z	1412.5360.08		M	P
1650	1	S	W206	DY FLACHBANDKABEL W206A (RFBOARD-ATT) RIBBON CABLE W206A (RFBOARD-ATT)	Z	1419.5014.00		M	P
1680	1	S	W310A	DW HF-KABEL W310A (EICHLTG. ZU RF-B) RF CABLE W310A (ATT TO RF-B)	Z	1419.4976.00		M	P
1690	1	S	W300A	DW HF-KABEL W300A (RUECKW. ZU EICHLTG) RF CABLE W300A (REAR TO ATT)	Z	1419.4960.00		M	V
2550	1	S	F2800	SS SMD-SICHERUNG 5A T FUSE 5A T incl. in 1416.1001.02		1090.4442.00		B	T
2560	1	S	F2801	SS SMD-SICHERUNG 5A T FUSE 5A T incl. in 1416.1001.02		1090.4442.00		B	T
2860	1	S	U1.2	EB CR2032 BATT(P) LI-MNO2 3.0/0.23 BATTERIES NON-RECHARGEABLE (PRIMARY) incl. in 1416.1330.02		0858.2049.00		B	O

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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
5	0	S		ZS ERSATZTEILLISTE VORHANDEN SPARE PARTS LIST AVAIL Sach-Nr. / Part No. 1419.5620.01 ST für/for SGT-B1		0999.9684.00		M	O
1810	1	S	A600	ED OCXO BOARD OCXO BOARD	Z	1416.2508.02	X	M	W
1830	2	S		VS HVC/ISR-M2.5X12-A2 COMBI SCREW HVC/ISR-M2.5X12-A2		1096.5205.00		B	B

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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
5	0	S		PH BEMERKUNG NOTE Ersatzteile sind fuer / Sparepart valid for SGT-B1, 1419.5608.02		0999.9610.00		B	O
1810	1	S	A600	ED OCXO BOARD OCXO BOARD	Z	1416.2508.02		M	W

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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDAUSFUEHRUNG +VAR02=BASIC MODEL					
3	0	S		PH BEMERKUNG NOTE Zur Montage des SGT-B88 ist ein Gerät SGT100A notwendig. Damit die MAC-Adresse des SGT100A am Gerät sichtbar ist, benötigt das SAP-Schild für die Rückwand die MAC-Adresse des dazugehörenden SGT100A / For mounting of the device SGT-B88, an instrument SGT100A is necessary. The MAC address of the SGT100A must be visible. The SAP Label required the MAC address of the associated SGT100A		0999.9610.00		B	O
5	0	S		ZS ERSATZTEILLISTE VORHANDEN SPARE PARTS LIST AVAIL Mat.-Nr. / Part No. 1419.8220.01 ST		0999.9684.00		M	O
20	1	S		KN BW2010 WANNE BESCHR. FUER SGT-B88 HOUSING TROUGH PRINTED FOR SGT-B88	Z	1419.8242.00		M	
30	1	S		KN BW2010 1E 1/2 FRONTMONTAGEWANNE BW2010 1E 1/2 FRONT MOUNTING TRAY	Z	1419.8359.00		M	
40	1	S	W1	DW HF-KABEL RF-OUT INTERN N-SMA RF CABLE RF-OUT INTERN N-SMA	Z	1419.8413.00		M	
50	1	S		DZ KABELBI.L100 B2.4 CABLETIE		0209.4852.00		B	O
60	1	S		VS 6900/ISR M2.5 X 8 A2 COMBI SCREW 6900/ISR M2.5 X 8 A2		0041.1653.00		B	T
70	5	S	W2 W3 W4 W5 W6	DV HF-KABEL, INTERN, SMA-BNC RF-CABLE, INTERN, SMA-BNC	Z	1419.8420.00		M	P
80	1	S		KN BW2010 1E 1/2 FRONTPLATTE BESCHR. BW2010 1U 1/2 FRONT COVER	Z	1419.8320.00		M	
100	2	S		MM BW2010 RAHMENTEIL 1/2 BW2010 FRAME 1/2		1174.0047.00		B	T
110	2	S		MM BW2010 2E GESTELLGRIFF BW2010 2U RACK MOUNT GRIP		1174.2956.00		B	O
120	4	S		VS SCHRAUBE M4 X 21 ISR PA SCREW M4 X 21 ISR PA		1096.4996.00		B	O
130	2	S		KN BW2010 2E T350 SEITENT. F. SGT-B88 BW2010 2U D350 SIDE PANEL		1419.8388.00		M	
150	2	S		MF BW2010 2E RUECKWANDFUSS NACHBEARB. BW2010 2E REAR FOOT WORKED OVER	Z	1419.8288.00		M	
180	1	S	W1A	DW HF-KABEL RF-OUT EXTERN SMA-SMA RF CABLE RF-OUT EXT. SMA-SMA	Z	1419.8442.00		M	
190	5	S	W2A	DW HF-KABEL EXTERN SMA-SMA	Z	1419.8459.00		M	

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			W3A W4A W5A W6A	RF CABLE EXT. SMA-SMA					
220	2	S		KR BW2-AUFSTELLFUSS KLEIN BW2-FOOT SMALL		1096.2441.00		B	T

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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
20	1	S		DW HF-KABEL RF-OUT INTERN N-SMA RF CABLE RF-OUT INTERN N-SMA	Z	1419.8413.00		M	
30	1	S		DV HF-KABEL, INTERN, SMA-BNC RF-CABLE, INTERN, SMA-BNC	Z	1419.8420.00		M	P
40	1	S		DW HF-KABEL RF-OUT EXTERN SMA-SMA RF CABLE RF-OUT EXT. SMA-SMA	Z	1419.8442.00		M	
50	1	S		DW HF-KABEL EXTERN SMA-SMA RF CABLE EXT. SMA-SMA	Z	1419.8459.00		M	
80	1	S		MF BW2010 2E RUECKWANDFUSS NACHBEARB. BW2010 2E REAR FOOT WORKED OVER	Z	1419.8288.00		M	

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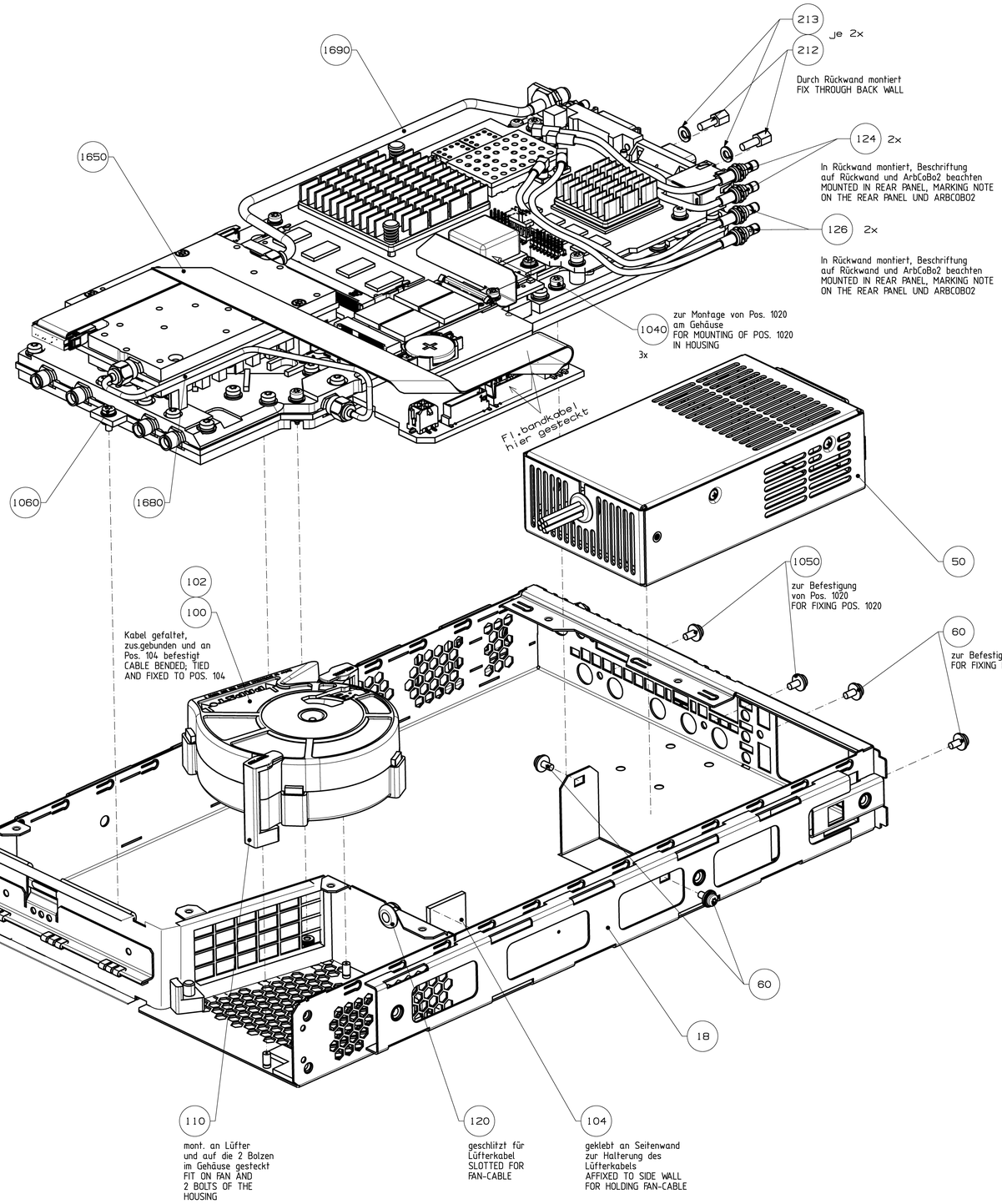
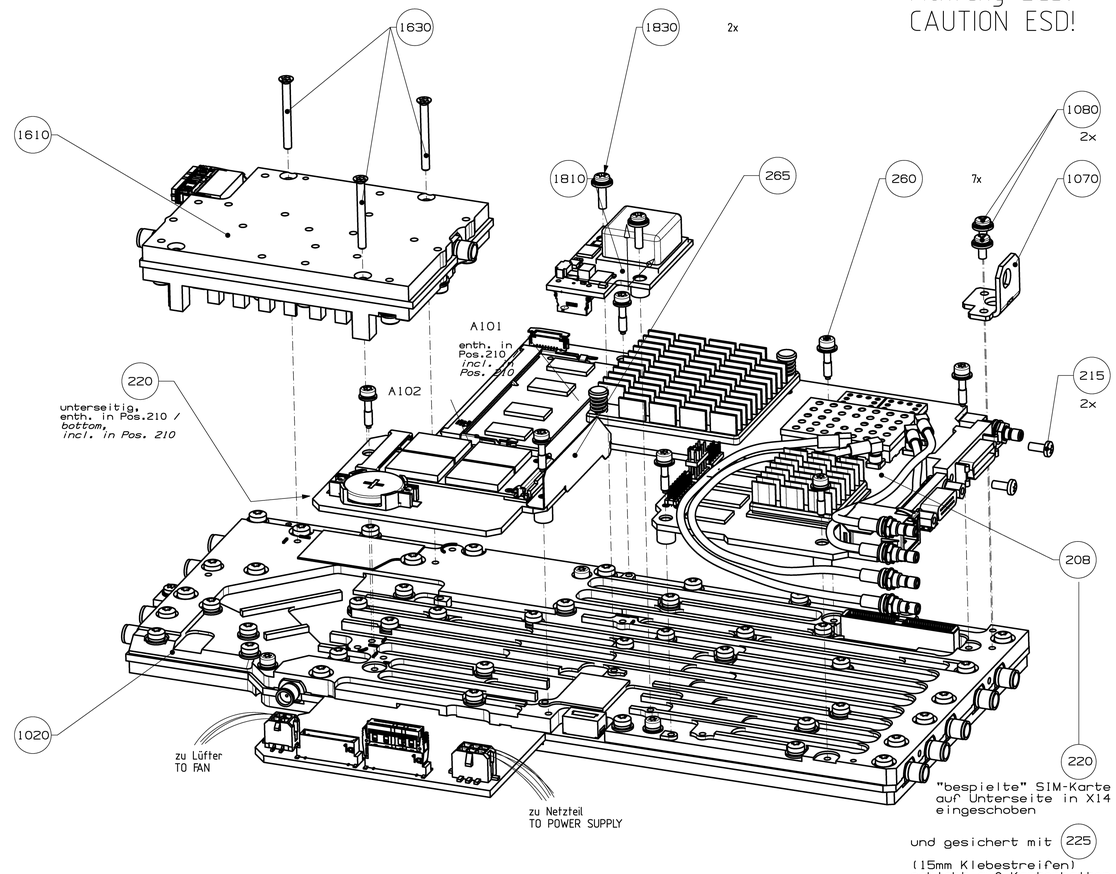
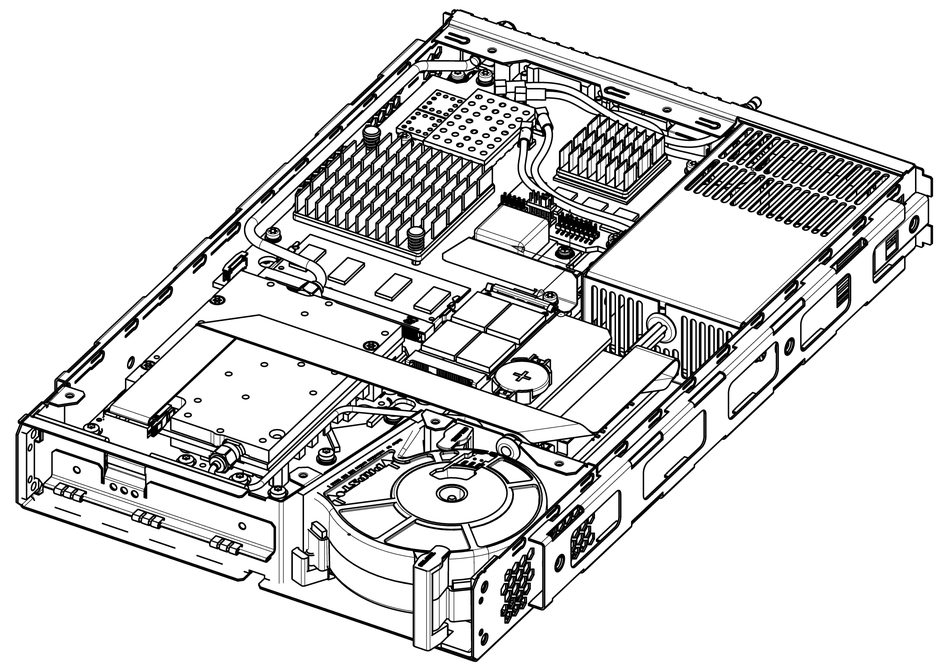
Achtung EGB!
CAUTION ESD!







Max. Drehmoment der HF-Schraubverbindungen: 60 Ncm
MAX TORQUE FOR RF-SCREW CONNECTION: 60 Ncm

Variantenerklärung: VAR02 = Grundausführung
EXPLANATION OF MODELS: MOD02 = BASIC MODEL

Maßstab / Scale	1:1	Toleranz / Tol.	ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ		Benennung / Designation	SGT100A SGMA VECTOR RF SOURCE SGT100A SGMA VECTOR RF SOURCE	Sprache / Lang.	de en	Ax. / Cl. 05.00	Blatt / Sh. 1
SGT100A		Datum / Date	2014-01-22	Abteilung / Dept.	1GPK	Name / Name	Hi
				Technische Zeichnung / Drawing No.	1419.4501.01		D

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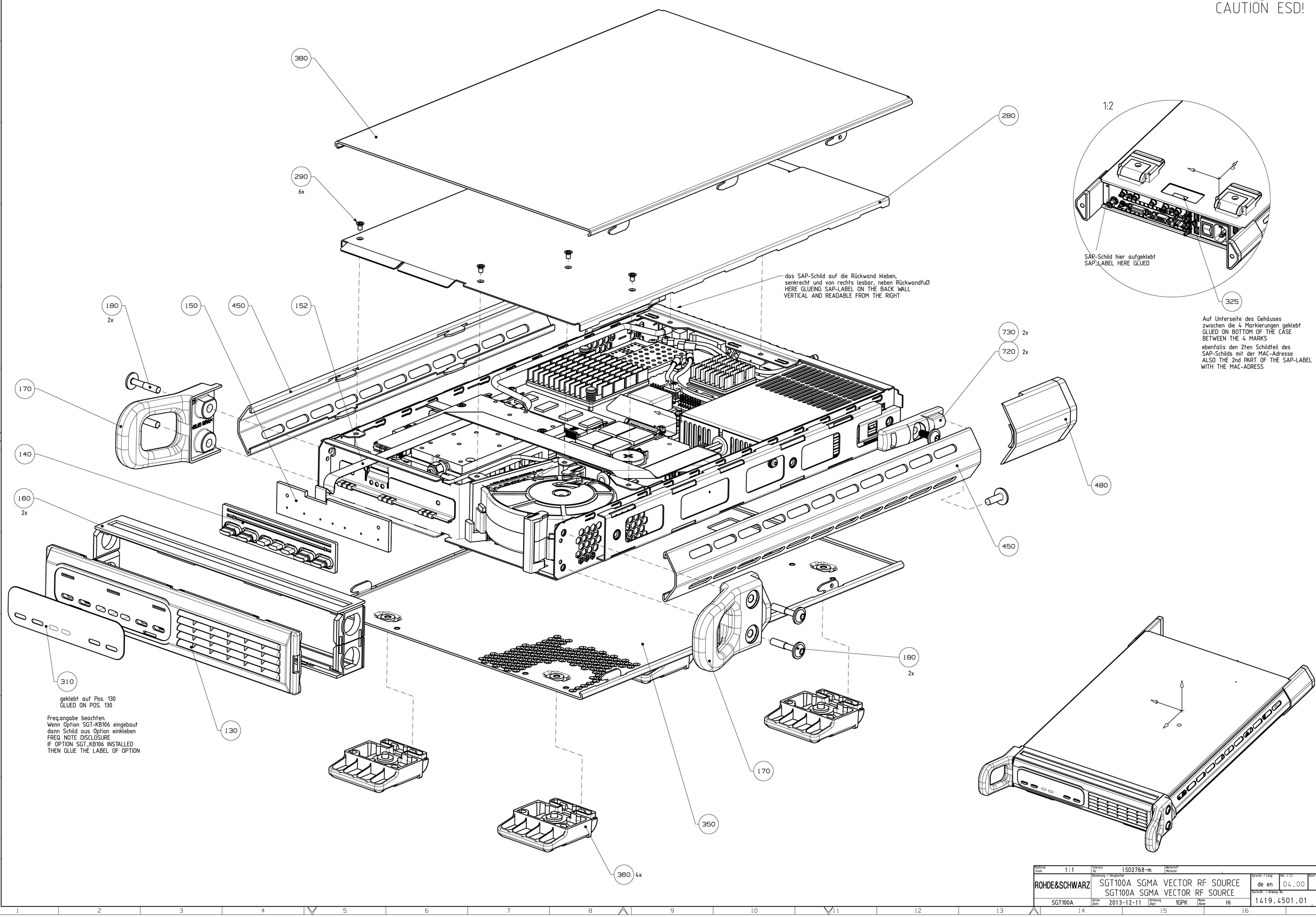
Projektionsmethode
Projection Method

Achtung EGB!
CAUTION ESD!



das SAP-Schild auf die Rückwand kleben,
senkrecht und von rechts lesbar, neben Rückwandfuß
HERE GLUEING SAP-LABEL ON THE BACK WALL
VERTICAL AND READABLE FROM THE RIGHT

Auf Unterseite des Gehäuses
zwischen die 4 Markierungen geklebt
GLUED ON BOTTOM OF THE CASE
BETWEEN THE 4 MARKS

ebenfalls den 2ten Schildteil des
SAP-Schilds mit der MAC-Adresse
ALSO THE 2nd PART OF THE SAP-LABEL
WITH THE MAC-ADRESS

geklebt auf Pos. 130
GLUED ON POS. 130

Freq.angabe beachten.
Wenn Option SGT-KB106 eingebaut
dann Schild aus Option einkleben
FREQ. NOTE DISCLOSURE
IF OPTION SGT_KB106 INSTALLED
THEN GLUE THE LABEL OF OPTION

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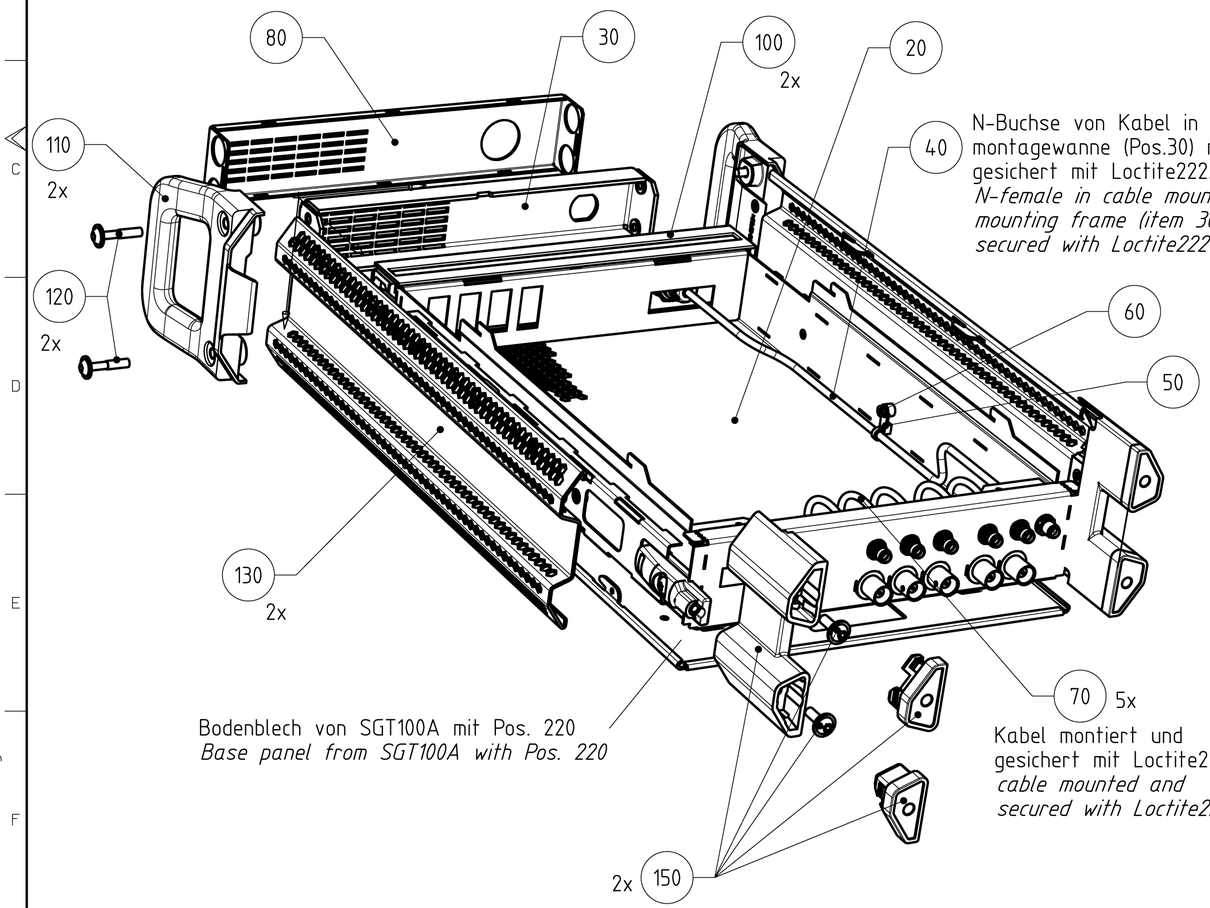
Projektions-methode
Projection Method

Maßstab / Scale 1:1	Toleranz / Tol. ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation SGT100A SGMA VECTOR RF SOURCE SGT100A SGMA VECTOR RF SOURCE		Sprache / Lang. de en	Rev. / Cl. 04.00	Blatt / Sh. 2
SGT100A	Datum / Date 2013-12-11	Abteilung / Dept 1GPK	Name / Name Hi	Zeichn.-Nr. / Drawing No. 1419.4501.01	D

ACHTUNG! EGB
ATTENTION! ESD

Darstellung ohne SGT100A zur Vormontage des Gehäuses
Representation without SGT100A for pre-assembly of the housing



N-Buchse von Kabel in Frontmontagewanne (Pos.30) montiert und gesichert mit Loctite222.
N-female in cable mounted in front mounting frame (item 30) and secured with Loctite222 .

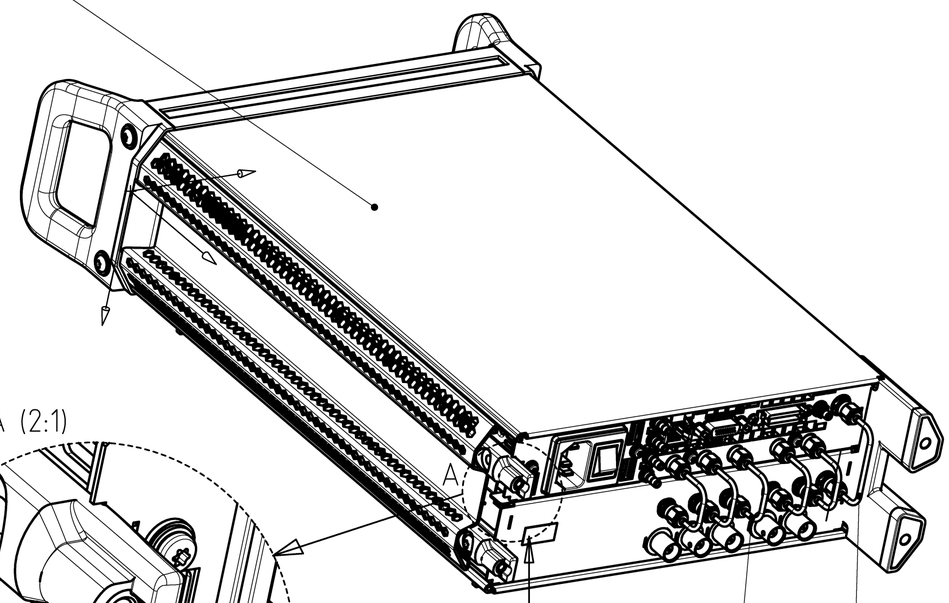
Bodenblech von SGT100A mit Pos. 220
Base panel from SGT100A with Pos. 220

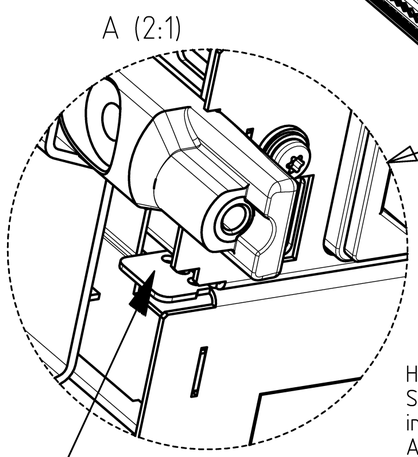
Kabel montiert und gesichert mit Loctite222.
cable mounted and secured with Loctite222 .

An allen 4 Gummipuffern jeweils 2 Ecken (4x4mmx45°) mit dem Seitenschneider abschneiden. Wegen Kollision mit dem Schraubenkopf im Rückwandfuß.
On all 4 rubber buffers each with 2 corners (4x4mmx45°) cut with wire cutters. Due to collision with the screw head.

SGT100A

Vom Gerät die Frontgriffe, Seitenteile, Bodenblech und die Rückwandfüße demontiert.
Die vorderen Gerätefüße im Bodenblech mit den Aufstellfüßen (Pos. 220) versehen.
Anschließend unter SGT-B88 montiert.
From the Instrument the Front handles, side panels, bottom plate and the rear panel feet unmounted. The front feet in the base panel with the set-upfeet (pos. 220) provided. Then mounted under SGT-B88.





Hier den 2ten Teil des SAP-Schildes (MAC-Adr.) in Rahmen geklebt, Die MAC-Adresse muss die gleiche sein wie die des SGT100A !
Here the 2nd part of the SAP-Label (MAC Adr.) Stuck under. The MAC Address must be the same as the SGT100A !

190 5x 180

! Max. Anzugsdrehmoment 60 Ncm !
Kabel erst nach der Montage der Rückwandfüße montieren.
Max. Tightening torque 60 Ncm. Cable only after installing the Rear panel feet.

Diesen Biegelappen von Blechwanne (Pos. 20) nach dem Einsetzen des SGT100A zur Sicherung um ca. 45 bis 60° nach oben gebogen. Auch auf der gegenüberliegenden Seite.
This formed sheet of metal trough (Pos. 20) after inserting the SGT100A for securing to 45 - 60° up bent upward. Also on the opposite side

Variantenerklärung: VAR02 = Grundausführung
Explanation of Variants: VAR02 = Basic Model

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For this document all rigths are reserved

Maßeinheit *Measuring Unit* [mm]

Projektionsmethode *Projection Method*

ISO A2

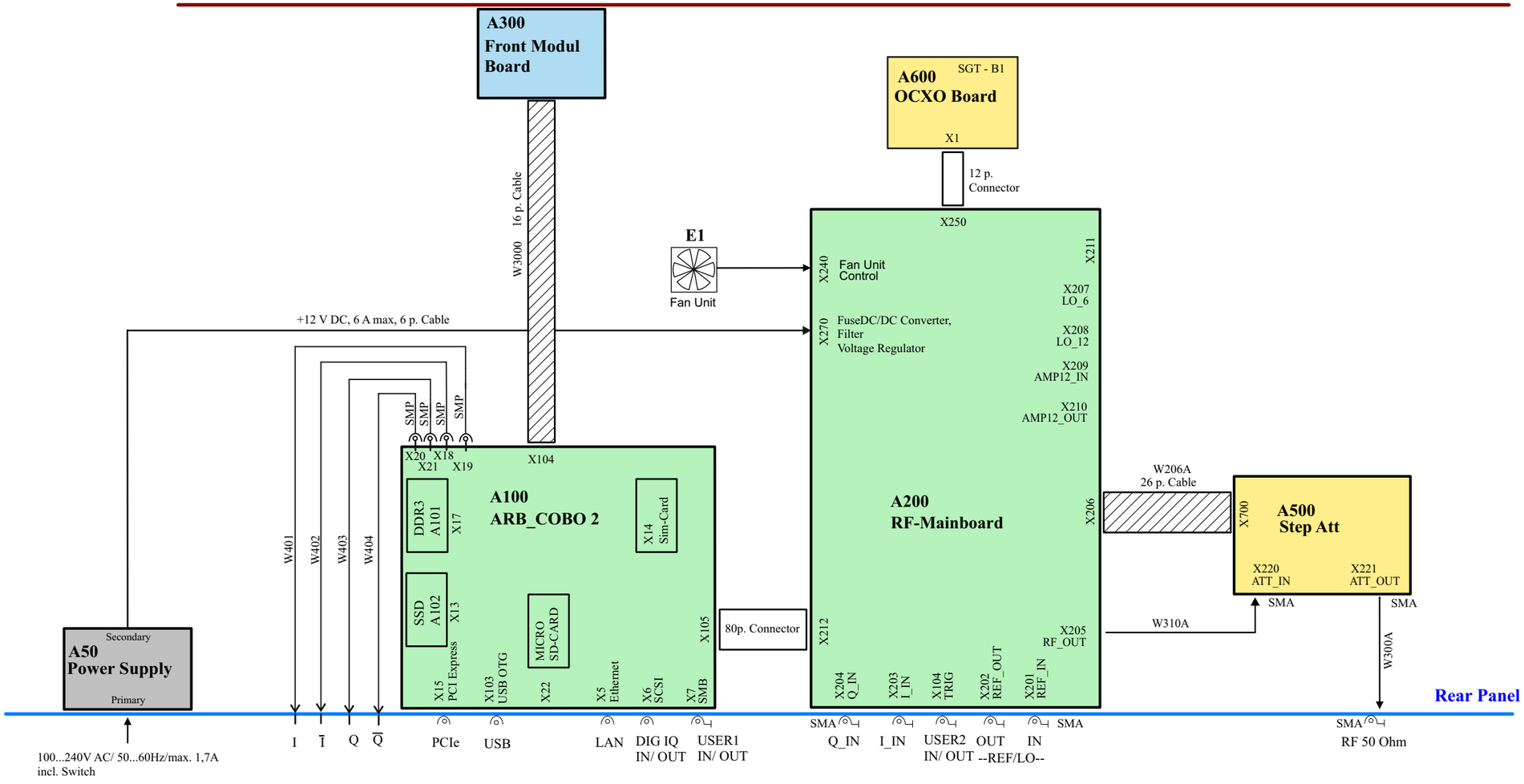
Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*				
ROHDE&SCHWARZ	Benennung / *Designation*	SGT-B88 EXTENSION UNIT SGT-B88 EXTENSION UNIT			Sprache / *Lang.* de en	Aei. / *Cl.* 02.00	Blatt / *Sh.* 1
SGT-B88	Datum *Date* 2016-02-04	Abteilung *Dept.* 1GAK	Name *Name* Hi		Zeichn.Nr. / *Drawing No.* 1419.8207.01		D

ROHDE&SCHWARZ

Block Circuit Diagram

SGT100A
Vector RF Source

Front Panel



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ISO-Projektion
Methode E

ROHDE&SCHWARZ	Benennung: *Designation:* SGT100A SGMA Vector RF Source					Sprache: */ Lang.:* de/en	Aei: */ C.I.:* 06.00	Blatt: */ Sh.:* 1 +
Typ: *Type:* SGT100A	Datum: *Date:* 2016-07-22	Abteilung: *Dept.:* 3MTEK	Name: *Name:* Falger			Zeichn. Nr.: */ Drawing Nr.:* **1419.4501.01 FS**		
1. Z.: *used in:* 1419.4501.01								

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X201
REF/LO IN

0.08..6GHz
1GHz
MIMO_IN
100/13/10MHz
Reference Input Selector
Ref_Out
D_REFPD
D_REFDIFF
D_REFTUNE
TCXO
10MHz
Reference Loop
VCO 1GHz
D_REF250M
1GHz
10MHz
SGT-B1
OCXO
X250
D_REF1000M
DDS-DAC
DDS
1...80MHz
D_PLLDIFF
D_VCOTUNE
Main PLL
VCO
3..6GHz
D_DDSRF
1GHz
Reference Output Selector
D_REFOUT
Ref_Out
10/100MHz
X202
REF/LO OUT
10/100/1000MHz
80...6000MHz
0.08..6GHz
D_MIMOUT
0.08..6GHz
RF_1
X208
LO_12
not used
X207
LO_6
not used
AMP12_IN
X209
not used
AMP12_OUT
X210
not used
D_FILTIN
Filter bank
D_FILTOUT
Amplifier
Levelling
1...80MHz
not used
0.08..6.00 GHz
1...80 MHz
Power Amps
Directional Coupler
1MHz..6GHz
X205
RF_OUT
D_ALC
DAC
D_DETREF
ADC
RF_1
IQ-Modulator
(0.08 ... 6 GHz)
I
Q
D_THERM
Thermostat
Detector
D_DETLVL
ADC
X220
RF_IN
X221
RF_OUT
RF Output
Step Attenuator
Power supply and control functions
X203
I Input
X204
Q Input
I external
DDS_CAL
Q external
IQ-Matrix
I internal
Q internal
D_ICAL
D_QCAL
Adj. Voltage
FPGA
14
DDS
ADC
Diagnosis Mux 32 Inputs
DDS_CAL
LVDS Fast Bus,
SPI, GPIOs
12V (Controller)
X212
ARB Controller
Control Unit
Digital Baseband
X105
X5
LAN
X15
Cable
PCI express
X6
DIG I/Q
MDR-26
X103
USB OTG
Micro USB
X7
USER1
SMA
D_P12V
+12V
D_P24V
+24V
Power Supply
D_P8V
+8V
D_P6V
+6V
D_N6V
-6V
D_P3V3
+3.3V
D_P2V5
+2.5V
D_P1V1
+1.1V
+3.9V
X270
+12V
7A
12V (Controller)
7A
RF Mainboard
X104
USER2

ISO-Projektion
Methode E

ROHDE&SCHWARZ	Benennung: *Designation:* SGT100A SGMA Vector RF Source					Sprache: */ Lang.:* de/en	Aei: */ C.I.:* 06.00	Blatt: */ Sh.:* 1 -
Typ: *Type:* SGT100A	Datum: *Date:* 2016-07-22	Abteilung: *Dept.:* 3MTEK	Name: *Name:* Falger			Zeichn. Nr.: */ Drawing Nr.:* **1419.4501.01 FS**		
1. Z.: *used in:* 1419.4501.01								

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