Service Manual Instrument

Measuring Receiver

R&S® FSMR 3
1166.3311.03

R&S® FSMR 26
1166.3311.26

R&S® FSMR 43
1166.3311.43

R&S® FSMR 50
1166.3311.50

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Basic Safety Instructions

Always read through and comply with the following safety instructions!

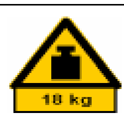
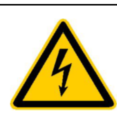
All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance 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 attached 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 intention 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 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.

Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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ON/OFF supply voltage	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double (reinforced) insulation

Tags 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 the possibility of incorrect operation which can result in damage to the product. In the product documentation, the word ATTENTION is used synonymously.

These tags 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 tags described here are always used only in connection with the related product documentation and the related product. The use of tags 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, pollution severity 2, overvoltage category 2, 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.
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 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 death.

Electrical safety

If the information on electrical safety is not observed either at all 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 AC 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 an earthing contact and protective earth connection.
3. Intentionally breaking the protective earth connection 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 the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 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, a disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, you can ensure that the cable will not 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 fused 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. 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, fusing, 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 IEC60950-1/EN60950-1 or IEC61010-1/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 PE terminal on site and the product's PE 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 fused 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", 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. 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).

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, PE 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. Keep cells and batteries out of the hands of children. If a cell or a battery has been swallowed, seek medical aid immediately.
5. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
6. 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.
7. 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.
8. 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

1. 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.
2. 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.

Informaciones elementales de seguridad

Es imprescindible leer y observar 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 adjunto 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.

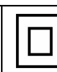
Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa 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.

Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Adver-tencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

Palabras de señal y su significado

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

⚠ PELIGRO	PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.
⚠ ADVERTENCIA	ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.
⚠ ATENCIÓN	ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.
AVISO	AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo. 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, grado de suciedad 2, categoría de sobrecarga eléctrica 2, 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.
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, pueden causarse lesiones o 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, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados 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", 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. 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).

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. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

6. 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.
7. 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).
8. 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

1. 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.
2. 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.

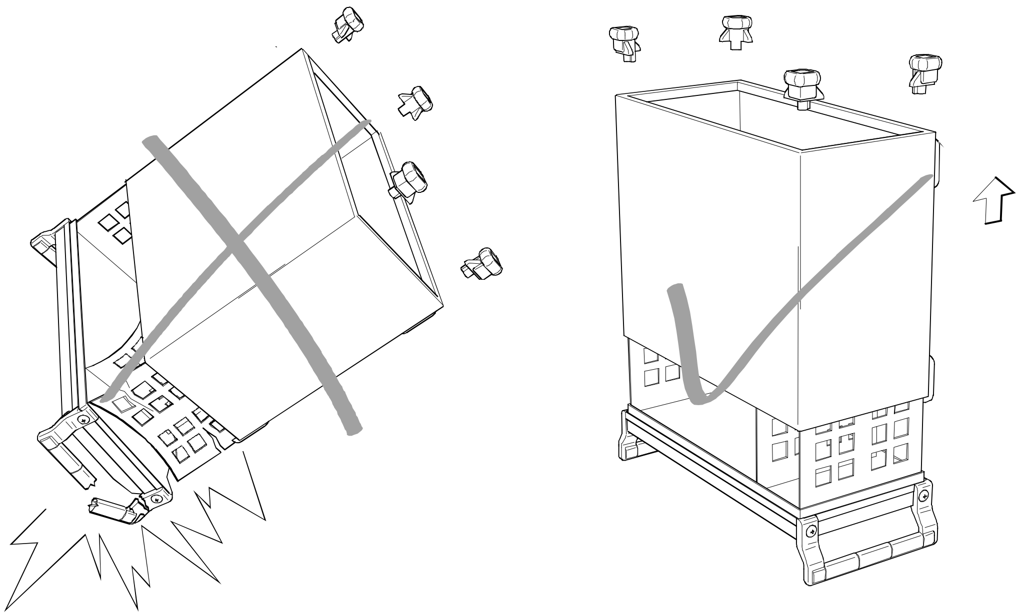
Safety Instructions for Units with Removable Cabinet

WARNING

Danger of injuries

When removing the rear feet, the unit can slip out of the cabinet.

Put the unit onto the front handles, before removing the rear feet and taking off the cabinet. Thus the risk of personal injuries and damages to the unit is avoided.



When mounting the cabinet take care not to pen in the fingers. Also pay attention not to damage or pull off cables. Screw the rear feet back on immediately after mounting the cabinet. Do not move the unit with the rear feet missing.

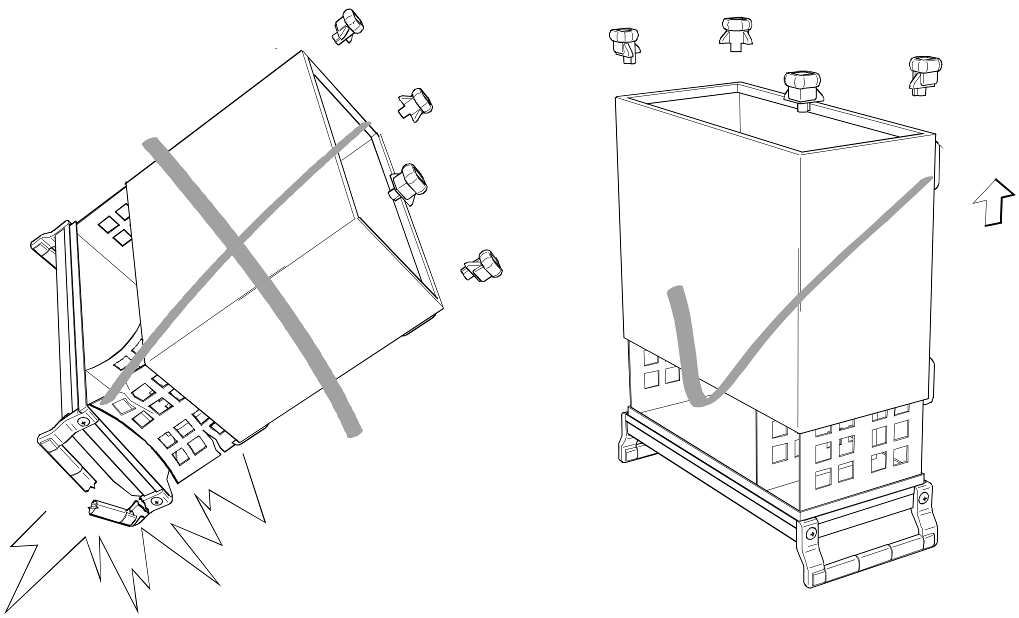
Informaciones de seguridad para aparatos con tubo de quita y pon

ADVERTENCIA

Peligro de heridas

Al sacar los piés de la pared posterior puede deslizarse el aparato fuera de la caja.

Posicionar el aparato de manera segura sobre las asas delanteras, antes de sacar los piés de la pared posterior y entonces sacar la caja. De esta manera evitarán el riesgo de daños en personas y daños en el aparato.



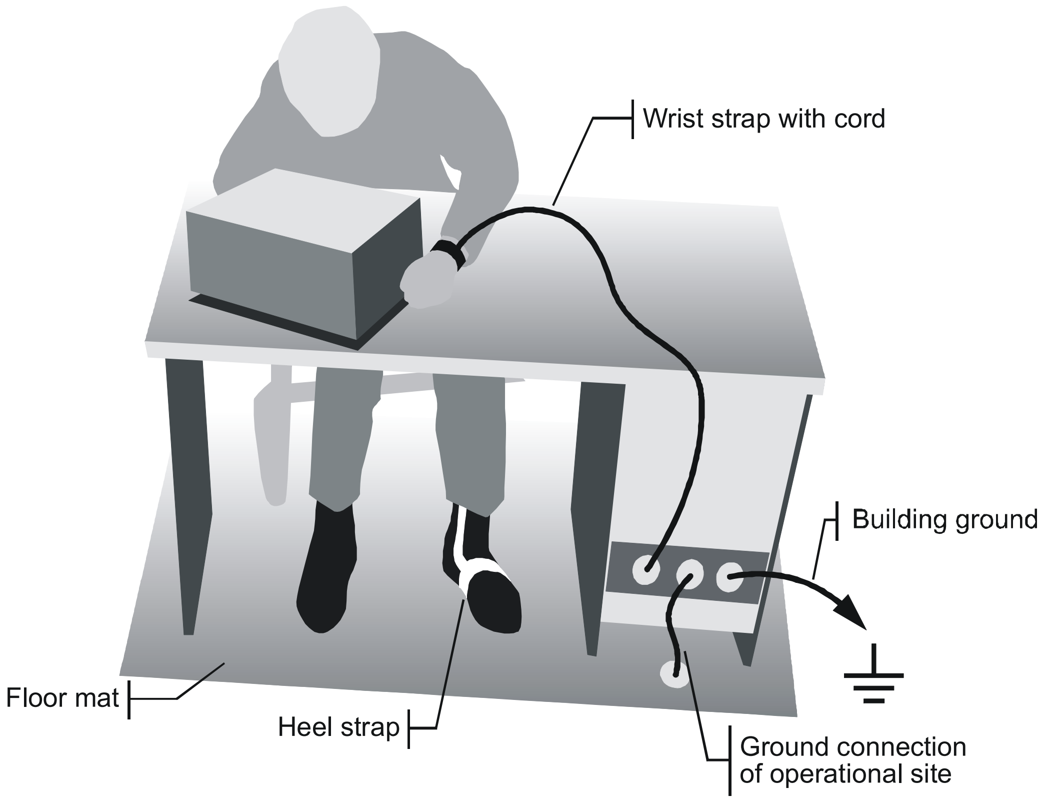
Existe el riesgo de heridas en el momento de poner otra vez la caja, como por ejemplo posiblemente engancharse los dedos. Por favor tengan además en cuenta de que no se enganchen o desconecten cables. Por favor atornillen los piés de la pared posterior directamente despues de poner la caja. No muevan el aparato nunca sin que los piés de la pared posterior estén atornillados.

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:

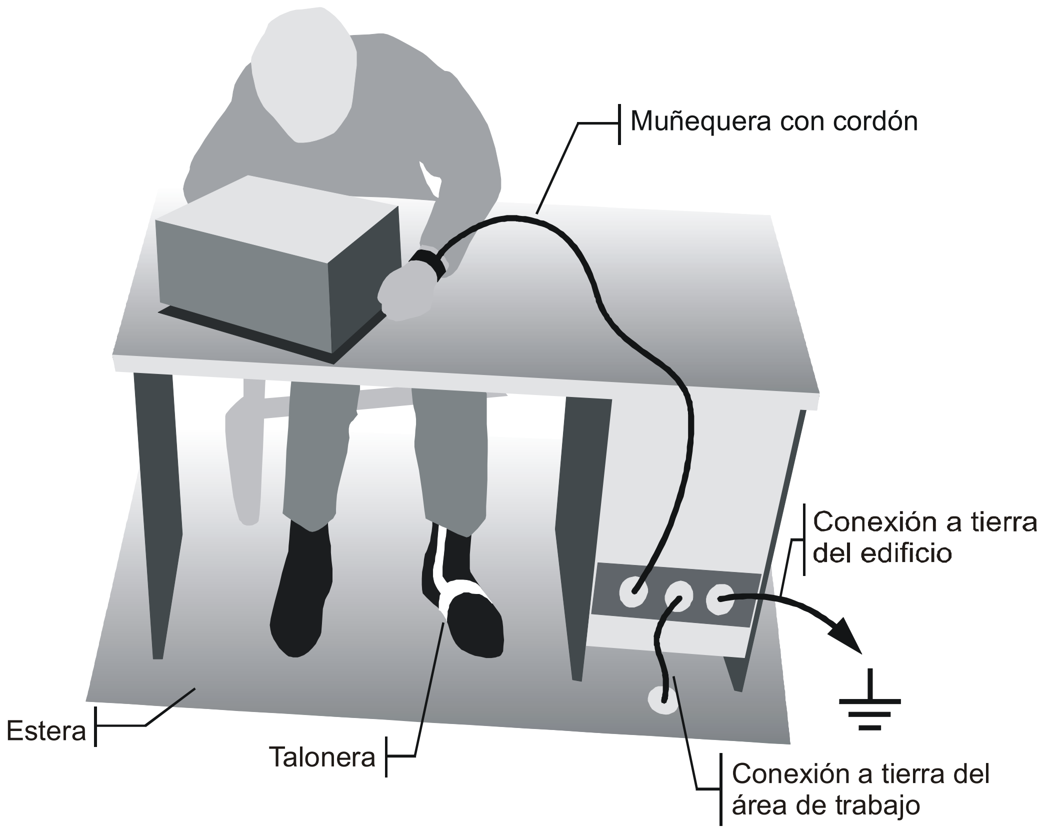
- Wrist strap with cord to ground connection
- Conductive floor mat and heel strap combination

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

Shipping of Instrument

Please contact your local Rohde & Schwarz service center if you need service or repair work of your equipment or wish to order spare parts. The list of the Rohde & Schwarz representatives is provided at the beginning of this service manual. You can find the current address of your representative on our homepage www.rohde-schwarz.com. Navigate to Service & Support / Service Locations

We require the following information in order to answer your inquiry fast and correctly: Instrument model

- Instrument type designation
- Instrument stock number
- Instrument serial number
- Firmware version
- Indicatio whether the instrument should be updated to the latest firmware version during service or the existing firmware retained
- 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.

Ordering Spare Parts

Please contact your local Rohde & Schwarz service center if you need service or repair work of your equipment. The list of the Rohde & Schwarz representatives is provided at the beginning of this service manual. You can find the current address of your representative on our homepage www.rohde-schwarz.com. Navigate to Service & Support / Service Locations

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

- Stock number (see list of mechanical parts and spare parts in this chapter)
- Designation
- Component number according to list of mechanical parts and 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

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. 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, nonchargeable material to protect the battery from being discharged.

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 replaced modules of that 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
- Rohde & Schwarz customer Order number (is indicated on the accompanying document forreturned merchandise)
- Service reference number (if available)

Contents - Chapter 1 "Performance Test"

1 Performance Test

Test Instructions

The rated specifications of the analyzer are tested after a warm-up time of at least 30 minutes and complete internal calibration. The verification of the Level Linearity demands for a warm up time of 90 minutes ! Thus it is recommendable to perform the Level Linearity test at the end of the verification process.
Starting of internal calibration: [***CAL*** *: CAL TOTAL*]

- If nothing else is specified, all measurements will be done with **external reference frequency**.
- Values given in the following sections are not guaranteed. Only the technical specifications of the data sheet are binding.
- The values given in the datasheet are the guaranteed limits. Due to measurement uncertainties these limits must be extended by the tolerance of the measuring equipment used in this performance test.
- Inputs for settings during measurements are shown as follows:

[**<KEY>**]	Press a key on the front panel, eg **[SPAN]**
[<SOFTKEY>]	Press a softkey, eg [MARKER -> PEAK]
[<**nn unit**>]	Enter a value and terminate by entering the unit, eg [**12 kHz**]

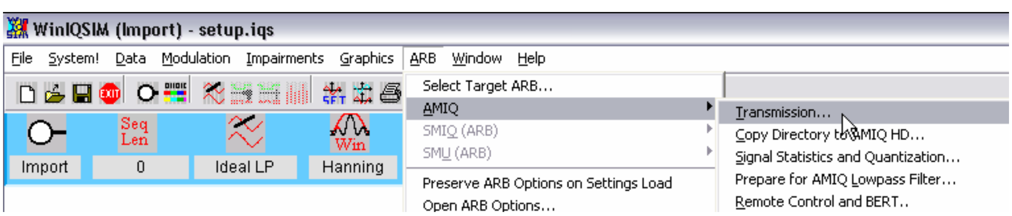
Successive entries are separated by [:], eg. [**BW** : RES BW MANUAL : **3 kHz**]

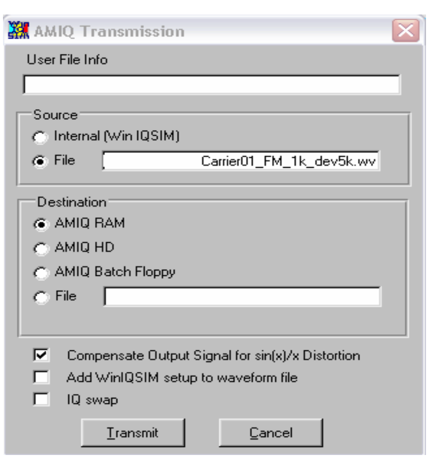
Test Files for Arbitrary Waveform Generator R&S AMIQ

Most of the modulation test signals must be generated using an Arbitrary Waveform Generator in order to attain the requisite accuracy and other characteristics.

Suitable files for the R&S AMIQ can be downloaded from GLORIS (https://gloris.rohde-schwarz.com/):
Firmware/Software → Software → R&S FSMR → **Modulation Test Files**

A convenient method to transfer the files into the AMIQ is to use WinIQSIM, also available from GLORIS:
Firmware/Software → Software → **WinIQSIM**





Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
1	Frequency counter	accuracy < $1x10^{-9}$, frequency range up to 10 MHz	Advantest R5361B with option 23		Frequency accuracy of reference oscillator
2	Signal generator	R&S FSMR 3: 10 MHz to 13 GHz R&S FSMR 26: 10 MHz to 27 GHz R&S FSMR 50: 10 MHz to 50 GHz	R&S SMP02 R&S SMP03 R&S SMR50	1035.5005.02 1035.5005.03 1134.9008.50	Immunity to interference Third-Order Intercept Frequency response
3	Signal generator	1 MHz to 3.6 GHz Phase noise at 640 MHz: < -100 dBc(1 Hz) @ 100 Hz < -115 dBc(1 Hz) @ 1 kHz < -127 dBc(1 Hz) @ 10 kHz < -130 dBc(1 Hz) @ 100 kHz < -142 dBc(1 Hz) @ 1 MHz 1 MHz to 36 MHz +16 dBm output level	R&S SMHU	0835.8011.52	Calibration source 128 MHz 2nd-Order harmonic dist. Third-Order Intercept IF Filters Frequency response Display linearity RF attenuator Reference level switching Phase Noise B9: Frequency response of the base band input
4	Signal generator	R&S FSMR 26: 10 MHz to 27 GHz R&S FSMR 50: 10 MHz to 40 GHz	R&S SMP03 R&S SMP04	1035.5005.03 1035.5005.04	Third-Order Intercept
5	3 or 6-dB coupler (power combiner)	R&S FSMR 3: 10 MHz to 3.6 GHz R&S FSMR 26: 10 MHz to 26.5 GHz R&S FSMR 50: 10 MHz to 40 GHz			Third-Order Intercept
6	6-dB divider (power splitter)	level imbalance 10 MHz to 2.2 GHz ≤ 0.10 dB 2.2 GHz to 7 GHz ≤ 0.2 dB 7 GHz to 18 GHz ≤ 0.3 dB 18 GHz to 50 GHz ≤ 0.4 dB R&S FSMR 3: 10 MHz to 3.6 GHz R&S FSMR 26: 10 MHz to 26.5 GHz R&S FSMR 50: 10 MHz to 50 GHz	Agilent 11667B Agilent 11667C + adapter to K		Frequency response Third-Order Intercept
7	50-Ohm termination	R&S FSMR 3: 10 MHz to 3,6 GHz R&S FSMR 26: 10 MHz to 26.5 GHz R&S FSMR 50: 10 MHz to 50 GHz	RNA Wiltron 28S50 Agilent 85138A	0272.4510.50	Noise display
8	Power meter	R&S FSMR 3 / 26 / 50 R&S FSMR 50	R&S NRVD Anritsu ML2438	0857.8008.02	Frequency response Calibration source 128 MHz Power Reference Uncertainty Level Linearity Frequency response
9	Power sensor	1 MHz to 3.6 GHz RSS ≤ 0.8 % Meter noise ≤ 20 pW	R&S NRV-Z4 or R&S NRV-Z5	0828.3618.02 0857.9004.02	Frequency response

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
10	Power sensor	RSS referred to indicated Power: 3.6 GHz to 7 GHz ≤2 % 7 GHz to 26.5 GHz ≤3.5 % 26.5 GHz to 50 GHz ≤3.5 % R&S FSMR 3: 10 MHz to 3,6 GHz R&S FSMR 26: 10 MHz to 26 GHz R&S FSMR 50: 10 MHz to 50 GHz	R&S NRV-Z4 R&S NRV-Z55 Anritsu MA2475A	0828.3628.02 1081.2005.02	Frequency response
11	Step attenuator	variable attenuation 0 dB to 100 dB, 1-dB steps attenuation accuracy < 0.1 dB (f = 5 MHz) SWR at 30 MHz: ≤ 1.2	R&S RSP R&S RSG	0831.3515.02 1009.4505.02	Reference level switching Display linearity RF attenuator Level linearity
12	Attenuator (2 x)	fixed attenuation 10 dB R&S FSMR 3: 10 MHz to 3.6 GHz R&S FSMR 26: 10 MHz to 26.5 GHz R&S FSMR 50: 10 MHz to 40 GHz	R&S DNF	0272.4210.50	Third-Order Intercept
13	Low pass	cut-off frequency: 28 MHz, 107 MHz, 262 MHz, 640 MHz, 1000 MHz, 1700 MHz			2^{nd}–order harmonic distortion.
14	Vector Network Analyzer with Cal Kit	R&S FSMR 3: 10 MHz to 3 GHz R&S FSMR 26: 10 MHz to 26.5 GHz R&S FSMR 50: 10 MHz to 50 GHz	R&S ZVR R&S ZVK		VSWR
15	Arbitrary Waveform Generator	Flat Bandwidth >13MHz Programmable Sampling Rate up to 60 MHz Memory depth ≥ 1.2 M Samples 14 Bit Resolution SFDR > 70 dB @ 0dBm into 50Ω External Reference Freq. Input 2 sinusoidal signals with 90 deg phase difference	R&S AMIQ	1110.2003.04	Audio Input: Frequency Counter Uncertainty AM: Modulation Depth Uncertainty & Flatness AM: Inherent Distortion AM: FM Rejection FM/PM : Deviation Uncertainty FM/PM: AM Rejection FM/PM: Inherent Distortion B9: test of modulation
16	Voltmeter	DC and AC voltage	R&S URE02 R&S URE03	0350.5315.02 0350.5315.03	B9: test of modulation
17	N cable	High Quality Network Analyzer Test Cable N-male attenuation< 0.2 dB up to 3.6 GHz	R&S ZV-Z11	1085.6505.03	Level Linearity B9/B12: test of output level
18	Spectrum Analyzer	Frequency range up to 3.6 GHz	R&S FSU 3	1129.9003.03	B9: test of modulation
19	WinIQSIM	PC test program for R&S AMIQ			B9: Generation of data for modulation test.
20	Software: Modulation test 100 kHz	Setup files for R&S AMIQ with modulated signal 100 kHz		1142.9232.00	B9: test FM

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
21	Software modulation test 1 MHz + 90 degrees	AMIQ setup file to generate 2 base band signals of 1 MHz with + 90 deg phase shift between I- and Q- channel		1142.9249.00	B9: test AM; Test of I/Q-modulation with + 90 deg phase shift
22	Software modulation test 1 MHz – 90 degrees	AMIQ setup file to generate 2 base band signals of 1 MHz with – 90 deg phase shift between I- and Q- channel		1142.9255.00	B9: test AM; Test of I/Q-modulation with – 90 deg phase shift
23	PC	Windows, LAN and RSIB SW or GPIB interface			B9
24	640 MHz reference output	low-noise signal source for 640 MHz from FSU with synthesizer 1166.2209.02	R&S FSU-B5 option	1157.1490.02	B5 option for the FSU for testing phase noise at 640 MHz
25	Signal source	low-noise signal source for 800 MHz	REFSYN	1158.2878.06	as an alternative for testing the phase noise, if there is no FSU with a 640 MHz output available
26	Digital Multimeter	Resistance: 50 Ω to 1 MΩ ±1% DC Voltage: 0.1V to 4 V ±0.1% AC Voltage: 0,1V to 3 V 20 Hz to 100 kHz: ±0.25% 100 kHz to 300 kHz: ±0.5% 300 kHz to 1 MHz: ±1%	Fluke 8508A Agilent 3458A		Audio Input: Resistance Audio Input: AC & DC Voltage Meas. Uncertainty
27	Audio Signal Generator	20 Hz to 100 kHz, 0 to 3 V RMS THD 100 Hz to 100 kHz: <0.012% (78 dB) Dual Tone relative amplitude accuracy: <0.2 dB Adjustable DC Offset: 0 to ±4 V (optional: replaces item 28)	Stanford DS360 R&S UPD	1030.7500.05	Audio Input: AC & DC Voltage Meas. Uncertainty Audio Input: Inherent Distortion Audio Input: THD & SINAD Measurement Uncertainty Audio Input: Audio Filter Frequency Response
28	DC Source	adjustable 0 to ±4 V			Audio Input: DC Voltage Measurement Uncertainty
29	RF Signal Generator	300 kHz to 3 GHz FM Modulation, Incidental AM <0,1 % @ Dev = 50 kHz, f_{mod} = 1 kHz Residual AM, RMS, B=3kHz: <0,005% Residual FM, RMS, B=3kHz: <0,5Hz @1GHz <1,25Hz @3GHz	R&S SMHU R&S SMIQ incl. Option SM-B5 (FM Modulator)	0835.8011.52 1125.5555.03	AM: FM Rejection AM: Residual AM FM: Residual FM
30	Power Sensor	Calibration Uncertainty at 50 MHz / 0 dBm ± 0.5 %	R&S NR&S RV-Z51	0857.9004.02	Power Reference Uncertainty Level Linearity

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
31	Attenuation Standard	Set of precision N-Type Attenuators; 2 x 6 dB nominal 1 x 6 dB ±0.5 dB *) 1 x 10 dB ±0.5 dB *) 2 x 20 dB ±0.5 dB *) SWR at 30.02 MHz: ≤ 1.01 *) With calibration certificate from a national metrology institute (e.g. NIST, PTB) Expanded (k=2) calibration uncertainty of insertion loss at 30.02 MHz: ± 0.003 dB	R&S FSMR-Z2 Atten. Cal Kit	1169.4954.02	Level Linearity
32	6-dB divider (power splitter)	Equivalent output SWR at 30 MHz: ≤ 1.1	Agilent 11667A		Level Linearity

Performance Test R&S FSMR (Basic Instrument)

Note: *For the following tests the R&S FSMR must be switched to the analyzer preset:*

- [**SETUP** : **NEXT** : PRESET ANALYZER]

Checking the Reference Frequency Accuracy

Preparation: The measurement can be performed either with a signal generator on the RF INPUT connector (front panel) at 1 GHz or on the EXT REF OUT connector (rear panel) at 10 MHz with a frequency counter.
For adjustment, the R&S FSMR must be switched to an internal reference source.

Note: *To speed up the measurements, a lower frequency counter resolution can be used for the measurement at 3 GHz.*

Measurement with Generator:

Test equipment: Signal generator (chapter "Measuring Equipment and Accessories", item 2):

Frequency	e.g. 3000 MHz
Level	-20 dBm
Frequency accuracy	$<1x10^{-9}$

If the frequency accuracy of the test transmitter is insufficient, the transmitter can be set to the correct frequency with the aid of the frequency counter prior to the measurement.

Test setup: Connect RF output of the signal generator to RF input of the R&S FSMR.

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **3 GHz**]
- [**SPAN** : **1 MHz**]
- [**BW** : RES BW MANUAL : **300 kHz]**
- [**AMPT** : REF LEVEL : **-8 dBm**]
- [**AMPT** : RF ATTEN AUTO]
- [**SETUP** : REFERENCE INT / EXT]

Switch to an internal reference source (INT)

Note: *Before the following measurement, the R&S FSMR must be on for at least ten minutes with an internal reference, so that the reference oscillator is warmed up.*

Measurement: Switch marker frequency count:
- [**MKR** : SIGNAL COUNT]

Set the appropriate resolution:
- [**MKR : NEXT** : CNT RESOL 1 HZ

Model without B4	3 GHz ± 30 Hz (corresponds to 1E-7)
Model with B4	3 GHz ± 10 Hz (corresponds 0.35E-7)

Measurement with Frequency Counter:

Test equipment: Frequency counter (Section "Measurement Equipment", item 1):
Accuracy < $1x10^{-9}$
Frequency range up to 10 MHz

Test setup: Connect frequency counter to 10-MHz reference output of the R&S FSMR (rear panel)

R&S FSMR settings: - [**SETUP** : REFERENCE INT / EXT]
Toggle to internal reference (INT)

Measurement: Measure frequency with frequency counter
Nominal frequency:

Model without option B4	10 MHz ± 1 Hz
Model with option B4	10 MHz ± 0.3Hz

Note: *The frequency of the reference oscillator can be adjusted by means of a service function (see chapter "Adjustment")*

Checking Immunity to Interference

Note: *If option R&S FSMR-B2 is installed see chapter "Test Procedure Option YIG Preselector R&S FSMR-B2" for test instructions.*

Test equipment: Signal generator (Section "Measurement Equipment", item 2):

Frequency range	R&S FSMR 3:	10 MHz to 13 GHz
	R&S FSMR 26:	10 MHz to 27 GHz
	R&S FSMR 50:	10 MHz to 50 GHz

maximum level ≥ 0 dBm

Test setup: Connect RF output of the signal generator to RF input.

Signal generator settings: Level: adjust the output level of signal generator for an RF-Input level of 0 dBm

R&S FSMR settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : REF LEVEL : **-30 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **3 kHz**]

1st IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 9256.8 MHz
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dBm – L_{dis}

2nd IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 808.8 MHz
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dBm – L_{dis}

3rd IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 40.8 MHz
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dBm – L_{dis}

1st IF Rejection

Additional signal generator settings:	- Frequency 4628.4 MHz
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = 0dBm – L_{dis}

2nd IF Rejection

Additional signal generator settings:	- Frequency +/- 808.8 MHz see table "performance test report" for explanation of "+/-"
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = 0dBm – L_{dis}

Checking Nonlinearities

Third-Order Intercept Point

Note: *If option R&S FSMR-B2 is installed see chapter "Test Procedure Option YIG Preselector R&S FSMR-B2" for test instructions.*

Test equipment:

- 2 signal generators
  R&S FSMR 3: Section "Measurement Equipment", item 2 and 3
  R&S FSMR 26 / 50: Section "Measurement Equipment", item 2, 3, 4
  Frequency range:
  R&S FSMR 3: 10 MHz to 3.6 GHz
  R&S FSMR 26: 10 MHz to 27 GHz
  R&S FSMR 50: 10 MHz to 40 GHz
- 2 attenuators (Section "Measurement Equipment", item 12)
  Attenuation a_{ATT} = 10 dB
  Frequency range:
  R&S FSMR 3: 10 MHz to 3.6 GHz
  R&S FSMR 26: 10 MHz to 26.5 GHz
  R&S FSMR 50: 10 MHz to 40 GHz
- Power combiner (Section "Measurement Equipment", item 5)
  Frequency range:
  R&S FSMR 3: 10 MHz to 3.6 GHz
  R&S FSMR 26: 10 MHz to 26.5 GHz
- Power splitter (Section "Measurement Equipment", item 6)
  Frequency range
  R&S FSMR 50: 10 MHz to 40 GHz

Test setup:

Connect RF outputs of the signal generators via 10 dB attenuators to the inputs of the combiner.
Connect output of the combiner to the RF input of the R&S FSMR.

Signal generator settings:
(both generators)

- Frequency: generator 1 $f_{g1} = f_{in} - 50$ kHz
  generator 2 $f_{g2} = f_{in} + 50$ kHz
  See table of performance test report for values of f_{in}

➢ Adjust the output level of the signal generators for an input level at the R&S FSMR of –10 dBm.

➢ Switch off the ALC of the generators to reduce the interference between the generators.

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **500 kHz**]
- [**BW** : RES BW MANUAL : **3 kHz**]
- [**FREQ** : CENTER : {f_{in}}]
  See table of performance test report for values of f_{in}

Measurement

- [**MKR FCTN** : TOI]

Evaluation:

The third order intercept point (T.O.I) referred to the input signal is displayed in the marker field by the reading [TOI].

Second-Order Harmonic Distortion

Test equipment: Signal generator (Section "Measurement Equipment", item 3)
Frequency range: 9 kHz to 1.8 GHz

Recommended harmonic suppression:

f <100 MHz :	>35 dBc
100 MHz < f < 1 GHz :	>45 dBc
f >1 GHz :	>35 dBc

In order to improve the harmonic suppression of the generator it is recommended to insert a low pass filter with a suitable cut-off frequency (Section "Measurement Equipment", item 13) after the generator. If the harmonic suppression of the signal generator is sufficient, the low pass filter can be left out. The RF output of the generator can be connected directly to the RF input of the R&S FSMR in this case.

Test setup:

- ➢ Connect RF output of signal generator to the input of the low pass filter.
- ➢ Connect the output of the low pass filter to the RF input of the R&S FSMR.

Signal generator settings:

- Level: 0 dBm
- Frequency: f_{in}

see table of performance test report for values of f_{in}

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **3 kHz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**FREQ :** CENTER : { f_{in} }]

See table of performance test report for values of f_{in}

Measurement:

➢ Set marker to peak of signal.

- [**MKR** ⇒ : PEAK]

The level of the input signal L_{IN} is displayed by the marker reading for marker 1.

➢ Set center frequency of the R&S FSMR to the frequency of the 2nd harmonic.

- [**FREQ** : CENTER : {2 x f_{in}}]

Measurement:

➢ Set marker to peak of the 2nd harmonic.

- [**MKR** ⇒ : PEAK]

The level of the harmonic signal L_{K2} is displayed by the marker reading for marker 1.

Evaluation: The second order harmonic distortion can be calculated as

$$IP_{k2} / \text{dBm} = (L_{IN} - L_{K2}) + L_{IN}$$

Checking IF Filters

Test equipment: Signal generator (Section "Measurement Equipment", item 3):
Frequency 128 MHz
Level ≥ 0 dBm

Test setup:
- ➢ Connect RF output of the signal generator to the RF input of the R&S FSMR.

Checking the bandwidth switching level accuracy

Reference measurement (RBW 10 kHz)

Signal generator settings:
- Frequency: 128 MHz
- Level: -20 dBm

R&S FSMR settings:
- [**PRESET**]
- [**AMPT** : **-15 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**FREQ** : CENTER : **128 MHz**]
- [**SPAN** : **5 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : RBW MANUAL : **10** : **kHz**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Checking the level accuracy

R&S FSMR settings:
- [SPAN : {0.5 x RBW}], 0 Hz for RBW > 3 MHz
- [**BW** : RBW MANUAL : {RBW} : **ENTER**]

Additional R&S FSMR setting for RBW = 50 MHz:
- [**MKR** ⇒ : SEARCH LIMITS]

Note: *To check the FFT- filter, the resolution bandwidth has to be set manually to FFT mode. R&S FSMR*

- [**BW** : BW MODE : FFT]

Measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

Evaluation: The level difference is displayed in the marker field by the reading ´Delta [T1 FXD] {xxx} dB´.

Checking Bandwidth

Signal generator settings:
- Frequency: 128 MHz
- Level: -10 dBm

R&S FSMR settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**FREQ** : CENTER : **128 MHz**]
- [**BW** : COUPLING RATIO : SPAN/RBW MANUAL : **3** : **ENTER**]

Determine 3-dB-Bandwith
- [**MKR FCTN** : N DB DOWN : **3 dB**]
- [**SPAN** : {3 x RBW}]
  See table of performance test report for values of RBW.

Note: *To check the filters > 3 MHz, the resolution bandwidth has to be set manually to X MHz. All other bandwidths will be set automatically by changing the span.*

- [**BW** : RES BW MANUAL : **X MHz**] , with X = 5, 10, 20 or 50 MHz

Additional signal generator setting for RBW = 50 MHz:
- Frequency: 999 MHz

Additional R&S FSMR setting for RBW = 50 MHz:
- [**FREQ** : CENTER : **999 MHz**]

Measurement:
- [**MKR** ⇒ : PEAK]

The 3 dB bandwidth is displayed by the reading ´BW {bandwidth}´.

Checking the Shape Factor

Note: *To check the shape factor the values of the 3 dB bandwidth will be needed. Please check before this measurement.*

Signal generator settings:
- Frequency: 128 MHz
- Level: 0 dBm

R&S FSMR settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**FREQ** : CENTER : **128 MHz**]
- [**BW** : COUPLING RATIO : SPAN/RBW MANUAL : **20 ENTER**]
- [**BW** : COUPLING RATIO : RBW/VBW NOISE [10]]
- [**MKR FCTN** : N DB DOWN : **60 dB**]
- [**SPAN** : {20 x RBW}]
  See table of performance test report for values of RBW.

Note: *To check the filters > 3 MHz, the resolution bandwidth has to be set manually to X MHz. All other bandwidths will be set automatically by changing the span.*

- [**BW** : RES BW MANUAL : **X MHz**] , with X = 5, 10 or 20 MHz

Measurement:
- [**MKR** ⇒ : PEAK]

The 60 dB bandwidth is displayed by the reading ´BW {bandwidth}´.

Evaluation: The shape factor is calculated by BW (60dB) / BW (3dB).

Checking Noise Display

Note: *If option R&S FSMR-B2 is installed see chapter "Test Procedure Option YIG Preselector R&S FSMR-B2" for test instructions.*

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 7)

Frequency range:

R&S FSMR 3:	DC to 3.6 GHz
R&S FSMR 26:	DC to 26.5 GHz
R&S FSMR 50:	DC to 50 GHz

Test setup: Terminate the RF input of the R&S FSMR with 50 Ω

R&S FSMR settings:

Measurement for $f_n \leq$ 1 kHz:
- [**PRESET**]
- [**AMPT** : RF INPUT : DC] (R&S FSMR3 and R&S FSMR26 only)
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SPAN** : **10 Hz**]
- [**BW** : BW MODE : **FFT**]
- [**BW** : RES BW MANUAL : **10 Hz**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**AMPT** : {RefLev}]
- [**FREQ** : CENTER : {f_{noise}}]

See table below for values of RefLev.

Measurement for f_{noise} >1 kHz:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SPAN** : 0 Hz]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : SWEEP TIME MANUAL : **50 ms**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**AMPT** : {RefLev}]
- [**FREQ** : CENTER : {f_{noise}}]
- [**MEAS** : Time Dom Power : **Mean**]

See table of performance test report for values of f_{noise}.

Measurement:

- ➢ Set the marker to the center frequency for the value below or equal 1 kHz.
- ➢ Read out the mean marker for frequencies above 1 kHz and correct the measurement value by –20 dB for the ratio of 10 Hz / 1 kHz .

Note: *For example the DANL in 1 kHz bandwidth –126 dBm results in a corrected value of –146 dBm in 10 Hz bandwidth.*
As both filter designs are digitally and using the same hardware setting, the DANL can be measured also with 1 kHz bandwidth to reduce measurement time.

Evaluation: The noise level is displayed by the level reading of marker 1.

Frequency	< 10kHz	< 100kHz	< 1MHz	< 10MHz	> 10MHz
RefLev	-10 dBm	-20 dBm	-30 dBm	-60 dBm	-60 dBm

Checking the Level accuracy and the Frequency Response

Test equipment:

- Signal generator :
  - R&S FSMR 3: Section "Measurement Equipment", item 3
  - R&S FSMR 26 / 50 Section "Measurement Equipment", item 2 and 3

  Frequency range:

R&S FSMR 3:	10 MHz to 3.6 GHz
R&S FSMR 26:	10 MHz to 27 GHz
R&S FSMR 50:	10 MHz to 50 GHz

  Maximum level ≥ 0 dBm
- Power meter (Section "Measurement Equipment", item 8)

- Power sensor :
  - R&S FSMR 3: Section "Measurement Equipment", item 9
  - R&S FSMR 26/50: Section "Measurement Equipment", item 9 and 10

  Impedance Z = 50 Ω
- 6 dB divider (Section "Measurement Equipment", item 6)

  Frequency range

R&S FSMR 3:	DC to 3.6 GHz
R&S FSMR 26:	DC to 26.5 GHz
R&S FSMR 50:	DC to 50 GHz

  Level imbalance[1])

1 MHz to 3.6 GHz	≤ 0.1 dB
3.6 GHz to 8 GHz	≤ 0.2 dB

[1]) If a power splitter with higher level imbalance is used correction of the measured frequency response is recommended.

Determining the level accuracy at 128 MHz

Test setup:

- ➢ Connect power sensor (item 9) to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor
- ➢ Connect power sensor to RF output of signal generator

Signal generator settings:

- Frequency 128 MHz
- Level -30 dBm

Measurement:

Determine output power of the signal generator with the power meter
Connect RF output of the signal generator to RF input of the R&S FSMR

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **-30 dBm**]
- [**SPAN** : **30 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Set marker to peak of signal
[**MKR** ⇒ : PEAK]

Evaluation: The difference between the signal levels measured with the power meter and the R&S FSMR (level reading of marker 1) reflects the absolute level accuracy of the R&S FSMR. It can be calculated as:

Level $\text{accuracy}_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Checking the frequency response

Note: *If option R&S FSMR-B2 is installed see chapter "Test Procedure Option YIG Preselector R&S FSMR-B2" for test instructions.*

Test setup:

- ➢ Connect RF output of the signal generator to input of the divider
- ➢ Connect output 1 of the divider to the power sensor / power meter
- ➢ Connect output 2 of the divider to RF input of the R&S FSMR

Signal generator settings:

- Level	0 dBm
- Frequency	128 MHz

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Reference measurement: Determine signal level $L_{powermeter}$.
Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

$Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Measurement

Signal generator settings:

- Frequency f_{fresp}

See table of performance test report for values of f_{fresp}

Power meter settings:

- ➢ Determine signal level $L_{powermeter}$. To achieve higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:

- [**FREQ** : CENTER : {f_{fresp}}]
 See table of performance test report for values of f_{fresp}
- Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
 The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation: The frequency response can be calculated as:

Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Checking the Display Linearity

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)
  Frequency 128 MHz [1)]
  Maximum level ≥ 10 dBm
- Step attenuator (Section "Measurement Equipment", item 11)
  Frequency 128 MHz [1)]
  Attenuation 0 to 100 dB in 1 dB steps
  Attenuation accuracy < 0.1 dB

Test setup:

➢ Connect RF output of the signal generator to RF input of the step attenuator

➢ Connect RF output of the step attenuator to RF input of the R&S FSMR

Signal generator settings:

- Frequency 128 MHz [1)]
- Level +10 dBm

Step attenuator settings: Attenuation 20 dB

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**FREQ** :CENTER : **5 MHz**]
- [**SPAN** : **0 Hz**]
- [**TRACE** : DETECTOR : AV]
- [**SWEEP** : SWEEP TIME MANUAL : **200 ms**]
- [**MEAS** : TIME DOM POWER : MEAN]

1. Measurement:
- [**BW** : RES BW MANUAL : **500 Hz**]

2. Measurement:
- [**BW** : RES BW MANUAL : **300 kHz**]

3. Measurement:
- [**BW** : RES BW MANUAL : **20 MHz**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Measurement

Step attenuator settings: Attenuation {a_{ATT}}
See table of performance test report for values of a_{ATT}.

Evaluation: The difference between the level of the input signal of the R&S FSMR and the reference (about 10 dB below the reference level) is displayed in the marker field by the reading ´Delta [T1 FXD]´.

1) A frequency between 5 MHz and 1 GHz may be used. It is recommended to use correction values for the uncertainty of the attenuator.

Checking the RF Attenuator

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)
  Frequency 128 MHz
  Maximum level ≥ 0 dBm
- Step attenuator (Section "Measurement Equipment", item 11)
  Frequency 128 MHz
  Attenuation 0 to 80 dB in 5 dB steps
  Attenuation accuracy < 0.1 dB

Test setup:

➢ Connect RF output of the signal generator to RF input of the step attenuator

➢ Connect RF output of the step attenuator to RF input of the R&S FSMR

Signal generator settings:

- Frequency 128 MHz
- Level 0 dBm

Step attenuator settings: Attenuation 70 dB

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **128 MHz**]
- [**SPAN** : **500 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **-30 dBm**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Measurement

Step attenuator settings: Attenuation { 80dB - $a_{R\&S\ FSMR}$ }
See table below for values of a_{ATT}.

R&S FSMR settings:

- [**AMPT** : RF ATTEN MANUAL : { $a_{R\&S\ FSMR}$ }]
- [**AMPT** : {-40dBm + $a_{R\&S\ FSMR}$ } **dBm**]
- [**MKR** ⇒ : PEAK]

See table below for values of $a_{R\&S\ FSMR}$, a_{ATT} and reference level.

Evaluation: The difference between the level of the input signal of the R&S FSMR and the reference (at 10 dB RF-Attenuation) is displayed in the marker field by the reading Delta [T1 FXD].

a_{ATT}	80 dB	75 dB	70 dB	60 dB	40 dB
$a_{R\&S\ FSMR}$	0 dB	5 dB	10 dB	20 dB	40 dB
reference level	-40 dBm	-35 dBm	-30 dBm	-20 dBm	0 dBm

Checking the Reference Level Switching (IF-Gain)

Test principle:

The IF gain of the R&S FSMR can be switched from 0 to 50 dB by changing the reference level at fixed RF attenuation. To prevent the IF gain accuracies to be mixed up with the log amplifier accuracy it is determined by comparison using an external precision attenuator.

Test equipment:

Signal generator (Section "Measurement Equipment", item 3)
Frequency 5 MHz
Maximum level ≥ -10 dBm
Step attenuator (Section "Measurement Equipment", item 11)
Frequency 5 MHz
Attenuation 0 to 60 dB in 1 dB steps
Attenuation accuracy < 0.1 dB

Test setup:

➢ Connect RF output of the signal generator to RF input of the step attenuator

➢ Connect RF output of the step attenuator to RF input of the R&S FSMR

Signal generator settings:

- Frequency 5 MHz
- Level -10 dBm

Step attenuator settings:

- Attenuation 20 dB

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **5 MHz**]
- [**SPAN** : **2 kHz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**TRACE** : DETECTOR : RMS]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **-10 dBm**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Measurement

Step attenuator settings: Attenuation {a_{ATT}}
See table below for values of a_{ATT}.

R&S FSMR settings:
- [**AMPT** : {reference level} **dBm**]
  See table below for values of reference level.
- [**MKR** ⇒ : PEAK]

Evaluation: The difference between the level of the input signal of the R&S FSMR and the reference (at 10 dB IF-Gain) is displayed in the marker field by the reading ´Delta [T1 FXD]´.

10 dB gain steps:

a_{ATT}	10 dB	20 dB	30 dB	40 dB	50 dB	60 dB
reference level	0 dBm	-10 dBm	-20 dBm	-30 dBm	-40 dBm	-50 dBm

1 dB gain steps:

a_{ATT}	20 dB	21 dB	22 dB	23 dB	24 dB	25 dB	26 dB	27 dB	28 dB	29 dB
reference level	-10 dBm	-11 dBm	-12 dBm	-13 dBm	-14 dBm	-15 dBm	-16 dBm	-17 dBm	-18 dBm	-19 dBm

Checking the Phase Noise for Instruments with serial numbers smaller than 200000

Test equipment:

Signal generator (Section "Measurement Equipment", item 3)
Frequency 640 MHz
Level ≥ 0 dBm
Phase noise at 640 MHz: < -100 dBc/Hz @ 100 Hz
< -115 dBc/Hz @ 1 kHz
< -127 dBc/Hz @ 10 kHz
< -130 dBc/Hz @ 100 kHz
< -142 dBc/Hz @ 1MHz

Test setup:

➢ Connect RF output of the signal generator to RF input of the R&S FSMR

Signal generator settings:

- Frequency 640 MHz
- Level 0 dBm

Fine-adjust the frequency of the generator so that the R&S FSMR shows exactly 640 MHz .

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **640 MHz**]
- [**AMPT** : **0 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**SPAN** : {span}]
- [**Ext Ref** : **INT**]

  Depending on offset, see table below for values of span.

- [**BW** : COUPLING RATIO : RBW/VBW NOISE[10]]
- [**BW** : RBW MANUAL : {RBW}]

  Depending on offset, see table below for values of RBW.

- [**TRACE 1** : AVERAGE]
- [**SWEEP** : SWEEP COUNT : **20** : **ENTER**]

➢ Activate phase noise marker

- [**MKR FCTN**: PHASE NOISE]
- [**FREQ** : CENTER : {640 MHz + offset}]

  See table below for values of offset.

- [**AMPT** : {reference level}]

  Depending on offset, see table below for values of reference level.

- [**AMPT** : RF ATTEN MANUAL : {$a_{\text{R\&S FSMR}}$}]

  Depending on offset, see table below for values of $a_{\text{R\&S FSMR}}$.

➢ Set phase noise marker

- [**MKR :** MARKER 2 : {offset}]
  See table below for values of offset.

Note*: Please make sure not to measure on a spurious signal.*

Evaluation: The phase noise is displayed in the marker field by the reading Delta 2 [T1 PHN].

Phase noise measurement settings				
Offset	**Span**	**RBW**	**Reference level**	**a** R&S FSMR
100 Hz	20 Hz	30 Hz	0 dBm	10 dB
1 kHz	200 Hz	100 Hz	0 dBm	10 dB
10 kHz	2 kHz	300 Hz	0 dBm	10 dB
100 kHz	10 kHz	3 kHz	-10 dBm	0 dB
1 MHz	100 kHz	30 kHz	-30 dBm	0 dB

Note: *To obtain a precise measurement of the phase noise at high offsets, the level used at the R&S FSMR input is 10 dB to 30 dB higher than the reference level. To reduce the measurement time, the phase noise is measured with a small span around the frequency offset. This prevents the R&S FSMR from being overloaded.*

Checking the Phase Noise at 640 MHz for instruments with serial number larger than 200000

Measuring equipment: Tester (section “measuring instruments and accessories”, pos. 24)

Frequency	640 MHz
Level	5 dBm to 9 dBm (on the R&S FSMR)
Phase noise at 640 MHz	< -103 dBc (1 Hz) at 100 Hz
	< -123 dBc (1 Hz) at 1 kHz
	< -130 dBc (1 Hz) at 10 kHz
	< -143 dBc (1 Hz) at 100 kHz
	< -143 dBc (1 Hz) at 1 MHz

Test setup:

➢ Connect the RF output (rear panel of the FSU generator) to the RF input of the R&S FSMR

FSU generator settings:

- [**PRESET**]
- [**SETUP** : SERVICE : INPUT CAL : NEXT : CALGEN COMB 640 MHZ]
- [**SWEEP** : SINGLE SWEEP]

R&S FSMR settings:

- [**PRESET**]

➢ Switch to internal reference (INT)
- [**SETUP** : REFERENCE INT / EXT]
- [**FREQ** : CENTER : **640 MHz**]

➢ Record reference (carrier)
- [**AMPT** : Make the setting so that the signal is at the reference level]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**SPAN** : {Span}]

The span depends on the offset, refer to table below.

➢ Correct offset frequency f_{Offset} between R&S FSU and R&S FSMR with:
- [**FREQ** : FREQUENCY OFFSET {f_{Offset}}]
- [**FREQ** : CENTER **640 MHz**]

➢ Set resolution filter
- [**BW** : COUPLING RATIO : RBW/VBW NOISE[10]]
- [**BW** : RES BW MANUAL : {RES BW}]

RES BW depends on the offset, refer to table below.

➢ Form the average value.
- [**TRACE** : AVERAGE]
- [**SWEEP** : SWEEP COUNT : **20** : **ENTER**]

➢ Activate the phase noise marker.
- [**MKR FCTN**: PHASE NOISE]
- [**SPAN** : ZERO SPAN]
- [**FREQ** : CENTER : **{640 MHz + Offset}**]
- [**SWEEP** : SWEEP TIME MANUAL {$s_{R\&S\ FSMR}$}]

Regarding offset and sweep time values, refer to the table below.

- [**TRACE** : DETECTOR RMS]

- [**AMPT** : {Reference level}]

Depends on the offset, regarding the reference level values, refer to the table below.

- [**AMPT** : RF ATTEN MANUAL : {$a_{R\&S\ FSMR}$}]

Depends on the offset, regarding the value of a, refer to the table below.

➢ Set the phase noise marker
- [**MKR :** MARKER 2 : {Offset}]

Regarding the offset values, see the following table.

***Note**: Please make sure not to measure on a spurious signal.*

Evaluation: The phase noise is displayed in the marker information field by delta 2 [T1 PHN].

Note: *To avoid correlation during the phase noise measurement, (especially at 100 Hz), the R&S FSMR and generator references should not be connected.*

Setting for phase noise measurement				
Offset	**Span**	**RES BW / SWEEP TIME**	**Reference level**	**$a_{R\&S\ FSMR}$**
100 Hz	0 Hz	10 Hz / 10s	+ 8 dBm	10 dB
1 kHz	0 Hz	100 Hz / 10s	+8 dBm	10 dB
10 kHz	0 Hz	500Hz / 5s	-5 dBm	10 dB
100 kHz	0 Hz	10 kHz / 2s	-2 dBm	5 dB
1 MHz	0 Hz	30 kHz / 2s	-20 dBm	5 dB

Notes:

Measurement at 640 MHz is the standard measurement case. If there is no FSU with a 640 MHz output available, you can alternatively measure the phase noise at 800 MHz .
To obtain an accurate phase noise measurement at high offsets, the level at the R&S FSMR input is 10 dB to 30 dB higher than the reference level. An analog filter located before the AD converter prevents the ADC from being overdriven.

Alternative phase-noise testing at 800 MHz for instruments with a serial number larger than 200000

Measuring equipment: Alternative measuring at 800 MHz
(Section measuring instruments and accessories pos. 25)
This measurement can be performed , if no FSU with a 640 MHz output is available.

Frequency	800 MHz
Level	5 dBm to 9 dBm (at the R&S FSMR)
Phase noise at 800 MHz:	< -103 dBc (1 Hz) at 100 Hz
	< -123 dBc (1 Hz) at 1 kHz
	< -130 dBc (1 Hz) at 10 kHz
	< -143 dBc (1 Hz) at 100 kHz
	< -143 dBc (1 Hz) at 1 MHz

Test setup:
- Connect the 800 MHz RF output of the REFSYN to the RF input of the R&S FSMR.

R&S FSMR settings:

- [**PRESET**]

➢ Switch to internal reference (INT).
- [**SETUP** : REFERENCE INT / EXT]
- [**FREQ** : CENTER : **800 MHz**]

➢ Correct offset frequency f_{Offset} between REFSYN and R&S FSMR with:
- [**FREQ** : FREQUENCY OFFSET : {f_{Offset}}]
- [**FREQ** : CENTER : **800 MHz**]

➢ Set resolution filter.
- [**BW** : COUPLING RATIO : RBW/VBW NOISE[10]]
- [**BW** : RES BW MANUAL : {RES BW}]

RES BW depends on the offset, refer to the table below.

➢ Form the average value.
- [**TRACE** : AVERAGE]
- [**SWEEP** : SWEEP COUNT : **20** : **ENTER**]

Record reference (carrier).
- [**AMPT** : Make the setting so that the signal is at the reference level]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**SPAN** : {Span}]

➢ Activate the phase noise marker.
- [**MKR FCTN**: PHASE NOISE]
- [**SPAN** : ZERO SPAN]
- [**FREQ** : CENTER : **{800 MHz + Offset}**]
- [**SWEEP** : SWEEP TIME MANUAL : {$s_{R\&S\ FSMR}$}]

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- [**TRACE** : DETECTOR RMS]
- [**AMPT** : {Reference level}]

Depends on the offset, regarding the reference level values, refer to the table below.

- [**AMPT** : RF ATTEN MANUAL : {$a_{R\&S\ FSMR}$}]

Depends on the offset, regarding the values of a, refer to the table below.

➢ Set the phase noise marker.
- [**MKR :** MARKER 2 : {Offset}]

Regarding offset values, see the following table.

***Note**: Please make sure not to measure on a spurious signal.*

Evaluation: The phase noise is displayed in the marker information field by Delta 2 [T1 PHN].

Note: To avoid correlation during the phase noise measurement (especially at 100 Hz), the R&S FSMR and generator references should not be connected.

Setting for phase noise measurement				
Offset	**Span**	**RES BW / SWEEP TIME**	**Reference level**	$a_{R\&S\ FSMR}$
100 Hz	0 Hz	10 Hz/10s	+ 8 dBm	10 dB
1 kHz	0 Hz	100 Hz/10s	+8 dBm	10 dB
10 kHz	0 Hz	500Hz/5s	-5 dBm	10 dB
100 kHz	0 Hz	10 kHz/2s	-2 dBm	5 dB
1 MHz	0 Hz	30 kHz/2s	-20 dBm	5 dB

***Note:** To obtain a precise phase noise measurement at high offsets, the level used at the R&S FSMR input is 10 dB to 30 dB higher than the reference level. An analog filter located before the AD converter prevents the ADC from being overdriven.*

Checking the Return Loss at the RF Input

Test equipment: - Network analyzer (Section "Measurement Equipment", item 14)

Calibration: See the manual of the network analyzer for detailed information on calibration for S_{11} measurement.
Perform calibration in the required frequency range.
See table of performance test report.

Test setup: Connect port 1 of the network analyzer to the RF input of the R&S FSMR

R&S FSMR settings:
- [**SYSTEM PRESET**]
- [**INPUT** : RF ATTEN MANUAL : {$\mathbf{a_{R\&S\ FSMR}}$ }]
- [**SPAN** : **0 Hz**]
- [**CENTER** : {f_{in} }]

See table of performance test report for values of $\mathbf{a_{R\&S\ FSMR}}$ and f_{in}.

Evaluation: Determine S_{11} of the R&S FSMR at f_{in}.
Refer to the operating manual of the network analyzer for detailed information about S_{11} measurement.

Note: Set the center frequency of the R&S FSMR to 3 GHz for $a_{R\&S\ FSMR}$ > 10 dB.

Performance Test R&S FSMR (Measuring Receiver)

Note:	*For the following tests the R&S FSMR must be switched to the receiver preset:* - [**SETUP** : **NEXT** : PRESET RECEIVER]

Checking the Audio Input Characteristics

DC Offset

Test Setup:	Disconnect all instruments from the R&S FSMR Audio Input.
R&S FSMR Settings:	[**PRESET**] [**AUDIO** : INPUT IMPEDANCE 50 Ohm : INPUT LEVEL 4V: FILTER: LP 3 kHz: COUPLING DC]
Measurement:	Read the +PEAK value from the R&S FSMR.
R&S FSMR Settings:	[**AUDIO** : INPUT LEVEL 400 mV]
Measurement:	Read the +PEAK value from the R&S FSMR.

Inherent Noise

Test Equipment:	Disconnect all instruments from the R&S FSMR Audio Input.
R&S FSMR Settings:	[**PRESET**] [**AUDIO** : INPUT IMPEDANCE 50 Ohm : INPUT LEVEL 4V: FILTER: LOWPASS 100 kHz: COUPLING AC]
Measurement:	Read the RMS indication from the R&S FSMR.
R&S FSMR Settings:	[**AUDIO** : INPUT LEVEL 400 mV]
Measurement:	Read the RMS indication from the R&S FSMR.

Input Resistance

Test Equipment:	Digital Multimeter (Section "Measuring Equipment", item 26)
Test Setup:	Connect Digital Multimeter to the Audio Input of the R&S FSMR.
R&S FSMR Settings:	[**PRESET**] [**AUDIO** : INPUT IMPEDANCE 1 MOhm / 50 Ohm]
Measurement:	Measure the input resistance with both settings.

DC Voltage Measurement Uncertainty

Test Equipment:	Digital Multimeter (Section "Measuring Equipment", item 26) AF Generator with settable DC offset or other DC source (Section "Measuring Equipment", item 27 or 28)
Test Setup:	Connect both, AF Generator (or other DC Source) and Digital Multimeter via T-adaptor to the Audio Input of the R&S FSMR.
R&S FSMR Settings:	[**PRESET**] [**AUDIO** : FILTER : COUPLING : DC] [**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V: FILTER: COUPLING DC]
Measurement:	Set the DC voltage of the source to the following values (nominal): +4V, +0.4V, -4V, -0.4V Record the difference between the +PEAK indication of the R&S FSMR and the DC voltage reading of the Digital Multimeter.
R&S FSMR Settings:	[**AUDIO** : INPUT LEVEL 400 mV]
Measurement:	Set the DC voltage of the source to the following values (nominal): +400 mV, +100 mV, -400 mV, -100 mV Record the difference between the +PEAK indication of the R&S FSMR and the DC voltage reading of the Digital Multimeter.

AC Voltage Measurement Uncertainty

Test Equipment:	Digital Multimeter (Section "Measuring Equipment", item 26) AF Generator (Section "Measuring Equipment", item 27) RF Generator (Section "Measuring Equipment", item 29)
Test Setup:	Connect both, AF Generator (f ≥300 kHz: RF Generator) and Digital Multimeter via T-adaptor to the Audio Input of the R&S FSMR.
R&S FSMR Settings:	[**PRESET**] [**AUDIO** : FILTER : COUPLING : DC] [**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V]

Measurement:

Set frequency and output voltage of the Signal Generator as follows:

Frequency	Voltage (RMS, nominal)
20 Hz	3 V
1 kHz	3 V
20 kHz	3 V
100 kHz	3 V
300 kHz	2 V
1 MHz	2 V
1 kHz	0.3 V
300 kHz	0.3 V

Record the difference between the RMS indication of the R&S FSMR and the AC voltage reading of the Digital Multimeter.

Note: *The RF Signal Generator level setting implies a 50 Ω load. Due to the high input impedance at the Audio Input, the nominal setting of the output level is half the value given in the table:*
Desired voltage: 2 V → Signal Gen. setting 1V (+13 dBm)
Desired voltage: 0.3 V → Signal Gen. setting 0.15V (-3.5 dBm)
Regarding the Audio Generator refer to the user manual.

R&S FSMR Settings: [**AUDIO** : INPUT LEVEL 400 mV]

Measurement:

Set frequency and output voltage of the Signal Generator as follows:

Frequency	Voltage (RMS, nominal)
1 kHz	0.3 V
20 kHz	0.3 V
100 kHz	0.3 V
300 kHz	0.3 V
1 MHz	0.3 V
1 kHz	0.1 V
300 kHz	0.1 V

Record the difference between the RMS indication of the R&S FSMR and the AC voltage reading of the Digital Multimeter.

Inherent Distortion (THD)

Test Equipment: AF Generator (Section "Measuring Equipment", item 27)

Test Setup: Connect the AF Generator to the Audio Input of the R&S FSMR.

R&S FSMR Settings: [**PRESET**]
[**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V]

Measurement:

Set frequency and output voltage of the AF Generator as follows:

Frequency	Voltage (RMS, unloaded)
100 Hz	3 V
1 kHz	3 V
20 kHz	3 V
100 kHz	3 V
20 kHz	0.6 V
100 kHz	0.6 V
20 kHz	0.3 V
100 kHz	0.3 V

Read the THD indication from the R&S FSMR.

Distortion (THD) Measurement Uncertainty

Test Equipment: Dual Tone AF Generator (Section "Measuring Equipment", item 27)

Test Setup: Connect the AF Generator to the Audio Input of the R&S FSMR.

R&S FSMR Settings: [**PRESET**]
[**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V]

Measurement: Generate a dual tone signal. Set frequencies and output voltages as follows.

Frequency 1	Voltage 1	Frequency 2	Voltage 2	THD
1 kHz	1 V	2 kHz	0.1 V	-20.04 dB
1 kHz	1 V	2 kHz	0.01 V	-40.00 dB
1 kHz	1 V	3 kHz	0.01 V	-40.00 dB
1 kHz	1 V	4 kHz	0.01 V	-40.00 dB
1 kHz	1 V	10 kHz	0.01 V	-40.00 dB
100 Hz	1 V	200 Hz	0.01 V	-40.00 dB
20 kHz	1 V	40 kHz	0.01 V	-40.00 dB
50 kHz	1 V	100 kHz	0.01 V	-40.00 dB

Read the THD indication from the R&S FSMR.

Sinad Measurement Uncertainty

Test Equipment: Dual Tone AF Generator (Section "Measuring Equipment", item 27)

Test Setup: Connect the AF Generator to the Audio Input of the R&S FSMR.

R&S FSMR Settings: [**PRESET**]
[**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V]

Measurement: Generate a dual tone signal. Set frequencies and output voltages as follows.

Frequency 1	Voltage 1	Frequency 2	Voltage 2	SINAD
1 kHz	1 V	100 Hz	0.1 V	20.04 dB
1 kHz	1 V	1.5 kHz	0.03 V	30.46 dB
1 kHz	1 V	15.5 kHz	0.01 V	40.00 dB
1 kHz	1 V	100 kHz	0.01 V	40.00 dB

Read the SINAD indication from the R&S FSMR.

Audio Filter Frequency Response

Test Equipment: AF Generator (Section "Measuring Equipment", item 27)

Test Setup: Connect the AF Generator to the Audio Input of the R&S FSMR.

R&S FSMR Settings:
[**PRESET**]
[**AUDIO** : FILTER : COUPLING : DC]
[**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 4V:
RESULT REL: FILTER: *Filter type see table, e.g.* HIGHPASS: 50Hz]

Measurement: Set the output voltage of the AF Generator to 1V and the frequency as listed in the table.
Procedure: At first the filter is switched off and the measured voltage is stored as reference value. The relative reading is 0.00 dB now. Then the filter is switched on and the relative reading equals the attenuation of the filter at the given frequency.

Frequency	Select FILTER	Action
200 Hz	none	press MEAS -> REF
200 Hz	High Pass 50 Hz	read RMS Δ dB
20 Hz	High Pass 50 Hz	read RMS Δ dB
1 kHz	none	press MEAS -> REF
1 kHz	High Pass 300 Hz	read RMS Δ dB
100 Hz	High Pass 300 Hz	read RMS Δ dB
1 kHz	none	press MEAS -> REF
1 kHz	Low Pass 3 kHz	read RMS Δ dB
6 kHz	Low Pass 3 kHz	read RMS Δ dB
10 kHz	none	press MEAS -> REF
10 kHz	Low Pass 15 kHz	read RMS Δ dB
30 kHz	Low Pass 15 kHz	read RMS Δ dB
10 kHz	none	press MEAS -> REF
10 kHz	Low Pass 100 kHz	read RMS Δ dB
100 kHz	Low Pass 100 kHz	read RMS Δ dB
1 kHz	none	press MEAS -> REF
6.366 kHz	Deemphasis 25 µs	read RMS Δ dB
3.183 kHz	Deemphasis 50 µs	read RMS Δ dB
2.122 kHz	Deemphasis 75 µs	read RMS Δ dB
212.2 Hz	Deemphasis 750 µs	read RMS Δ dB

Audio Frequency Counter Uncertainty

Test Equipment: Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)

Note: Instead of the Arbitrary Waveform Generator any Synthesized Signal Generator (20 Hz to 1 MHz) with a reference frequency input/output can be used.

Test Setup: Connect the Signal Generator to the Audio Input of the R&S FSMR.
When using the R&S AMIQ the "I" output must be used.

IMPORTANT: Connect the reference frequency input of both instruments to an external reference frequency and select REFERENCE EXT on both instruments. Alternatively connect the reference frequency input of the Signal Generator to the REF OUT contact of the R&S FSMR and select REFERENCE EXT on the Signal Generator.

R&S FSMR Settings: [**PRESET**]
[**AUDIO** : INPUT IMPEDANCE 1 MOhm : INPUT LEVEL 400 mV]

Measurement: Set frequency and output voltage of the Signal Generator as follows. When using the R&S AMIQ download the listed files into the AMIQ.

File	Frequency	Voltage (RMS, unloaded)
Audio_300mV_20.wv	20 Hz	0.3 V
Audio_300mV_100.wv	100 Hz	0.3 V
Audio_300mV_990.wv	990 Hz	0.3 V
Audio_300mV_1010.wv	1.01 kHz	0.3 V
Audio_300mV_9k9.wv	9.9 kHz	0.3 V
Audio_300mV_99k.wv	99 kHz	0.3 V
Audio_300mV_300k.wv	300 kHz	0.3 V
Audio_300mV_990k.wv	990 kHz	0.3 V
Audio_100mV_300k.wv	300 kHz	0.1 V
Audio_100mV_1010.wv	1.01 kHz	0.1 V
Audio_100mV_20.wv	20 Hz	0.1 V

Read the Frequency indication from the R&S FSMR.

Checking the Amplitude Modulation (AM)

Modulation Depth Uncertainty

Test Equipment:	Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR. When using the R&S AMIQ the "I" output must be used.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **5 dBm**] [**DEMOD** : AM : DETECTOR SELECTION: RMS x SQR2] [**FREQ** : RECEIVER FREQUENCY : **12.5 MHz**]
Signal Generator Settings:	Generate an amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the tables. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ.

AM depth absolute at 1kHz and ILS frequencies

Measurement:

Carrier frequency = 12.5 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Modulation Frequency	Depth
Carrier_AM_1k_5%.wv	1 kHz	5%
Carrier_AM_1k_50%.wv	1 kHz	50%
Carrier_AM_1k_99%.wv	1 kHz	99%
Carrier_AM_90_5%.wv	90 Hz	5%
Carrier_AM_90_50%.wv	90 Hz	50%
Carrier_AM_90_99%.wv	90 Hz	99%
Carrier_AM_150_5%.wv	150 Hz	5%
Carrier_AM_150_50%.wv	150 Hz	50%
Carrier_AM_150_99%.wv	150 Hz	99%

Read the RMS√2 indication from the R&S FSMR.

R&S FSMR Settings: [**FREQ** : RECEIVER FREQUENCY : **100 kHz**]

Measurement:

Carrier frequency = 100 kHz
AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ Files	Modulation Frequency	Depth
Carrier01_AM_1k_5%.wv	1 kHz	5%
Carrier01_AM_1k_50%.wv	1 kHz	50%
Carrier01_AM_1k_99%.wv	1 kHz	99%

Read the RMS√2 indication from the R&S FSMR.

AM Flatness

R&S FSMR Settings:

[**FREQ** : RECEIVER FREQUENCY : **12.5 MHz**]
[**DEMOD** : RELATIVE : RMS x SQR2: RELATIVE %]

Measurement:

Carrier frequency = 12.5 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Mod. Freq.	Depth	Action
Carrier_AM_1k_50%.wv	1 kHz	50%	press MEAS -> REF
Carrier_AM_50_50%.wv	50 Hz	50%	read RMS√2 Δ %
Carrier_AM_10k_50%.wv	10 kHz	50%	read RMS√2 Δ %
Carrier_AM_50k_50%.wv	50 kHz	50%	read RMS√2 Δ %
Carrier_AM_100k_50%.wv	100 kHz	50%	read RMS√2 Δ %

R&S FSMR Settings:	[**FREQ** : RECEIVER FREQUENCY : **100 kHz**] [**DEMOD** : RELATIVE]
Measurement:	Carrier frequency = 100 kHz AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ Files	Mod. Freq.	Depth	Action
Carrier01_AM_1k_50%.wv	1 kHz	50%	press MEAS -> REF
Carrier01_AM_50_50%.wv	50 Hz	50%	read RMS√2 Δ %
Carrier01_AM_10k_50%.wv	10 kHz	50%	read RMS√2 Δ %

Inherent AM Distortion (THD)

Test Equipment:	Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR. When using the R&S AMIQ the "I" output must be used.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **5 dBm**] [**DEMOD** : AM : DETECTOR SELECTION: THD & SINAD] [**FREQ** : RECEIVER FREQUENCY : **12.5 MHz**]
Signal Generator Settings:	Generate an amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the tables. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ.
Measurement:	Carrier frequency = 12.5 MHz AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Modulation Frequency	Depth
Carrier_AM_50_99%.wv	50 Hz	99%
Carrier_AM_1k_99%.wv	1 kHz	99%
Carrier_AM_10k_99%.wv	10 kHz	99%
Carrier_AM_50k_99%.wv	50 kHz	99%

Read the THD indication from the R&S FSMR.

R&S FSMR Settings:	[**FREQ** : RECEIVER FREQUENCY : **100 kHz**]
Measurement:	Carrier frequency = 100 kHz AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ Files	Modulation Frequency	Depth
Carrier01_AM_50_99%.wv	50 Hz	99%
Carrier01_AM_1k_5%.wv	1 kHz	5%
Carrier01_AM_1k_99%.wv	1 kHz	99%
Carrier01_AM_10k_99%.wv	10 kHz	99%

Read the THD indication from the R&S FSMR.

FM Rejection

Test Equipment: Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.
When using the R&S AMIQ the "I" output must be used.

R&S FSMR Settings:
[**PRESET**]
[**AMPT** : REF LEVEL : **5 dBm**]
[**DEMOD** : AM]
[**DEMOD** : FILTER: LOW PASS 3 KHZ]
[**FREQ** : RECEIVER FREQUENCY : **100 kHz**]

Signal Generator Settings: Generate a frequency modulated carrier with a peak level of 0 dBm.
Carrier frequency: 100 kHz
Modulation frequency: 1 kHz
Deviation: 5 kHz
32 x oversampling (32 x carrier frequency) is recommended in order to push the incidental AM below the noise floor.

When using the R&S AMIQ download the file
Carrier01_FM_1k_dev5k.wv into the AMIQ.
AMIQ Hardware Setting: Level Fix, Filter 2,5 MHz

Measurement: Read the ±PEAK/2 indication from the R&S FSMR.

FM Rejection (cont.)

Test Equipment: RF Signal Generator (Section "Measuring Equipment", item 29)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.

R&S FSMR Settings: [**FREQ** : RECEIVER FREQUENCY : **600 MHz**]

Signal Generator Settings: Level: 0 dBm, Frequency 600 MHz,
(Analog) FM Modulation On:
Modulation frequency 1 kHz, Deviation **50** kHz

Measurement: Read the ±PEAK/2 indication from the R&S FSMR.

Residual AM

Test Equipment: RF Signal Generator (Section "Measuring Equipment", item 29)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.

R&S FSMR Settings:
[**PRESET**]
[**AMPT** : REF LEVEL : **0 dBm :** RF ATT MANUAL**: 15 dB**]
[**DEMOD** : AM: FILTER: LOW PASS 3 KHZ]
[**DEMOD**: DETECTOR SELECTION: RMS]
[**FREQ** : RECEIVER FREQUENCY : **300 kHz / 600 MHz / 3 GHz**]

Signal Generator Settings: Level: 0 dBm, Frequency 300 kHz / 600 MHz / 3 GHz (unmodulated !)

Measurement: Read the RMS indication from the R&S FSMR at the given frequencies..

Checking the Frequency Modulation (FM)

Frequency Deviation Uncertainty

Test Equipment: Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.
When using the R&S AMIQ the "I" output must be used.

R&S FSMR Settings:
[**PRESET**]
[**AMPT** : REF LEVEL : **5 dBm**]
[**DEMOD** : FM : DETECTOR SELECTION: RMS x SQR2]
[**FREQ** : RECEIVER FREQUENCY : **200 kHz** / **12 MHz**]

Signal Generator Settings: Generate a frequency modulated carrier, level 0 dBm. Set carrier frequency, modulation frequency and deviation as listed in the tables.
5x oversampling (5x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ.

Carrier frequency = 200 kHz
AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ Files	Mod. Freq.	Deviation
Carrier02_FM_1k_dev5k52.wv	1 kHz	5.52 kHz
Carrier02_FM_10k_dev55k2.wv	10 kHz	55.2 kHz
Carrier02_FM_50_dev50k.wv	50 Hz	50 kHz

Carrier frequency = 12 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Mod. Freq.	Deviation
Carrier12_FM_1k_dev5k52.wv	1 kHz	5.52 kHz
Carrier12_FM_10k_dev55k2.wv	10 kHz	55.2 kHz
Carrier12_FM_100k_dev552k.wv	100 kHz	552 kHz
Carrier12_FM_200k_dev481k.wv	200 kHz	481 kHz

Measurement: Read the RMS$\sqrt{2}$ indication from the R&S FSMR.

Inherent FM Distortion (THD)

Test Equipment: Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.
When using the R&S AMIQ the "I" output must be used.

R&S FSMR Settings:
[**PRESET**]
[**AMPT** : REF LEVEL : **5 dBm**]
[**DEMOD** : FM : DETECTOR SELECTION: THD & SINAD]
[**FREQ** : RECEIVER FREQUENCY : **200 kHz** / **12 MHz**]

Signal Generator Settings: Generate a frequency modulated carrier, level 0 dBm. Set carrier frequency, modulation frequency and deviation as listed in the tables.
5x oversampling (5x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ.

Carrier frequency = 200 kHz
AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ Files	Mod. Freq.	Deviation
Carrier02_FM_1k_dev50k.wv	1 kHz	50 kHz
Carrier02_FM_5k_dev50k.wv	5 kHz	50 kHz
Carrier02_FM_10k_dev50k.wv	10 kHz	50 kHz

Carrier frequency = 12 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Mod. Freq.	Deviation
Carrier12_FM_1k_dev50k.wv	1 kHz	50 kHz
Carrier12_FM_10k_dev50k.wv	10 kHz	50 kHz
Carrier12_FM_1k_dev500k.wv	1 kHz	500 kHz
Carrier12_FM_20k_dev500k.wv	20 kHz	500 kHz
Carrier12_FM_50k_dev500k.wv	50 kHz	500 kHz
Carrier12_FM_100k_dev500k.wv	100 kHz	500 kHz

Measurement: Read the THD indication from the R&S FSMR.

AM Rejection

Test Equipment:	Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR. When using the R&S AMIQ the "I" output must be used.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **5 dBm**] [**DEMOD** : FM] [**DEMOD** : FILTER: LOW PASS 3 KHZ] [**FREQ** : RECEIVER FREQUENCY : **200 kHz** / **12.5 MHz**]
Signal Generator Settings:	Generate an amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the tables. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ.

Carrier frequency = 200 kHz
AMIQ Hardware Setting: Level Fix, Filter 2.5 MHz

AMIQ File	Mod. Freq.	Depth
Carrier02_AM_1k_50%.wv	1 kHz	50%

Carrier frequency = 12.5 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ File	Mod. Freq.	Depth
Carrier12_AM_1k_50%.wv	1 kHz	50%

Measurement:	Read the +/- PEAK/2 indication from the R&S FSMR.

Residual FM

Test Equipment:	RF Signalgenerator (Section "Measuring Equipment", item 29)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **0 dBm**] [**DEMOD** : FM: FILTER: LOW PASS 3 KHZ: COUPLING AC] [**DEMOD**: DETECTOR SELECTION: RMS] [**FREQ** : RECEIVER FREQUENCY : **300 kHz / 1GHz / 3 GHz**]
Signal Generator Settings:	Level: 0 dBm, Frequency 300 kHz / 1GHz / 3 GHz
R&S FSMR Settings:	[**FREQ** : RECEIVER FREQUENCY : **3 GHz**]
Measurement:	Read the RMS indication from the R&S FSMR at the given frequencies.

Checking the Phase Modulation (PM)

Phase Deviation Uncertainty

Test Equipment:	Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR. When using the R&S AMIQ the "I" output must be used.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **0 dBm**] [**DEMOD** : PM : DETECTOR SELECTION: RMS x SQR2] [**DEMOD** : FILTER : HIGH PASS 50Hz: COUPLING AC] [**FREQ** : RECEIVER FREQUENCY : **12 MHz**]
Signal Generator Settings:	Generate a phase modulated carrier, level 0 dBm. Set carrier frequency, modulation frequency and phase deviation as listed in the tables. 5x oversampling (5x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ. Carrier frequency = 12 MHz AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Mod. Freq.	Phase Dev.
Carrier12_PM_100k_dev5r52.wv	100 kHz	5.52 rad
Carrier12_PM_20k_dev20r.wv	20 kHz	20 rad
Carrier12_PM_1k_dev400r.wv	1 kHz	400 rad

Measurement:	Read the RMS√2 indication from the R&S FSMR.

Inherent PM Distortion (THD)

Test Equipment:	Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)
Test Setup:	Connect the Signal Generator to the RF Input of the R&S FSMR. When using the R&S AMIQ the "I" output must be used.
R&S FSMR Settings:	[**PRESET**] [**AMPT** : REF LEVEL : **0 dBm**] [**DEMOD** : PM : DETECTOR SELECTION: THD & SINAD] [**FREQ** : RECEIVER FREQUENCY : **12 MHz**]

Signal Generator Settings: Generate a phase modulated carrier, level 0 dBm. Set carrier frequency, modulation frequency and phase deviation as listed in the tables.
5x oversampling (5x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ.

Carrier frequency = 12 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ Files	Mod. Freq.	Phase Dev.
Carrier12_FM_1k_dev500k.wv	1 kHz	500 rad
Carrier12_FM_20k_dev500k.wv	20 kHz	25 rad
Carrier12_FM_50k_dev500k.wv	50 kHz	10 rad
Carrier12_FM_100k_dev500k.wv	100 kHz	5 rad

Measurement: Read the THD indication from the R&S FSMR.

AM Rejection

Test Equipment: Arbitrary Waveform Generator (Section "Measuring Equipment", item 15)

Test Setup: Connect the Signal Generator to the RF Input of the R&S FSMR.
When using the R&S AMIQ the "I" output must be used.

R&S FSMR Settings:
[**PRESET**]
[**AMPT** : REF LEVEL : **0 dBm**]
[**DEMOD** : PM]
[**DEMOD** : FILTER: LOW PASS 3 KHZ: COUPLING AC]
[**FREQ** : RECEIVER FREQUENCY : **12.5 MHz**]

Signal Generator Settings: Generate an amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the tables. 4x oversampling (4x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ.

Carrier frequency = 12.5 MHz
AMIQ Hardware Setting: Level Fix, Filter 25 MHz

AMIQ File	Mod. Freq.	Depth
Carrier12_AM_1k_50%.wv	1 kHz	50%

Measurement: Read the +/- PEAK/2 indication from the R&S FSMR.

Checking Level Linearity

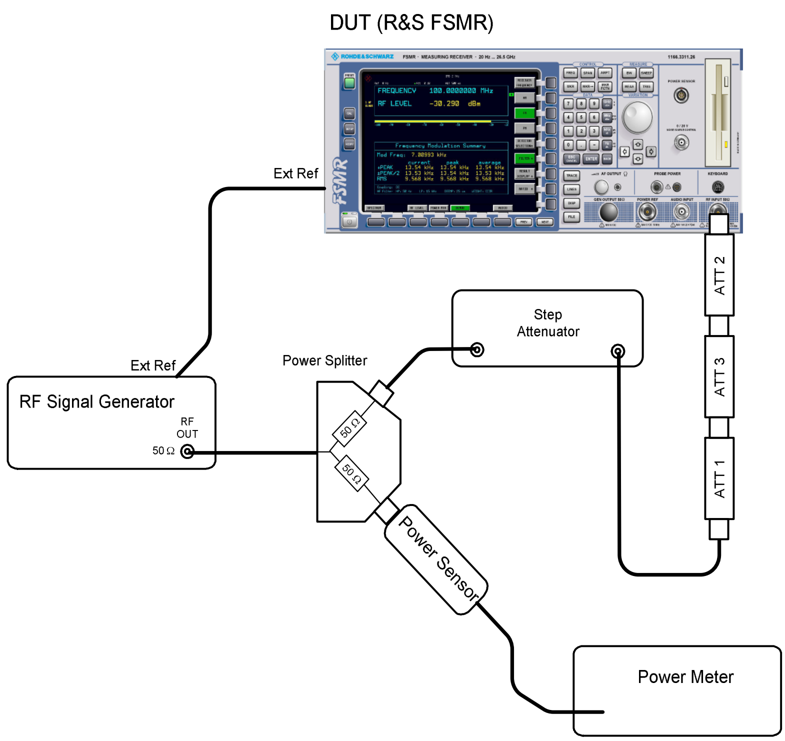
(RF Level Relative)

Test Equipment:

RF Signal Generator (Section "Measuring Equipment", item 29)
Power Splitter (Section "Measuring Equipment", item 32)
Power Meter (Section "Measuring Equipment", item 8)
Power Sensor (Section "Measuring Equipment", item 30)
Step Attenuator (Section "Measuring Equipment", item 11)
Attenuation Standard (Atten. Cal Kit, Section "Measuring Equipment", item 31)
High Quality N-Type Cable (Section "Measuring Equipment", item 17)

Test Setup:

Connect test equipment as shown.



ATT1, ATT2, ATT3 = Attenuation Cal Kit
ATT1 & ATT2 are 6 dB Attenuators (not calibrated devices) for matching purpose.
ATT3 is one or more of the calibrated Attenuators.
<u>At first, ATT3 is omitted !</u>

The cable between the Step Attenuator and ATT1 must be a high quality cable (item 11). During the procedure the attenuator pads (ATT3) are exchanged and therefore the cable is moved. It is essential that the insertion loss of the cable does not change when the cable is moved!

Connect the reference frequency input of both instruments to an external reference frequency and select REFERENCE EXT on both instruments. Alternatively connect the reference frequency input of the Signal Generator to the REF OUT contact of the R&S FSMR and select REFERENCE EXT on the Signal Generator.

Signal Generator Settings:	Frequency 30.02 MHz Level: +13 dBm
Step Attenuator Setting:	0 dB
R&S FSMR Settings:	[**PRESET**] [**RF LEVEL** : RECEIVER FREQUENCY : **30.02 MHz**] [**AMPT:** AUTORANGE CONFIG: 10 dB MIN OFF: AUTOPREAMP ON]

Softkey AUTOPREAMP ON/OFF is only available with installed option B23/B25.

[**RF LEVEL:** AVERAGING: **[n]: ENTER**]

Average count [n] is defined in the tables below.
At first set average count n = 4!

[**RF LEVEL:** RELATIVE: MEAS → REF]

Measurement:

Reference

Power Meter

Read the power meter indication:

rated value: +7 dBm ± 1.5 dB

If necessary, adjust the Signal Generator output level.

Activate relative dB indication and store the measured value as reference value! Set resolution to 0.001 dB.

R&S FSMR

Read the RF LEVEL indication from the R&S FSMR.

rated value: 0 ± 0.003 dB

If necessary, press Softkey MEAS → REF again.

Linearity

Insert the calibrated attenuators (ATT3) as given in the table.

Whenever the RECAL prompt occurs, press the RECAL Softkey before you proceed: [**RF LEVEL:** RECAL]

<u>Average count n=1</u>

Level Relative	ATT3 Attenuators (Cal Kit)	Certified Attenuation *) (Sum)	R&S FSMR Reading	Power Meter Reading
-6 dB	6 dB	_______dB	_______dB	_______dB
-10 dB	10 dB	_______dB	_______dB	_______dB
-16 dB	6+10 dB	_______dB	_______dB	_______dB
-20 dB	20 dB	_______dB	_______dB	_______dB
-26 dB	6+20 dB	_______dB	_______dB	_______dB
-30 dB	10+20 dB	_______dB	_______dB	_______dB
-40 dB	20+20 dB	_______dB	_______dB	_______dB
-50 dB	10+20+20 dB	_______dB	_______dB	_______dB
-56 dB	6+10+20+20 dB	_______dB①	_______dB②	_______dB③

*) refer to the Calibration Certificate supplied with the Cal. Kit.

Step Attenuator Setting: 56 dB

Cross Cal.

Level Relative	ATT3 Attenuators	R&S FSMR Reading	Power Meter Reading
-56 dB	none	_______dB④	_______dB⑤

Calculate the Step Attenuator insertion loss from the results marked with ① to ⑤**:**

Step_Att = ① + ② - ③ - ④ + ⑤ = ________ dB ⑥

(Linearity cont.)

With average count n>1 press: [**SWEEP:** SINGLE SWEEP] and wait until the averaging has finished. It takes 40 seconds with n=100 !

Level Relative	ATT3 Attenuators	Certified Attenuation (Sum)	R&S FSMR Reading	Power Meter Reading
Average count n=1				
-66 dB	10 dB	_______dB	_______dB	_______dB
-76 dB	20 dB	_______dB	_______dB	_______dB
Average count n=4				
-86 dB	10+20 dB	_______dB	_______dB	_______dB
Average count n=20				
-96 dB	20+20 dB	_______dB	_______dB	_______dB
Average count n=100				
-106 dB	10+20+20 dB	_______dB	_______dB	_______dB

Evaluation

Calculate the linearity error of the R&S FSMR as follows:

Relative Level from -6 dB to -56 dB:

Lin_Error = R&S FSMR_Rdg. – PowerMeter_Rdg. + Certified Atten.

Relative Level from -66 dB to -106 dB:

Lin_Error = R&S FSMR_Rdg. – PowerMeter_Rdg. + Certified Atten. + Step_Att

(Step_Att = calculated value ⑥ from cross calibration)

Record the results in the Performance Test Report.

Checking the Power Reference Output

Level Uncertainty

Test Equipment:	Power Meter (Section "Measuring Equipment", item 8) Power Sensor (Section "Measuring Equipment", item 30)
Test Setup:	Connect Power Sensor and Power Meter and perform the "Zero" Function. Then connect the Power Sensor to the POWER REF Output of the R&S FSMR.
R&S FSMR Settings:	**[PRESET : POWR METER**: **NEXT** : POWER REF ON]
Measurement:	Read the Level indication from the Power Meter.

Performance Test Option YIG Preselector B2

Note: *For the following tests the R&S FSMR must be switched to the analyzer preset:*

- [**SETUP** : **NEXT** : PRESET ANALYZER]

Checking Immunity to Interference

Test equipment:	Signal generator (Section "Measurement Equipment", item 2):		
	Frequency range	R&S FSMR 3:	10 MHz to 13 GHz
		R&S FSMR 26:	10 MHz to 27 GHz
		R&S FSMR 50:	10 MHz to 50 GHz
	maximum level	≥ 0 dBm	

Test setup: Connect RF output of the signal generator to RF input.

Signal generator settings: Level: adjust the output level of signal generator for an RF-Input level of 0 dBm

R&S FSMR settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : REF LEVEL : **-30 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **3 kHz**]
- [**SETUP** : SIGNAL SOURCE: YIG FILTER {state}]
  Measurement is performed with state OFF and ON.

1st IF Image Frequency Rejection

Additional signal generator settings: - Frequency f_{in} + 9256.8 MHz

Additional R&S FSMR settings: - [**FREQ** : CENTER : {f_{in}}]
See table of performance test report for values of f_{in}

Measurement: Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Evaluation: The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}):
Image frequency rejection = 0dBm – L_{dis}

2nd IF Image Frequency Rejection

Additional signal generator settings: - Frequency f_{in} + 808.8 MHz

Additional R&S FSMR settings: - [**FREQ** : CENTER : {f_{in}}]
See table of performance test report for values of f_{in}.

Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dBm – L_{dis}

2^{nd} IF Rejection

Additional signal generator settings:	- Frequency +/- 808.8 MHz see table "performance test report" for explanation of "+/-"
Additional R&S FSMR settings:	- [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): IF rejection = 0dBm – L_{dis}

Checking Nonlinearities

Third-Order Intercept Point

Test equipment:

- 2 signal generators
  - R&S FSMR 3: Section "Measurement Equipment", item 2 and 3
  - R&S FSMR 26 / 50: Section "Measurement Equipment", item 2, 3, 4
  - Frequency range:
    - R&S FSMR 3: 10 MHz to 3.6 GHz
    - R&S FSMR 26: 10 MHz to 27 GHz
    - R&S FSMR 50: 10 MHz to 40 GHz
- 2 attenuators (Section "Measurement Equipment", item 12)
  - Attenuation a_{ATT} = 10 dB
  - Frequency range:
    - R&S FSMR 3: 10 MHz to 3.6 GHz
    - R&S FSMR 26: 10 MHz to 26.5 GHz
    - R&S FSMR 50: 10 MHz to 40 GHz
- Power combiner (Section "Measurement Equipment", item 5)
  - Frequency range:
    - R&S FSMR 3: 10 MHz to 3.6 GHz
    - R&S FSMR 26: 10 MHz to 26.5 GHz
- Power splitter (Section "Measurement Equipment", item 6)
  - Frequency range
    - R&S FSMR 50: 10 MHz to 40 GHz

Test setup: Connect RF outputs of the signal generators via 10 dB attenuators to the inputs of the combiner.
Connect output of the combiner to the RF input of the R&S FSMR.

Signal generator settings: (both generators)	- Frequency: generator 1 $f_{g1} = f_{in} - 50$ kHz generator 2 $f_{g2} = f_{in} + 50$ kHz See table of performance test report for values of f_{in} ➢ Adjust the output level of the signal generators for an input level at the R&S FSMR of –10 dBm. ➢ Switch off the ALC of the generators to reduce the interference between the generators.
R&S FSMR settings:	- [**PRESET**] - [**AMPT** : RF ATTEN MANUAL : **0 dB**] - [**AMPT** : **0 dBm**] - [**SPAN** : **500 kHz**] - [**BW** : RES BW MANUAL : **3 kHz**] - [**FREQ** : CENTER : {f_{in}}] - [SETUP : SIGNAL SOURCE : YIG FILTER {state}] See table of performance test report for values of f_{in} Measurement is performed with state OFF and ON.
Measurement	- [**MKR FCTN** : TOI]
Evaluation:	The third order intercept point (T.O.I) referred to the input signal is displayed in the marker field by the reading [TOI].

Checking Noise Display

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 7)
Frequency range:

R&S FSMR 3:	DC to 3.6 GHz
R&S FSMR 26:	DC to 26.5 GHz
R&S FSMR 50:	DC to 50 GHz

Test setup: Terminate the RF input of the R&S FSMR with 50 Ω

R&S FSMR settings:

Measurement for $f_n \leq$ 1 kHz:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SETUP** . SIGNAL SOURCE : YIG FILTER {state} }
- [**SPAN** : **10 Hz**]
- [**BW** : BW MODE : **FFT**]
- [**BW** : RES BW MANUAL : **10 Hz**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**AMPT** : {RefLev}]
- [**FREQ** : CENTER : {f_{noise}}]

See table below for values of RefLev.

Measurement for f_n >1 kHz:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [SPAN : 0 Hz]

- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : SWEEP TIME MANUAL : **50 ms**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**AMPT** : {RefLev}]
- [**FREQ** : CENTER : {f_{noise}}]
- [**MEAS** : Time Dom Power : **Mean**]

See table of performance test report for values of f_n.
Measurement is performed with state OFF and ON.

Measurement:

➢ Set the marker to the center frequency for the value below or equal 1 kHz.

➢ Read out the mean marker for frequencies above 1 kHz and correct the measurement value by –20 dB for the ratio of 10 Hz / 1 kHz .

Note: *For example the DANL in 1 kHz bandwidth –126 dBm results in a corrected value of –146 dBm in 10 Hz bandwidth.*
As both filter designs are digitally and using the same hardware setting, the DANL can be measured also with 1 kHz bandwidth to reduce measurement time.

Evaluation: The noise level is displayed by the level reading of marker 1.

Frequency	< 10kHz	< 100kHz	< 1MHz	< 10MHz	> 10kHz
RefLev	-10 dBm	-20 dBm	-30 dBm	-60 dBm	-60 dBm

Checking the Level accuracy and the Frequency Response

Test equipment:

- Signal generator :
  R&S FSMR 3: Section "Measurement Equipment", item 3
  R&S FSMR 26 / 50 Section "Measurement Equipment", item 2 and 3

  Frequency range: R&S FSMR 3: 10 MHz to 3.6 GHz
  R&S FSMR 26: 10 MHz to 27 GHz
  R&S FSMR 50: 10 MHz to 50 GHz

  Maximum level ≥ 0 dBm
- Power meter (Section "Measurement Equipment", item 8)

- Power sensor :
  R&S FSMR 3: Section "Measurement Equipment", item 9
  R&S FSMR 26 / 50: Section "Measurement Equipment", item 9 and 10

  Impedance Z = 50 Ω
- 6 dB divider (Section "Measurement Equipment", item 6)

  Frequency range R&S FSMR 3: DC to 3.6 GHz
  R&S FSMR 26: DC to 26.5 GHz
  R&S FSMR 50: DC to 50 GHz

  Level imbalance[1]) 1 MHz to 3.6 GHz ≤ 0.1 dB
  3.6 GHz to 8 GHz ≤ 0.2 dB

[1]) If a power splitter with higher level imbalance is used correction of the measured frequency response is recommended.

Checking the frequency response

Test setup:

➢ Connect RF output of the signal generator to input of the divider

➢ Connect output 1 of the divider to the power sensor / power meter

➢ Connect output 2 of the divider to RF input of the R&S FSMR

Signal generator settings:

- Level 0 dBm
- Frequency 128 MHz

R&S FSMR settings:

- [**PRESET**]
- [**SETUP** : SIGNAL SOURCE : YIG FILTER {state}
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]
  Measurement is performed with state OFF and ON.

Reference measurement:

Determine signal level $L_{powermeter}$.
Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

$Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Measurement

Signal generator settings:

- Frequency f_{fresp}

See table of performance test report for values of f_{fresp}

Power meter settings:

- Determine signal level $L_{powermeter}$. To achive higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:

- [**FREQ** : CENTER : {f_{fresp}}]

See table of performance test report for values of f_{fresp}

- Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation:

The frequency response can be calculated as:

Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Performance Test Option Tracking Generator B9 with Option Attenuator B12

Note:	*For the following tests the R&S FSMR must be switched to the analyzer preset:* - [**SETUP** : **NEXT** : PRESET ANALYZER]

Checking the output level

Test equipment:	- N cable (section "Measurement Equipment", item 17) Frequency up to 3.6 GHz Maximum attenuation < 0.2 dB
Test setup:	➢ Connect the tracking generator output to the RF input of the R&S FSMR.
R&S FSMR settings:	- [**PRESET**] - [**FREQ** : CENTER : **128 MHz**] - [**SPAN** : **0 Hz**] - [**BW** : RES BW MANUAL : **300 Hz**] - [**AMPT** : RF ATTEN MANUAL : **5 dB**] - [**AMPT** : **5 dBm**] - [**TRACE** : AVERAGE : SWEEP COUNT : **10 ENTER]** - [**NETWORK** : SOURCE POWER {level}] Without option B12: {level}: check from 0 dBm to –20 dBm in 5 dB steps With option B12: {level}: check 0 dBm, -10 dBm, -20 dBm, -40 dBm - [**SETUP** : SERVICE : ENTER PASSWORD **894129**] - [**SETUP** : SERVICE FUNCTIONS **2.29.21.1.0**] Switch B12 to 0 dB (fixed value) with service command 2.29.21.1.0e (after entering the password) {level} : check from 0 dBm to –20 dBm in 5 dB steps - [**SETUP** : SERVICE FUNCTIONS **2.29.21.0**] Reactivate B12 with service command 2.29.21.0
Measurement:	➢ Set marker to peak of signal: - [**MKR** ⇒ : PEAK] Read the value and store it as a reference for the frequency response measurement.

Checking the frequency response

Test equipment:

- N cable (section "Measurement Equipment", item 17)
  Frequency up to 3.6 GHz
  Maximum attenuation < 0.2 dB

Test setup:

Connect the tracking generator output to the RF input of the R&S FSMR.

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **5 dB**]
- [**AMPT** : **5 dBm**]
- [**AMPT** : RF INPUT DC] R&S FSMR, 50
- [**FREQ** : START : **100 kHz**]
- [**FREQ** : STOP : **3.6 GHz**]
- [**BW** : RES BW MANUAL : **30 kHz**]
- [**NETWORK** : SOURCE POWER {level}]

Without option B12:
{level} : check from 0 dBm to –20 dBm in 5 dB steps

With option B12:
{level}: check 0 dBm, -10 dBm, -20 dBm, -40 dBm
- [**SETUP** : SERVICE : ENTER PASSWORD **894129**]
- [**SETUP** : SERVICE FUNCTIONS **2.29.21.1.0**]

Switch B12 to 0 dB (fixed value) with service command 2.29.21.1.0.
{level}: check from 0 dBm to –20 dBm in 5 dB steps
- [**SETUP** : SERVICE FUNCTIONS **2.29.21.0**]

Reactivate B12 with service command 2.29.21.0.

Measurement:

➢ Set marker to peak of signal:
- [**MKR** ⇒ : PEAK]

➢ Set marker to minimum value:
- [**MKR** ⇒ : NEXT : MIN]

Evaluation:

The difference between the min and max of the reference value at 128 MHz yields the frequency response.

Checking the dynamic range

Test equipment:	- N cable (section "Measurement Equipment", item 17) Frequency up to 3.6 GHz Maximum attenuation < 0.2 dB
Test setup:	➢ Connect the tracking generator output to the RF input of the R&S FSMR.
R&S FSMR settings:	- [**PRESET**] - [**FREQ : 128 MHz**] - [**SPAN** : ZERO SPAN] - [**AMPT** : REF LEVEL : **0 dBm**] - [**AMPT** : RF ATTEN MANUAL : **0 dB**] - [**BW** : RES BW MANUAL : **1 kHz**] - [**AMPT** : RANGE LOG MANUAL : **120 dB**] - [**NETWORK** : SOURCE POWER : **0 dBm**] - [**MKR** : REFERENCE FIXED] Disconnect the cable and connect a 50 Ω termination to the tracking generator output and the RF input.
Measurement:	- [**TRACE** : AVERAGE : SWEEP COUNT : **50 ENTER]** Read off delta marker

Checking Modulation

Checking the I/Q modulator

Test equipment:
- AMIQ (section "Measurement Equipment", item 15)
- Spectrum analyzer (section "Measurement Equipment", item 18)

Test setup:

➢ Connect the the I and Q outputs of the AMIQ to the I and Q inputs of the analyzer. Ensure that the modulation lines are equal (phase shift).

➢ Connect the spectrum analyzer to the tracking generator output.

AMIQ settings

➢ AMIQ self-adjustment
AC voltage I output: U = 0.5 V
AC voltage Q output: U = 0.5 V

Frequency: 1 MHz
Phase (I/Q) = +/-90 degrees
(For this purpose, use AMIQ setup files from section "Measurement Equipment", items 22 and 23.)

Spectrum analyzer settings:
- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **10 MHz**]
- [**AMPT** : REF LEVEL : **10 dBm**]

R&S FSMR settings:
- [**PRESET**]
- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **0 MHz**]
- [**AMPT** : REF LEVEL : **0 dBm**]
- [**NETWORK** : SOURCE POWER: **0 dBm**]
- [MODULATION: EXT I/Q]

Measuring the residual carrier:

➢ Switch off the I and Q channels on the AMIQ.

➢ Set marker to peak of signal:

- [**MKR** ⇒ : PEAK]
Read off the measured value on the spectrum analyzer (Marker Peak)

Measuring the impairment (imbalance between the I and Q path):

➢ Switch on the I and Q channels on the AMIQ. Measure the carrier amplitude at 1 GHz and the lateral component amplitudes at 1 GHz + 1 MHz and 1 GHz - 1 MHz. Perform this measurement for baseband signals with a phase shift of +90 degrees and –90 degrees between the I and Q channel.

Checking the amplitude modulation

Test equipment:
- AMIQ (section "Measurement Equipment", item 15)
- Spectrum analyzer (section "Measurement Equipment", item 18)

Test setup:

➢ Connect the I and Q outputs of the AMIQ to the I and Q inputs of the analyzer.

➢ Connect the spectrum analyzer to the tracking generator output.

AMIQ settings:

- ➢ AMIQ self-adjustment
  AC voltage I output: U = 0.5 V
  AC voltage Q output: U = 0 V
  Frequency: 1 MHz
  (For this purpose, use AMIQ setup files from section "Measurement Equipment", item 22)

Spectrum analyzer settings:

- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **10 MHz**]
- [**AMPT** : REF LEVEL : **10 dBm**]

R&S FSMR settings:

- [**PRESET**]
- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **0 MHz**]
- [**AMPT** : REF LEVEL : **10 dBm**]
- [**NETWORK** : SOURCE POWER: **0 dBm]**
- [MODULATION : EXT AM]

Measurement:

- ➢ Determine the level difference between the carrier signal at 1 GHz and the modulation lateral components at 1 GHz ± 1 MHz.

Checking the frequency modulation

Test equipment:

- AMIQ (section "Measurement Equipment", item 15)
- Spectrum analyzer (section "Measurement Equipment", item 18)

Test setup:

- ➢ Connect the I and Q outputs of the AMIQ to the I and Q inputs of the analyzer.
- ➢ Connect the spectrum analyzer to the tracking generator output.

AMIQ settings:

- ➢ AC voltage I output: U = 0 V
  AC voltage Q output: U = 0.5 V
  Frequency: 100 kHz
  (For this purpose, use AMIQ setup files from section "Measuring Equipment", item 21)

Spectrum analyzer settings:

- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **1 MHz**]
- [**BW** : **10 kHz**]
- [**AMPT** : REF LEVEL : **10 dBm**]

R&S FSMR settings:

- [**PRESET**]
- [**FREQUENCY** : **1 GHz**]
- [**SPAN** : **0 MHz**]
- [**AMPT** : REF LEVEL : **10 dBm**]
- [**NETWORK** : SOURCE POWER: **0 dBm**]
- [MODULATION : EXT FM : **100 kHz**]

Measurement:

- ➢ Determine the level difference between the carrier signal at 1 GHz and the modulation lateral components at 1 GHz ± 100 kHz.

Performance Test RF Preamplifier Option B23, B223

Note: *For the following tests the R&S FSMR must be switched to the analyzer preset:*

- [**SETUP** : **NEXT** : PRESET ANALYZER]

With R&S FSMR 26 the option B23 is implemented in the signal path above 3.6 GHz. Therefore the measurements are done between 3.6 GHz and 26.5 GHz..

Checking Noise Display with Preamplifier

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 7)
frequency range: 3.6 to 26.5 GHz

Test setup: ➢ terminate the RF input of the R&S FSMR with 50 Ω

R&S FSMR settings:

- [**PRESET**]
- [**SETUP** : SIGNAL SOURCE : YIG FILTER OFF] *)
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SPAN** : **0 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : SWEEP TIME MANUAL : **50 ms**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**MEAS** : Time Dom Power : **Mean**]
- [**AMPT** : **- 80 dBm**]
- [**SETUP** : PREAMP ON]
- [**FREQ** : CENTER : {f_{noise}}]

See table of performance test report for values of f_{noise}.

*) if option R&S FSMR-B223 is installed.

Evaluation: Read out the mean marker and correct the measurement value by –20 dB for the ratio of 10 Hz / 1 kHz

Checking the Level accuracy and the Frequency Response with Preamplifier (B23)

Test equipment:

- Signal generator (Section "Measurement Equipment", item 2)
  frequency range: 3.6 GHz to 26.5 GHz
  maximum level ≥ 0 dBm

- Power meter (Section "Measurement Equipment", item 8)

- Power sensor (Section "Measurement Equipment", item 10)
  frequency range: 3.6 GHz to 26 GHz
  maximum power $P_{max} \geq 100$ µW
  impedance Z = 50 Ω

- 6-dB divider (Section "Measurement Equipment", item 6)
  level imbalance 3.6 GHz to 26.5 GHz ≤ 0.2 dB

Checking the frequency response

Test setup:

- ➢ connect RF output of the signal generator to input of the divider
- ➢ connect output 1 of the divider to the power sensor / power meter
- ➢ connect output 2 of the divider to RF input of the R&S FSMR

Signal generator settings:

- level 0 dBm
- frequency 128 MHz

R&S FSMR settings

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **0 dBm**]
- [**SETUP** : PREAMP ON]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Reference measurement:

- ➢ Determine signal level $L_{powermeter}$.
- ➢ set marker to peak of signal

- [**MKR ⇒** : PEAK]

The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

$Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Measurement

Signal generator settings:

- frequency f_{fresp}

see table of performance test report for values of f_{fresp}

Power meter settings:

Determine signal level $L_{powermeter}$. To achive higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:

- [**FREQ** : CENTER : {f_{fresp}}]

see table of performance test report for values of $f_{fresp.}$
set marker to peak of signal
- [**MKR** ⇒ : PEAK]
The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation:

The frequency response can be calculated as:

Frequency response = $L_{R\&S\ FSMR}$ - $L_{powermeter}$ - $Ref_{128\ MHz}$

Performance Test Option Preamplifier R&S FSU-B24

Note: *For the following tests the R&S FSMR must be switched to the analyzer preset:*

- [**SETUP** : **NEXT** : PRESET ANALYZER]

The option B24 is only avaible for the models R&S FSMR 26 and R&S FSMR 50.

Checking Noise Display

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 9)

Frequency range:

R&S R&S FSMR 26:	DC to 26.5 GHz
R&S R&S FSMR 50:	DC to 50 GHz

Test setup:

➢ Terminate the RF input 1of the R&S R&S FSMR with 50 Ω

R&S R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SPAN** : 0 Hz]
- [**SETUP** : PREAMP ON]
- [**SETUP** : SIGNAL SOURCE : YIG FILTER {state} *)
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : SWEEP TIME MANUAL : **50 ms**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**AMPT** : {RefLev}]
- [**FREQ** : CENTER : {f_n}]
- [**MEAS** : Time Dom Power : **Mean**]

*) if option R&S FSMR-B2 is installed.

See table of performance test report for values of f_n and state of YIG filter

Measurement:

➢ Set the marker to the center frequency for the value below or equal 1 kHz.

➢ Read out the mean marker for frequencies above 1 kHz and correct the measurement value by –20 dB for the ratio of 10 Hz / 1 kHz .

Note: *For example the DANL in 1 kHz bandwidth –126 dBm results in a corrected value of –156 dBm in 1 Hz bandwidth.*
As both filter designs are digitally and using the same hardware setting, the DANL can be measured also with 1 kHz bandwidth to reduce measurement time.

Evaluation: The noise level is displayed by the level reading of marker 1.

Frequency	< 1MHz	< 10MHz	> 10MHz
RefLev	-30 dBm	-60 dBm	-60 dBm

Checking the Level accuracy and the Frequency Response

Test equipment:

- Signal generator :
  R&S FSMR 3: Section "Measurement Equipment", item 3
  R&S FSMR 26 / 50 Section "Measurement Equipment", item 2 and 3

  Frequency range: R&S FSMR 3: 10 MHz to 3.6 GHz
  R&S FSMR 26: 10 MHz to 27 GHz
  R&S FSMR 50: 10 MHz to 50 GHz

  Maximum level ≥ 0 dBm
- Power meter (Section "Measurement Equipment", item 8)

- Power sensor :
  R&S FSMR 3: Section "Measurement Equipment", item 9
  R&S FSMR 26 / 50: Section "Measurement Equipment", item 9 and 10

  Impedance Z = 50 Ω
- 6 dB divider (Section "Measurement Equipment", item 6)

  Frequency range R&S FSMR 3: DC to 3.6 GHz
  R&S FSMR 26: DC to 26.5 GHz
  R&S FSMR 50: DC to 50 GHz

  Level imbalance[1]) 1 MHz to 3.6 GHz ≤ 0.1 dB
  3.6 GHz to 8 GHz ≤ 0.2 dB

[1]) If a power splitter with higher level imbalance is used correction of the measured frequency response is recommended.

Determining the level accuracy at 128 MHz

Test setup:

- Connect power sensor (item 9) to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor
- Connect power sensor to RF output of signal generator

Signal generator settings:

- Frequency 128 MHz
- Level -30 dBm

Measurement:

Determine output power of the signal generator with the power meter
Connect RF output of the signal generator to RF input of the R&S FSMR

R&S FSMR settings:

- [**PRESET**]
- [**SETUP** : PREAMP ON]
- [**AMPT** : RF INPUT DC] (R&S FSMR 26 only)
- [**AMPT** : RF ATTEN MANUAL : **30 dB**]
- [**AMPT** : **-30 dBm**]
- [**SPAN** : **30 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Set marker to peak of signal
[**MKR** ⇒ : PEAK]

Evaluation:

The difference between the signal levels measured with the power meter and the R&S FSMR (level reading of marker 1) reflects the absolute level accuracy of the R&S FSMR. It can be calculated as:

$\text{Level accuracy}_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Checking the frequency response

Test setup:

➢ Connect RF output of the signal generator to input of the divider

➢ Connect output 1 of the divider to the power sensor / power meter

➢ Connect output 2 of the divider to RF input of the R&S FSMR

Signal generator settings:

- Level	0 dBm
- Frequency	128 MHz

R&S FSMR settings:

- [**PRESET**]
- [**SETUP** : PREAMP ON]
- [**AMPT** : RF INPUT DC] (R&S FSMR 26 only)
- [**AMPT** : RF ATTEN MANUAL : **30 dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Reference measurement:

Determine signal level $L_{powermeter}$.
Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

$Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Frequency Response Measurement < 3.6 GHz

Signal generator settings:

- Frequency f_{fresp}

See table of performance test report for values of f_{fresp}

Power meter settings:

➢ Determine signal level $L_{powermeter}$. To achieve higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:
- [**FREQ** : CENTER : {f_{fresp}}]
  See table of performance test report for values of f_{fresp}
- Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
  The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation:
The frequency response can be calculated as:
Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Frequency Response Measurement > 3.6 GHz, YIG filter = OFF

Signal generator settings:
- Frequency f_{fresp}
  See table of performance test report for values of f_{fresp}

Power meter settings:
➢ Determine signal level $L_{powermeter}$. To achieve higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:
- [**SETUP** : SIGNAL SOURCE : YIG FILTER OFF] *)
- [**FREQ** : CENTER : {f_{fresp}}]
  See table of performance test report for values of f_{fresp}
- Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
  The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

*) if option R&S FSMR-B2 is installed.

Evaluation:
The frequency response can be calculated as:
Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Frequency Response Measurement > 3.6 GHz, YIG filter = ON (with option R&S FSMR-B2 only)

Signal generator settings:
- Frequency f_{fresp}
  See table of performance test report for values of f_{fresp}

Power meter settings:
➢ Determine signal level $L_{powermeter}$. To achieve higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:
- [**SETUP** : SIGNAL SOURCE : YIG FILTER ON]
- [**FREQ** : CENTER : {f_{fresp}}]
  See table of performance test report for values of f_{fresp}
- Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
  The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation:
The frequency response can be calculated as:
Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Performance Test Option Electronic Attenuator B25

Note: *For the following tests the R&S FSMR must be switched to the analyzer preset:*

- [**SETUP** : **NEXT** : PRESET ANALYZER]

With R&S FSMR 26, 50 the option B25 is implemented in the signal path below 3.6 GHz. Therefore the measurements are done up to 3.6 GHz only.

Checking Noise Display with Preamplifier

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 7)
Frequency range:
10 MHz to 3.6 GHz

Test setup: Terminate the RF input of the R&S FSMR with 50 Ω

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**SPAN** : **0 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**BW** : SWEEP TIME MANUAL : **50 ms**]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : **30 ENTER**]
- [**MEAS** : Time Dom Power : **Mean**]
- [**AMPT** : **- 80 dBm**]
- [**SETUP** : PREAMP ON]
- [**FREQ** : CENTER : {f_{noise}}]

See table of performance test report for values of f_{noise}.

Evaluation: Read out the mean marker and correct the measurement value by –20 dB for the ratio of 10 Hz / 1 kHz

Checking the Level accuracy and the Frequency Response with Preamplifier

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)

Frequency range	10 MHz to 3.6 GHz
Maximum level	≥ 0 dBm

- Power meter (Section "Measurement Equipment", item 8)

- Power sensor (Section "Measurement Equipment", item 9)

Frequency range	10 MHz to 3.6 GHz
Maximum power	P_{max} ≥ 100 µW
Impedance Z = 50 Ω	

- 6 dB divider (Section "Measurement Equipment", item 6)

Frequency range:	10 MHz to 3.6 GHz	
Level imbalance [1)]	1 MHz to 1 GHz	≤ 0.1 dB
	1 GHz to 3.6 GHz	≤ 0.2 dB

1) If a power splitter with higher level imbalance is used correction of the measured frequency response is recommended.

Determining the level accuracy at 128 MHz

Test setup:

- ➢ Connect power sensor to the power meter and execute function ´ZERO´ when there is no signal applied to the power sensor
- ➢ Connect power sensor to RF output of signal generator

Signal generator settings:

- Frequency 128 MHz
- Level -30 dBm

Measurement:

Determine output power of the signal generator with the power meter
Connect RF output of the signal generator to RF input of the R&S FSMR

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **-20 dBm**]
- [**SETUP** : PREAMP ON]
- [**SPAN** : **10 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

Set marker to peak of signal
- [**MKR** ⇒ : PEAK]

Evaluation:

The difference between the signal levels measured with the power meter and the R&S FSMR (level reading of marker 1) reflects the absolute level accuracy of the R&S FSMR. It can be calculated as:

$$\text{Level accuracy}_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$$

Checking the frequency response

Test setup:	➢ Connect RF output of the signal generator to input of the divider ➢ Connect output 1 of the divider to the power sensor / power meter ➢ Connect output 2 of the divider to RF input of the R&S FSMR
Signal generator settings:	- level 0 dBm - frequency 128 MHz
R&S FSMR settings	- [**PRESET**] - [**AMPT** : RF ATTEN MANUAL : **30 dB**] - [**AMPT** : **0 dBm**] - [**SETUP** : PREAMP ON] - [**SPAN** : **100 kHz**] - [**BW** : RES BW MANUAL : **10 kHz**] - [**TRACE** : DETECTOR : RMS] - [**FREQ** : CENTER : **128 MHz**]
Reference measurement:	Determine signal level $L_{powermeter}$. Set marker to peak of signal - [**MKR** ⇒ : PEAK] The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1. $Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Measurement

Signal generator settings:	- Frequency f_{fresp} See table of performance test report for values of f_{fresp}
Power meter settings:	Determine signal level $L_{powermeter}$. To achive higher accuracy it is recommended to compensate the frequency response of the power sensor.
R&S FSMR settings:	- [**FREQ** : CENTER : {f_{fresp}}] See table of performance test report for values of f_{fresp}. Set marker to peak of signal - [**MKR** ⇒ : PEAK] The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.
Evaluation:	The frequency response can be calculated as: Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Checking the Frequency Response with Electronic Attenuator

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)
  - Frequency range: 10 MHz to 3.6 GHz
  - Maximum level: ≥ 0 dBm
- Power meter (Section "Measurement Equipment", item 8)
- Power sensor (Section "Measurement Equipment", item 9)
  - Frequency range: 10 MHz to 3.6 GHz
  - Maximum power: Pmax ≥ 100 µW
  - Impedance Z = 50 Ω
- 6 dB divider (Section "Measurement Equipment", item 6)
  - Frequency range: 10 MHz to 3.6 GHz
  - Level imbalance[1)]: 1 MHz to 1 GHz ≤ 0.1 dB; 1 GHz to 3.6 GHz ≤ 0.2 dB

1) If a power splitter with higher level imbalance is used correction of the measured frequency response is recommended.

Test setup:

- ➢ Connect RF output of the signal generator to input of the divider
- ➢ Connect output 1 of the divider to the power sensor / power meter
- ➢ Connect output 2 of the divider to RF input of the R&S FSMR

Signal generator settings:

- Level: 0 dBm
- Frequency: 128 MHz

R&S FSMR settings:

- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : NEXT : ELEC ATTEN MANUAL : {E_{ATT}} : **dB**]
- [**AMPT** : **0 dBm**]
- [**SPAN** : **100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**FREQ** : CENTER : **128 MHz**]

See table of performance test report for values of E_{ATT} .

Reference measurement:

Determine signal level $L_{powermeter}$.
Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

$Ref_{128MHz} = L_{R\&S\ FSMR} - L_{powermeter}$

Measurement

Signal generator settings:
- Frequency f_{fresp}
  See table of performance test report for values of f_{fresp}

Power meter settings:
Determine signal level $L_{powermeter}$. To achieve higher accuracy it is recommended to compensate the frequency response of the power sensor.

R&S FSMR settings:
- [**FREQ** : CENTER : {f_{fresp}}]
see table of performance test report for values of f_{fresp}.
Set marker to peak of signal
- [**MKR** ⇒ : PEAK]
The signal level $L_{R\&S\ FSMR}$ is displayed by the level reading of marker 1.

Evaluation:
The frequency response can be calculated as:
Frequency response = $L_{R\&S\ FSMR} - L_{powermeter} - Ref_{128\ MHz}$

Checking Nonlinearities with Electronic Attenuator

Third-Order Intercept

Test equipment:	- 2 signal generators (Section "Measurement Equipment", item 2 and 3) Frequency range: 10 MHz to 3.6 GHz Maximum level ≥ 0 dBm - 2 attenuators (Section "Measurement Equipment", item 12) Attenuation a_{ATT} = 10 dB Frequency range 10 MHz to 3.6 GHz - Coupler (Section "Measurement Equipment", item 5) Frequency range 10 MHz to 3.6 GHz Decoupling > 12 dB
Test setup:	➢ Connect RF outputs of the signal generators via 10 dB attenuators to the inputs of the coupler ➢ Connect output of the coupler to the RF input of the R&S FSMR.
Signal generator settings: (both generators)	Frequency: generator 1 $f_{g1} = f_{in} - 50$ kHz generator 2 $f_{g2} = f_{in} + 50$ kHz See table of performance test report for values of f_{in} Adjust the output level of signal generators for an input level at the R&S FSMR of –20 dBm.
R&S FSMR settings:	- [**PRESET**] - [**AMPT** : RF ATTEN MANUAL : **0 dB**] - [**AMPT** : NEXT : ELEC ATTEN MANUAL : **0 dB**] - [**AMPT** : **0 dBm**] - [**SPAN** : **500 kHz**] - [**BW** : RES BW MANUAL : **3 kHz**] - [**FREQ** : CENTER : {f_{in}}] See table of performance test report for values of f_{in}.
Measurement	- [**MKR FCTN** : TOI]
Evaluation:	The third order intercept point (T.O.I) referred to the input signal is is displayed in the marker field by the reading [TOI].

Checking the RF Attenuator (with Option B25)

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)
  frequency 128 MHz
  maximum level $\geq$ 10 dBm

- Step attenuator (Section "Measurement Equipment", item 11)
  Frequency 128 MHz
  Attenuation 0 to 80 dB in 5 dB steps
  Attenuation accuracy < 0.1 dB

Test setup:

➢ Connect RF output of the signal generator to RF input of the step attenuator.

➢ Connect RF output of the step attenuator to RF input of the R&S FSMR.

Signal generator settings:

- Frequency 128 MHz
- Level 10 dBm

Step attenuator settings: Attenuation 70 dB

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **128 MHz**]
- [**SPAN** : **500 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **-35 dBm**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Measurement:

Step attenuator settings: Attenuation { 80dB - $a_{R\&S\ FSMR}$ }
See table below for values of a_{ATT}.

R&S FSMR settings:

- [**AMPT** : RF ATTEN MANUAL : {$a_{R\&S\ FSMR}$}]
- [**AMPT** : {-45dBm + $a_{R\&S\ FSMR}$ } **dBm**]
- [**MKR** ⇒ : PEAK]

See table below for values of a R&S FSMR , a_{ATT} and reference level.

Evaluation: The difference between the level of the input signal of the R&S FSMR and the reference (at 10 dB RF-Attenuation) is displayed in the marker field by the reading ´Delta [T1 FXD]´.

a_{ATT} in dB	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5
$a_{R\&S\ FSMR}$ in dB	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
Ref.level in dBm	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30

Checking the electronic Attenuator accuracy

Test equipment:

- Signal generator (Section "Measurement Equipment", item 3)
  - Frequency 128 MHz
  - Maximum level ≥ 0 dBm

- Step attenuator (Section "Measurement Equipment", item 11)
  - Frequency 128 MHz
  - Attenuation 0 to 40 dB in 5 dB steps
  - Attenuation accuracy < 0.1 dB

Test setup:

➢ Connect RF output of the signal generator to RF input of the step attenuator

➢ Connect RF output of the step attenuator to RF input of the R&S FSMR

Signal generator settings:

- Frequency 128 MHz
- Level 0 dBm

Step attenuator settings: attenuation 40 dB

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **128 MHz**]
- [**SPAN** : **500 Hz**]
- [**BW** : RES BW MANUAL : **1 kHz**]
- [**TRACE** : DETECTOR : RMS]
- [**BW** : VIDEO BW MANUAL : **100 Hz**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**AMPT** : **- 30 dBm**]

Reference measurement:

➢ Set marker to peak of signal

- [**MKR** ⇒ : PEAK]

➢ Set reference to peak of signal

- [**MKR** : REFERENCE FIXED]

Measurement:

Step attenuator settings:

Attenuation { 40dB - $a_{R\&S\ FSMR}$ }
See table below for values of a_{ATT}.

R&S FSMR settings:

- [**AMPT** : NEXT : ELEC ATTEN MANUAL : {$a_{R\&S\ FSMR}$}]
- [**AMPT** : {-30dBm + $a_{R\&S\ FSMR}$ } **dBm**]
- [**MKR** ⇒ : PEAK]

See table below for values of $a_{R\&S\ FSMR}$, a_{ATT} and reference level.

Evaluation:

The difference between the level of the input signal of the R&S FSMR and the reference (at 10 dB RF-Attenuation) is displayed in the marker field by the reading ´Delta [T1 FXD]´.

a_{ATT}	40 dB	35 dB	20 dB	25 dB	20 dB	15 dB	10 dB
$a_{R\&S\ FSMR}$	0 dB	5 dB	10 dB	15 dB	20 dB	25 dB	30 dB
Reference level	-30 dBm	-25 dBm	-20 dBm	-15 dBm	-10 dBm	-5 dBm	0 dBm

Performance Test Report R&S FSMR

Table 1-R&S FSMR Performance Test report

ROHDE & SCHWARZ	Performance Test Report	Measuring Receiver R&S FSMR	Version: 3 August 2010
Model R&S FSMR 3 / R&S FSMR 26 / R&S FSMR 50: Order number: 1166.3311.03 / 26 / 43 / 50: Serial number: 100013 Test person: jack Date: 4/nov/2016 Signature:			

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency accuracy Reference oscillator	Page 1.6					
Model w/o Opt. B4		9.999999	9.99999997	10.000001	MHz	
Model with Opt. B4		9.9999997		10.0000003	MHz	
Image frequency rejection,1st IF f_{in} +9256.8 MHz	Page 1.8		(rattling around with no avg)			
11 MHz 9267.8 MHz		90	120	-	dB	
100 MHz 9356.8		90	120	-	dB	
1701 MHz 10957.8 MHz		90	115	-	dB	
3001 MHz 12257.8		90	111	-	dB	
Image frequency rejection 2^{nd} IF f_{in} f_{in} + 808.8 MHz	Page 1.8					
100 MHz		90	90	-	dB	
Image frequency rejection 3rd IF f_{in}	Page 1.8					8340/41 issues below 2.3 GHz use 8665B
100 MHz		90	90	-	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
1st IF rejection	Page 1.9					
f_{in}						
11 MHz		90	119	-	dB	
100 MHz		90	120	-	dB	
1701 MHz		90	~~120~~	-	dB	
2990 MHz		90	110	-	dB	
2nd IF rejection	Page 1.9					
f_{in}						
100 MHz		90	90/90	-	dB	
3rd-order intercept point	Page 1.10					
f_{in}						
R&S FSMR 3:						
28 MHz		17		-	dBm	
106 MHz		17		-	dBm	
261 MHz		17		-	dBm	
640 MHz		19		-	dBm	
1000 MHz		19		-	dBm	
1700 MHz		19		-	dBm	for "TOI" MEAS-NEXT
2500 MHz		19		-	dBm	TOI and search TOI
3590 MHz		19		-	dBm	if needed
R&S FSMR 26 / 43 /50:						
28 MHz		17	21	-	dBm	
106 MHz		17		-	dBm	
261 MHz		17		-	dBm	
640 MHz		22	25	-	dBm	
1000 MHz		22		-	dBm	
1700 MHz		22	28	-	dBm	
2500 MHz	pass	22		-	dBm	
3590 MHz		22		-	dBm	
4001 MHz		6	17	-	dBm	
5001 MHz		8		-	dBm	
7999 MHz		8		-	dBm	
12000 MHz		8		-	dBm	
20000 MHz		8		-	dBm	
26000 MHz		8	14	-	dBm	
R&S FSMR 43 / 50:						
27000 MHz		4		-	dBm	
32000 MHz		8		-	dBm	
38000 MHz		8		-	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
2nd-order harmonic distortion	Page 1.11					adj zero for ease of calculation.
f_{in}						
28 MHz	dc-32 MHz LPF	35	50.07	-	dBm	(-0.28- -50.63)+0.28
106 MHz		45		-	dBm	-0.66dB - -67 dB
261 MHz	190 MHz LPF	45		-	dBm	
640 MHz	720 MHz LPF	45		-	dBm	0 - -65.5
1000 MHz		45		-	dBm	
1700 MHz		35		-	dBm	
IF bandwidth switch. level accuracy	Page 1.12					to check the filter (bla bla bla) BW [filter type] FFT enter the result displayed Delta2[T1 FXD]
100 Hz		-0.1	-0.05	+0.1	dB	
1 kHz		-0.1	-0.04	+0.1	dB	
10 kHz		-	reference	-		
100 kHz		-0.1	0	+0.1	dB	
300 kHz		-0.2	-0.03	+0.2	dB	
1 MHz		-0.2	-0.02	+0.2	dB	
3 MHz		-0.2	-0.04	+0.2	dB	
10 MHz		-0.2	-0.26	+0.2	dB	
20 MHz *)		-0.5	X	+0.5	dB	
50 MHz *)		-0.5	X	+0.5	dB	
*) not with R&S FSMR 43						
FFT Bandwidth level accuracy	Page 1.12					
100 Hz		-0.2	X	+0.2	dB	
300 Hz		-0.2	X	+0.2	dB	
1 kHz		-0.2	X	+0.2	dB	
3 kHz		-0.2	X	+0.2	dB	
IF bandwidth Bandwidth:	Page 1.13					nice test
100 Hz		97	100.48	103	Hz	
1 kHz		970		1030	Hz	
10 kHz		9.7		10.3	kHz	
100 kHz		97		103	kHz	
300 kHz		270		330	kHz	
1 MHz		900	980	1100	kHz	
3 MHz		2.7		3.3	MHz	
10 MHz		7		11	MHz	
20 MHz *)		14	20.5	22	MHz	
50 MHz *)		40	48	60	MHz	
*) not with R&S FSMR 43						

Characteristic 60dB	**Included in**	**Min. value**	**Actual value**	**Max. value**	**Unit**	**Tolerance**
IF Bandwidths 60dB Shape factor:	Page 1.13					
100 Hz		-	5.4	6	-	
1 kHz		-	4.74	6	-	
10 kHz		-	________	6	-	
100 kHz		-	________	6	-	
300 kHz		-	9.25	12	-	
1 MHz		-	________	12	-	
3 MHz		-	________	7	-	
10 MHz		-	3.22	7	-	
Noise Display normalized to 1Hz:	Page 1.14					when asked for BW FFT [BW]-[FILTER TYPE]
f_{noise}		-	-97	-90	dBm	-[FFT] enter
20 Hz		-	________	-110	dBm	freq center 20Hz
90 Hz		-	________	-120	dBm	
900 Hz		-	________	–130	dBm	Mkr 20 Hz
9 kHz		-	-131	–130	dBm	
95 kHz		-	-141	–140	dBm	
999 kHz		-	________	–153	dBm	
9.99 MHz						
Noise Display normalized to 1Hz: *)	Page 1.14					
f_{noise}						
R&S FSMR 3:						
19.99 MHz		-	________	–155	dBm	
49.99 MHz		-	________	–155	dBm	
99.99 MHz		-	________	–155	dBm	
199.9 MHz		-	________	–155	dBm	
499.9 MHz		-	________	–155	dBm	
999.9 MHz		-	________	–155	dBm	
1499 MHz		-	________	–155	dBm	
1999 MHz		-	________	–155	dBm	
2499 MHz		-	________	–153	dBm	
2999 MHz		-	________	–153	dBm	
3599 MHz		-	________	–152	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display	Page 1.14					
normalized to 1 Hz: *) <------Measurement @ 1KHz subtract 30 dB to normalize to 1Hz no 20dB as in notes.						
f_{noise}						
R&S FSMR 26 / 43 / 50:						
19.99 MHz		-	-158	–152	dBm	
49.99 MHz		-	________	–152	dBm	
99.99 MHz		-	________	–152	dBm	
199.9 MHz		-	________	–152	dBm	
499.9 MHz		-	________	–152	dBm	
999.9 MHz		-	________	–152	dBm	
1499 MHz		-	-154	–152	dBm	
1999 MHz		-	________	–152	dBm	
2499 MHz		-	________	–150	dBm	
2999 MHz		-	________	–150	dBm	
3599 MHz 8665B ^		-	-151	–150	dBm	
3601 MHz 8340bB		-	-151	–152	dBm	
6999 MHz		-	________	–152	dBm	
9999 MHz		-	________	–151	dBm	
12999 MHz		-	________	–151	dBm	
17999 MHz		-	________	–150	dBm	
21999 MHz		-	________	–149	dBm	
26499 MHz		-	-153	–148	dBm	
R&S FSMR 43 / 50:						
26799 MHz		-	________	–141	dBm	
30999 MHz			________	–141	dBm	
34999 MHz		-	________	–136	dBm	
38999 MHz		-	________	–136	dBm	
42999 MHz		-	________	–136	dBm	
45999 MHz **)		-	________	–136	dBm	
47499 MHz **)		-	________	–130	dBm	
49999 MHz **)		-	________	–130	dBm	
**) not with R&S FSMR 43						
*) R&S FSMR 26: If option R&S FSMR-B23 is installed, add 2 dB up to 8 GHz and 3 dB up to 26 GHz R&S FSMR 26 / 43 / 50: If option R&S FSMR-B24 is installed, see performance test protocol of R&S FSU-B24						
Level accuracy at 128 MHz. –30 dBm	Page 1.15	-0.2	0.12 dB	+0.2	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF Attenuation 10 dB DC coupling - APT DC f_{fresp}	Page 1.15 power meter -5.01,	DUT -5.19	@ 128 MHz			rock the [AMP] [AC/DC] to get next set of AC coupling meas as well
R&S FSMR 3 / 26 / 43 / 50:						
1 MHz		-0.5	________	+0.5	dB	
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz	pwr mtr -5.14	-0.3	0.05	+0.3	dB	
300 MHz		-0.3	0.19	+0.3	dB	
400 MHz		-0.3	________	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
600 MHz		-0.3	________	+0.3	dB	
700 MHz		-0.3	________	+0.3	dB	
800 MHz		-0.3	0.14	+0.3	dB	
900 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	0.21	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	0.19	+0.3	dB	
3599 MHz		-0.3	________	+0.3	dB	

maybe save time . . . also make measurements with TI attenuator at 10dB, 5dB,20dB, 40 dB with DC coupling (AMP-RF INPUT Coupling DC) up to 3,599 MHz. & AC coupling at 10 dB up to 3,599 MHz Then do next page 10 dB DC coupling up to 26.5 Ghz

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 / 50:						
3610 MHz		-1	________	+1	dB	
4000 MHz		-1	________	+1	dB	
4500 MHz		-1	________	+1	dB	
5000 MHz		-1	________	+1	dB	
5500 MHz		-1	________	+1	dB	
6000 MHz		-1	________	+1	dB	
6500 MHz		-1	________	+1	dB	
7000 MHz		-1	________	+1	dB	
7990 MHz		-1	________	+1	dB	
9000 MHz		-1.5	pass	+1.5	dB	
10000 MHz		-1.5	________	+1.5	dB	
11000 MHz		-1.5	________	+1.5	dB	
12000 MHz		-1.5	________	+1.5	dB	
13000 MHz		-1.5	________	+1.5	dB	
14000 MHz		-1.5	________	+1.5	dB	
15000 MHz		-1.5	________	+1.5	dB	
16000 MHz		-1.5	________	+1.5	dB	
17000 MHz		-1.5	________	+1.5	dB	
18000 MHz		-1.5	________	+1.5	dB	
19000 MHz		-1.5	________	+1.5	dB	
20000 MHz		-1.5	________	+1.5	dB	
21000 MHz		-1.5	________	+1.5	dB	
22000 MHz		-2	________	+2	dB	
23000 MHz		-2	________	+2	dB	
24000 MHz		-2	________	+2	dB	
25000 MHz		-2	________	+2	dB	
26000 MHz		-2	________	+2	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 43 / 50:						
27000 MHz		-2	________	+2	dB	
28000 MHz		-2	________	+2	dB	
29000 MHz		-2	________	+2	dB	
30000 MHz		-2	________	+2	dB	
31000 MHz		-2	________	+2	dB	
32000 MHz		-2	________	+2	dB	
33000 MHz		-2	________	+2	dB	
34000 MHz		-2	________	+2	dB	
35000 MHz		-2	________	+2	dB	
36000 MHz		-2	________	+2	dB	
37000 MHz		-2	________	+2	dB	
38000 MHz		-2	________	+2	dB	
39000 MHz		-2	________	+2	dB	
40000 MHz		-2.5	________	+2.5	dB	
41000 MHz		-2.5	________	+2.5	dB	
42000 MHz		-2.5	________	+2.5	dB	
43000 MHz *)		-2.5	________	+2.5	dB	
44000 MHz *)		-2.5	________	+2.5	dB	
45000 MHz *)		-2.5	________	+2.5	dB	
46000 MHz *)		-2.5	________	+2.5	dB	
47000 MHz *)		-2.5	________	+2.5	dB	
48000 MHz *)		-2.5	________	+2.5	dB	
49000 MHz *)		-2.5	________	+2.5	dB	
*) not with R&S FSMR 43						
Frequency response	Page 1.15					
RF attenuation 10 dB						
AC coupling apt-RF	INPUT AC					
f_{fresp}						
Not with R&S FSMR 43						
/ 50		-0.3	________	+0.3	dB	
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz		-0.3	pass	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	________	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	________	+0.3	dB	
3599 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF attenuation 5 dB DC coupling f_{fresp}	Page 1.15					
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz		-0.3	________	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	pass	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	________	+0.3	dB	
3599 MHz		-0.3	________	+0.3	dB	
Frequency response RF attenuation 20 dB DC coupling f_{fresp}	Page 1.15					
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz		-0.3	________	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	pass	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	________	+0.3	dB	
3599 MHz		-0.3	________	+0.3	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF attenuation 40 dB DC coupling f_{fresp}	Page 1.15					
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz		-0.3	________	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	________	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	________	+0.3	dB	
3599 MHz		-0.3	________	+0.3	dB	
Display linearity RBW 500 Hz @ 5MHz a_{ATT}	Page 1.17					
10 dB		9.9	9.98	10.1	dB	My 8494A-8496A 30-40 dB step not good, used 30 +10 on other & re-reference
15 dB		4.9	4.93	5.1	dB	
20 dB look ahead for other RBW		-	reference	-	-	
25 dB to check-save time		-5.1	-5.05	-4.9	dB	
30 dB		- 10.1	________	-9.9	dB	
35 dB		-15.1	________	-14.9	dB	
40 dB		-20.1	________	-19.9	dB	
45 dB		-25.1	________	-24.9	dB	
50 dB		-30.1	________	-29.9	dB	
55 dB		-35.1	________	-34.9	dB	
60 dB		-40.1	________	-39.9	dB	
65 dB		-45.1	________	-44.9	dB	
70 dB		-50.1	-49.9	-49.9	dB	
75 dB		-55.1	________	-54.9	dB	
80 dB		-60.1	________	-59.9	dB	
85 dB		-65.3	________	-64.7	dB	
90 dB		-70.3	- 70.22	-69.7	dB	
95 dB		-75.3	________	-74.7	dB	
100 dB		-80.3	-80.0	-79.7	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Display linearity	Page 1.17					
RBW 300 kHz						
a_{ATT}						
10 dB		9.8	________	10.2	dB	
15 dB		4.8	________	5.2	dB	
20 dB		-	reference	-	-	
25 dB		-5.2	________	-4.8	dB	
30 dB		- 10.2	________	-9.8	dB	
35 dB		-15.2	________	-14.8	dB	
40 dB		-20.2	________	-19.8	dB	
45 dB		-25.2	________	-24.8	dB	
50 dB		-30.2	________	-29.8	dB	
55 dB		-35.2	________	-34.8	dB	
60 dB		-40.2	________	-39.8	dB	
65 dB		-45.5	________	-44.5	dB	
70 dB		-50.5	________	-49.5	dB	
75 dB		-55.5	________	-54.5	dB	
80 dB		-60.5	________	-59.5	dB	
Display linearity	Page 1.17					
RBW 20 MHz						
a_{ATT}						
10 dB		9.5	________	10.5	dB	
15 dB		4.5	________	5.5	dB	
20 dB		-	reference	-	-	
25 dB		-5.5	________	-4.5	dB	
30 dB		– 10.5	________	-9.5	dB	
35 dB		-15.5	________	-14.5	dB	
40 dB		-20.5	________	-19.5	dB	
45 dB		-25.5	________	-24.5	dB	
50 dB		-30.5	________	-29.5	dB	
55 dB		-35.5	________	-34.5	dB	
60 dB		-40.5	________	-39.5	dB	
Attenuator accuracy	Page 1.18					8665B 8494A
a_{ATT}						8496A
0 dB		-9.8	-9.94	-10.2	dB	
5 dB		-4.8	________	-5.2	dB	
10 dB		-	reference	-	-	
20 dB		+9.8	________	+10.2	dB	
40 dB		+29.8	29.98	+30.2	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Reference level switching accuracy	Page 1.19					
Reference level						
0 dBm		+9,85	9.98	+10,15	dB	8665B and 8494G
-10 dBm		-	reference	-	-	8596G
-20 dBm		-10.15		-9,85	dB	
-30 dBm		-20.15		-19,85	dB	
-40 dBm		-30.15		-29,85	dB	
-50 dBm		-40.15		-39,85	dB	
-11 dBm		-1.15	-1.00	-0,85	dB	
-12 dBm		-2.15		-1,85	dB	
-13 dBm		-3.15		-2,85	dB	
-14 dBm		-4.15		-3,85	dB	
-15 dBm		-5.15		-4,85	dB	
-16 dBm		-6.15		-5,85	dB	
-17 dBm		-7.15	-7.01	-6,85	dB	
-18 dBm		-8.15		-7,85	dB	
-19 dBm		-9.15	-8.99	-8,85	dB	
Phase noise at instruments with serial number lower than 200000	Page 1.22					
Offset frequency						
100 Hz 10MHz cesium is		-	-118 dBc	-90	dBc (1Hz)	
1 kHz our only source		-	-117 dBc	-112	dBc (1Hz)	
10 kHz clean enough for this test		-	-121 dBc	-120	dBc (1Hz)	
100 kHz 8665B		-	-130.9 dBc	-120	dBc (1Hz)	
1 MHz 8665B		-	-137.9 dBc	-138	dBc (1Hz)	
Phase noise at instruments with serial number higher than 200000 at 640 MHz	Page 1.22					
Offset frequency						
100 Hz		-		-98	dBc (1Hz)	
1 kHz		-		-116	dBc (1Hz)	
10 kHz		-		-128	dBc (1Hz)	
100 kHz		-		-128	dBc (1Hz)	
1 MHz		-		-140	dBc (1Hz)	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Phase noise	Page 1.24					
at instruments with serial						
number higher than						
200000						
at 800 MHz						
Offset frequency						
100 Hz		-	________	-98	dBc (1Hz)	
1 kHz		-	________	-116	dBc (1Hz)	
10 kHz		-	________	-128	dBc (1Hz)	
100 kHz		-	________	-128	dBc (1Hz)	
1 MHz		-	________	-140	dBc (1Hz)	
Return Loss	Page 1.27					
at 30 MHz						
RF input DC coupled						
RF att						
10 dB		30.7	31 ~~31~~+	-	dB	
20 dB		30.7	38	-	dB	
30 dB		30.7	37	-	dB	
40 dB		30.7	36	-	dB	
50 dB		30.7	34	-	dB	
Return Loss	Page 1.27					8757C with 85027B & 8341B sweeper
RF input						
RF att 0 dB / DC						
f_{in}						
R&S FSMR 3 / 26 / 43 /						
50:		10.9	________	-	dB	
10 MHz		10.9	________	-	dB	
250 MHz	below 10 GHz	10.9	________	-	dB	
500 MHz		10.9	________	-	dB	
750 MHz	worst case	10.9	________	-	dB	
1000 MHz	was 16.01	10.9	________	-	dB	
1250 MHz		10.9	________	-	dB	
1500 MHz		10.9	________	-	dB	
1750 MHz		10.9	________	-	dB	
2000 MHz		10.9	________	-	dB	
2250 MHz		10.9	________	-	dB	
2500 MHz		10.9	________	-	dB	
2750 MHz		9.5	________	-	dB	
3000 MHz		9.5	________	-	dB	
3250 MHz		9.5	________	-	dB	
3500 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 /50:						
4000 MHz		7.4	________	-	dB	
6000 MHz		7.4	________	-	dB	
8000 MHz		7.4	________	-	dB	
10000 MHz	above 10 GHz W/C	7.4	________	-	dB	
12000 MHz	10.3	7.4	________	-	dB	
14000 MHz		7.4	________	-	dB	
16000 MHz		7.4	________	-	dB	
18000 MHz		7.4	________	-	dB	
20000 MHz	stopping point my sweeper	7.4	________	-	dB	
22000 MHz		7.4	________	-	dB	
24000 MHz		7.4	________	-	dB	
26000 MHz		7.4	________	-	dB	
R&S FSMR 43 /50:						
28000 MHz		6	________	-	dB	
30000 MHz		6	________	-	dB	
32000 MHz		6	________	-	dB	
34000 MHz		6	________	-	dB	
36000 MHz		6	________	-	dB	
38000 MHz		6	________	-	dB	
40000 MHz		6	________	-	dB	
Return Loss	Page 1.27					
RF input						
RF att 10 dB / DC						
f_{in}						
R&S FSMR 3 / 26 / 43						
/50:		20.8	________	-	dB	
10 MHz		20.8	________	-	dB	
250 MHz		20.8	________	-	dB	
500 MHz		20.8	________	-	dB	
750 MHz		20.8	________	-	dB	
1000 MHz	w/c 24.15 less than 2.5 Ghz	20.8	________	-	dB	
1250 MHz		20.8	________	-	dB	
1500 MHz		20.8	________	-	dB	
1750 MHz		20.8	________	-	dB	
2000 MHz		20.8	________	-	dB	
2250 MHz		17.7	________	-	dB	
2500 MHz		17.7	________	-	dB	
2750 MHz		17.7	________	-	dB	
3000 MHz		17.7	________	-	dB	
3250 MHz		17.7	________	-	dB	
3500 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 /50:						
4000 MHz		17.7	________	-	dB	
6000 MHz		17.7	________	-	dB	
8000 MHz		14	________	-	dB	
10000 MHz W/C 18.95		14	________	-	dB	
12000 MHz		12.7	________	-	dB	
14000 MHz		12.7	________	-	dB	
16000 MHz W/C 13.7		12.7	________	-	dB	
18000 MHz		11.7	________	-	dB	
20000 MHz		11.7	________	-	dB	
22000 MHz		10.9	________	-	dB	
24000 MHz		10.1	________	-	dB	
26000 MHz W/C 13.8		10.1	________	-	dB	
R&S FSMR 43 / 50:						
26000 MHz		9,5	________	-	dB	
28000 MHz		9,5	________	-	dB	
30000 MHz		9,5	________	-	dB	
32000 MHz		9,5	________	-	dB	
34000 MHz		9,5	________	-	dB	
36000 MHz		8.1	________	-	dB	
38000 MHz		8.1	________	-	dB	
40000 MHz		6	________	-	dB	
Return Loss RF input RF att 30 dB / DC f_{in}	Page 1.27					
R&S FSMR 3 / 26 / 43 / 50:						
10 MHz		20.8	________	-	dB	
250 MHz		20.8	________	-	dB	
500 MHz		20.8	________	-	dB	
750 MHz		20.8	________	-	dB	
1000 MHz	-24.9 W/C	20.8	________	-	dB	
1250 MHz		20.8	________	-	dB	
1500 MHz		20.8	________	-	dB	
1750 MHz		20.8	________	-	dB	
2000 MHz		20.8	________	-	dB	
2250 MHz		20.8	________	-	dB	
2500 MHz		17.7	________	-	dB	
2750 MHz		17.7	________	-	dB	
3000 MHz		17.7	________	-	dB	
3250 MHz		17.7	________	-	dB	
3500 MHz		17.7	________	-	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 / 50:						
4000 MHz		17.7	________	-	dB	
6000 MHz	18.0 WC	17.7	________	-	dB	
8000 MHz		14	________	-	dB	
10000 MHz		14	________	-	dB	
12000 MHz		12.7	________	-	dB	
14000 MHz		12.7	________	-	dB	
16000 MHz		12.7	________	-	dB	
18000 MHz		11.7	________	-	dB	
20000 MHz	14.77 WC	11.7	________	-	dB	
22000 MHz		10.9	________	-	dB	
24000 MHz	14.3 WC	10.1	________	-	dB	
26000 MHz		10.1	________	-	dB	
R&S FSMR 43 / 50:						
28000 MHz		9,5	________	-	dB	
30000 MHz		9,5	________	-	dB	
32000 MHz		9,5	________	-	dB	
34000 MHz		9,5	________	-	dB	
36000 MHz		8.1	________	-	dB	
38000 MHz		8.1	________	-	dB	
40000 MHz		6	________	-	dB	
Return Loss RF input RF att 50 dB / DC f_{in}	Page 1.27					
R&S FSMR 3 / 26 / 43 / 50:						
10 MHz		20.8	________	-	dB	
250 MHz		20.8	________	-	dB	
500 MHz		20.8	________	-	dB	
750 MHz		20.8	________	-	dB	
1000 MHz		20.8	________	-	dB	
1250 MHz		20.8	________	-	dB	
1500 MHz		20.8	________	-	dB	
1750 MHz		20.8	________	-	dB	
2000 MHz		20.8	________	-	dB	
2250 MHz		20.8	________	-	dB	
2500 MHz		17.7	________	-	dB	
2750 MHz	21.98 WC	17.7	________	-	dB	
3000 MHz		17.7	________	-	dB	
3250 MHz		17.7	________	-	dB	
3500 MHz		17.7	________	-	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 / 50:						
4000 MHz		17.7	________	-	dB	
6000 MHz		17.7	________	-	dB	
8000 MHz		14	________	-	dB	
10000 MHz		14	________	-	dB	
12000 MHz		12.7	________	-	dB	
14000 MHz		12.7	________	-	dB	
16000 MHz		12.7	________	-	dB	
18000 MHz		11.7	________	-	dB	
20000 MHz		11.7	________	-	dB	
22000 MHz		10.9	________	-	dB	
24000 MHz		10.1	________	-	dB	
26000 MHz		10.1	________	-	dB	
R&S FSMR 43 / 50:						
28000 MHz		9,5	________	-	dB	
30000 MHz		9,5	________	-	dB	
32000 MHz		9,5	________	-	dB	
34000 MHz		9,5	________	-	dB	
36000 MHz		8.1	________	-	dB	
38000 MHz		8.1	________	-	dB	
40000 MHz		6	________	-	dB	
Return Loss RF input RF att 20 dB / DC f_{in}	Page 1.27					
R&S FSMR 3 / 26 / 43 / 50:						
10 MHz		14	________	-	dB	
250 MHz		14	________	-	dB	
500 MHz		14	________	-	dB	
750 MHz		14	________	-	dB	
1000 MHz		14	________	-	dB	
1250 MHz		14	________	-	dB	
1500 MHz		14	________	-	dB	
1750 MHz		14	________	-	dB	
2000 MHz		14	________	-	dB	
2250 MHz		14	________	-	dB	
2500 MHz		14	________	-	dB	
2750 MHz		14	________	-	dB	
3000 MHz		14	________	-	dB	
3250 MHz		14	________	-	dB	
3500 MHz		14	________	-	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 / 50:						
4000 MHz		10.9	________	-	dB	
6000 MHz		10.9	________	-	dB	
8000 MHz		10.9	________	-	dB	
10000 MHz		10.9	________	-	dB	
12000 MHz		10.9	________	-	dB	
14000 MHz		10.9	________	-	dB	
16000 MHz		10.9	________	-	dB	
18000 MHz		9.5	________	-	dB	
20000 MHz		9.5	________	-	dB	
22000 MHz		9.5	________	-	dB	
24000 MHz		9.5	________	-	dB	
26000 MHz		9.5	________	-	dB	
R&S FSMR 43 / 50:						
28000 MHz		7.4	________	-	dB	
30000 MHz		7.4	________	-	dB	
32000 MHz		7.4	________	-	dB	
34000 MHz		7.4	________	-	dB	
36000 MHz		7.4	________	-	dB	
38000 MHz		7.4	________	-	dB	
40000 MHz		7.4	________	-	dB	
Return Loss RF input RF att 40 dB / DC f_{in}	Page 1.27					
R&S FSMR 3 / 26 / 43 /						
50:		14	________	-	dB	
10 MHz		14	________	-	dB	
250 MHz		14	________	-	dB	
500 MHz		14	________	-	dB	
750 MHz		14	________	-	dB	
1000 MHz		14	________	-	dB	
1250 MHz		14	________	-	dB	
1500 MHz		14	________	-	dB	
1750 MHz		14	________	-	dB	
2000 MHz		14	________	-	dB	
2250 MHz		14	________	-	dB	
2500 MHz		14	________	-	dB	
2750 MHz		14	________	-	dB	
3000 MHz		14	________	-	dB	
3250 MHz		14	________	-	dB	
3500 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
R&S FSMR 26 / 43 / 50:						
4000 MHz		10.9	________	-	dB	
6000 MHz		10.9	________	-	dB	
8000 MHz		10.9	________	-	dB	
10000 MHz		10.9	________	-	dB	
12000 MHz		10.9	________	-	dB	
14000 MHz		10.9	________	-	dB	
16000 MHz		10.9	________	-	dB	
18000 MHz		9.5	________	-	dB	
20000 MHz		9.5	________	-	dB	
22000 MHz		9.5	________	-	dB	
24000 MHz		9.5	________	-	dB	
26000 MHz		9.5	________	-	dB	
R&S FSMR 43 / 50:						
28000 MHz		7.4	________	-	dB	
30000 MHz		7.4	________	-	dB	
32000 MHz		7.4	________	-	dB	
34000 MHz		7.4	________	-	dB	
36000 MHz		7.4	________	-	dB	
38000 MHz		7.4	________	-	dB	
40000 MHz		7.4	________	-	dB	
DC Offset	Page 1.28					
Range 4 V		-5	728 uV	+5	mV	
Range 0.4 V		-1	73 uV	+1	mV	
Inherent Noise	Page 1.28					
Range 4 V			130 uV	250	µV	
Range 0.4 V			16.4 uV	25	µV	
Input Resistance	Page1.28					AC1378 34440A
50 Ω		+47.5	50.11	+52.5	Ω	
1 MΩ		+0.95	0.9942	+1.05	MΩ	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
DC Voltage Measurement Uncertainty	Page1.29					
Range 4 V						5520A/5720A
+4 V		-25	________	+25	mV	
+0.4 V		-7	________	+7	mV	
-4 V		-25	________	+25	mV	
-0.4 V		-7	________	+7	mV	
Range 0.4 V						
+400 mV		-3	________	+3	mV	
+100 mV		-1.5	________	+1.5	mV	
-400 mV		-3	________	+3	mV	
-100 mV		-1.5	________	+1.5	mV	
AC Voltage Measurement Uncertainty	Page 1.29					
Range 4 V						5520A/5720A
20 Hz / 3 V		-30	________	+30	mV	
1 kHz / 3 V		-30	________	+30	mV	
20 kHz / 3 V		-30	________	+30	mV	
100 kHz / 3 V		-30	________	+30	mV	
300 kHz / 2 V		-40	________	+40	mV	
1 MHz / 2 V		-100	________	+100	mV	
1 kHz / 0.3 V		-3	________	+3	mV	
300 kHz / 0.3 V		-6	________	+6	mV	
Range 0.4 V						
20 Hz / 0.3 V		-3	________	+3	mV	
1 kHz / 0.3 V		-3	________	+3	mV	
20 kHz / 0.3 V		-3	________	+3	mV	
100 kHz / 0.3 V		-3	________	+3	mV	
300 kHz / 0.3 V		-6	________	+6	mV	
1 MHz / 0.3 V		-15	________	+15	mV	
1 kHz / 0.1 V		-1	________	+1	mV	
300 kHz / 0.1 V		-2	________	+2	mV	

[PRESET]-[MRECEIVER]-[DETECTOR-SELECTOR]-[DIST UNIT]-[DB]-[PREV]-[AUDIO]

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Inherent Distortion (THD)	Page 1.30					
100 Hz / 3V						
1 kHz / 3 V		-	________	-60	dB	
20 kHz / 3 V		-	________	-60	dB	
100 kHz / 3 V		-	________	-60	dB	5720A
		-	________	-60	dB	
20 kHz / 0.6 V						
100 kHz / 0.6 V		-	________	-60	dB	
		-	________	-60	dB	
20 kHz / 0.3 V						
100 kHz / 0.3 V		-	________	-54	dB	
		-	________	-54	dB	
Distortion (THD) Dual tones	Page 1.31					use two 33250A
Measurement						with time bases strapped together
Uncertainty						equal cables
fund. / harm. / THD						
1 kHz / 2^{nd} / -20.04 dB		-20.54	________	-19.54	dB	
1 kHz / 2^{nd} / -40 dB		-40.5	________	-39.5	dB	
1 kHz / 3^{rd} / -40 dB		-40.5	________	-39.5	dB	
1 kHz / 4^{th} / -40 dB		-40.5	________	-39.5	dB	
1 kHz / 10^{th} / -40 dB		-40.5	________	-39.5	dB	
					dB	
100 Hz / 2^{nd} / -40 dB		-40.5	________	-39.5	dB	
20 kHz / 2^{nd} / -40 dB		-40.5	________	-39.5	dB	
50 kHz / 2^{nd} / -40 dB		-40.5	________	-39.5	dB	
Sinad Measurement	Page 1.31					
Uncertainty						same two 33250A
fundamental / 2^{nd} tone /						
SINAD						offset zero, lo/level zero
1 kHz/100 Hz/20.04dB		+19.54	________	+20.54	dB	
1 kHz/1.5kHz/30.46dB		+29.96	________	+30.96	dB	
1 kHz/15.5 kHz/40 dB		+39.5	________	+40.5	dB	
1 kHz/100 kHz/40 dB		+39.5	________	+40.5	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Audio Filter Frequency Response	Page 1.32					33250A 0 offset 0 Lo level
High Pass 50 Hz						
200 Hz		-0.09	________	+0.01	dB	
20 Hz		-15	________	-17	dB	
High Pass 300 Hz						
1 kHz		-0.09	________	+0.01	dB	
100 Hz		-18	________	-20	dB	
Low Pass 3 kHz						
1 kHz		-0.09	________	+0.01	dB	
6 kHz		-29	________	-31	dB	
Low Pass 15 kHz						
10 kHz		-0.09	________	+0.01	dB	
30 kHz		-29	________	-31	dB	
Low Pass 100 kHz						
10 kHz		-0.09	________	+0.01	dB	
100 kHz		-2.5	________	-3.5	dB	
Deemphasis						
25µs /6.366 kHz		-2.5	________	-3.5	dB	
50µs /3.183 kHz		-2.5	________	-3.5	dB	
75µs /2.122 kHz		-2.5	________	-3.5	dB	
750µs /212.2 Hz		-2.5	________	-3.5	dB	
Audio Frequency Counter Uncertainty	Page 1.33					
20 Hz / 0.3 V		19.98	________	20.02	Hz	
100 Hz / 0.3 V		99.98	________	100.02	Hz	
990 Hz / 0.3 V		989.98	________	990.02	Hz	
1.01 kHz / 0.3 V		1.00997	________	1.01003	kHz	
9.9 kHz / 0.3 V		9.89997	________	9.90003	kHz	
99 kHz / 0.3 V		98.9997	________	99.0003	kHz	
300 kHz / 0.3 V		299.997	________	300.003	kHz	
990 kHz / 0.3 V		989.997	________	990.003	kHz	
300 kHz / 100 mV		299.997	________	300.003	kHz	
1.01 kHz / 100 mV		1.00997	________	1.01003	kHz	
20 Hz / 100 mV		19.98	________	20.02	Hz	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Modulation Depth Uncertainly	Page 1.34					
Carrier frequency = 12.5 MHz	< FSMR and 33250A					33250A sine wave 12.5 MHz AM Freq, 1KHz:90 Hz:150 Hz
1 kHz / 5%		4.95	________	5.05	%	
1 kHz / 50 %		49.5	________	50.5	%	
1 kHz / 99 %		98.01	________	99.99	%	
90 Hz / 5 %		4.98	________	5.02	%	
90 Hz / 50 %		49.8	________	50.2	%	
90 Hz / 99 %		98.604	________	99.396	%	
150 Hz / 5 %		4.98	________	5.02	%	
150 Hz / 50 %		49.8	________	50.2	%	
150 Hz / 99 %		98.604	________	99.396	%	
Carrier frequency = 100 kHz	< FSMR & 33250A					
33250A Mod						
1 kHz / 5 %		4.925	________	5.075	%	
1 kHz / 50 %		49.25	________	50.75	%	
1 kHz / 99 %		97.515	________	100.485	%	
AM Flatness	Page 1.34					33250A & 11715A See K4-4-283-1 steps 4.7.17 & 18. Set for 50%, then change freq to match test
Carrier frequency = 12.5 MHz						
50 Hz / 50 %		-0.3	________	+0.3	Δ%	
10 kHz / 50 %		-0.3	________	+0.3	Δ%	
50 kHz / 50 %		-0.3	________	+0.3	Δ%	
100 kHz / 50 %		-0.8	________	+0.8	Δ%	
Carrier frequency = 100 kHz						
50 Hz / 50 %		-0.3	________	+0.3	Δ%	
10 kHz / 50 %		-0.3	X	+0.3	Δ%	

you just verified in previous steps that the DUT is accurate @10 KHz 50% at 12.5 MHz. So, using 33250A, set 33250A up at 12.5 MHz, 10 Khz tweek mod level out for 50%, then change 33250A carrier freq to 100 KHz

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Inherent AM Distortion (THD)	Page1.35					MRECEIVER: AM, FREQ 12.5 MHz PRESET: for 99% +- PEAK/2 distortion: 0 dB, set 99% by FSMR adj
Carrier frequency = 12.5 MHz						
50 Hz / 99 %		-	________	-50.5	dB	
1 kHz / 99 %		-	________	-50.5	dB	
10 kHz / 99 %		-	________	-50.5	dB	
50 kHz / 99 %		-	________	-50.5	dB	
Carrier frequency = 100 kHz						
50 Hz / 99 %		-	________	-50.5	dB	
1 kHz / 5 %		-	________	-50.5	dB	
1 kHz / 99 %		-	________	-50.5	dB	
10 kHz / 99 %		-	________	-50.5	dB	
FM Rejection	Page1.36					
100 kHz 33250A		-	________	0.2	%	
600 MHz 8665B	800 Mhz int 50KHz dev	-	________	0.2	%	
Residual AM 8655B	Page 1.36					
300 kHz		-	________	<0.01	%	
600 MHz		-	________	<0.01	%	
3 GHz		-	________	0.01	%	

-20 out of 11715A not adjustable. 33250A 50 Hz around 0.316 mV

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency Deviation Uncertainty	Page 1.37					11715A FM output to FSMR FREQ to 400 MHz, tune 11715A to 400 MHz (on FSMR) 33250A to 11715A audio in at 10 KHz (cw) adjust 33250A amplitude for 552 KHz deviation then change CW to 100 KHz, take reading.
Carrier frequency = 200 kHz						
rate / deviation						
1 kHz / 5.52 kHz		5.4648	________	5.5752	kHz	
10 kHz / 55.2 kHz		54.648	________	55.752	kHz	
50 Hz / 50 kHz		49.5	________	50.5	kHz	
Carrier frequency = 12.0 MHz						
rate / deviation						
1 kHz / 5.52 kHz		5.4648	________	5.5752	kHz	
10 kHz / 55.2 kHz		54.648	________	55.752	kHz	________33250A^____
100 kHz / 552 kHz		546.48	________	557.52	kHz	
200 kHz / 481 kHz		466.57	________	495.43	kHz	
Inherent FM Distortion (THD)	Page1.38					
Carrier frequency = 200 kHz						
rate / deviation						
1 kHz / 50 kHz		-	________	-50.5	dB	
5 kHz / 50 kHz		-	________	-50.5	dB	
10 kHz / 50 kHz		-	________	-50.5	dB	
Carrier frequency = 12 MHz						
rate / deviation						
1 kHz / 50 kHz		-	________	-60	dB	
10 kHz / 50 kHz		-	________	-60	dB	
1 kHz / 500 kHz		-	________	-50.5	dB	
20 kHz / 500 kHz		-	________	-50.5	dB	
50 kHz / 500 kHz		-	________	-50.5	dB	
100 kHz / 500 kHz		-	________	-50.5	dB	

33250A setup 12 MHz carrier, 20 KHz mod freq, set for 552 KHz deviation.

FM Deviation / FM Frequency= Rads

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
AM Rejection	Page 1.39					33250A
Carrier frequency = 12.5 MHz						
1 kHz / 50 %			________	20	Hz	
Carrier frequency = 100 kHz						
1 kHz / 50 %			________	20	Hz	
Residual FM	Page1.39					8665B
300 kHz		-	________	1	Hz	
600 MHz		-	________	1	Hz	
3 GHz		-	________	2.5	Hz	
Phase Deviation Uncertainty	Page1.40 33250A					
100 kHz / 5.52 rad		5.4648	________	5.5752	rad	12MHz carrier -20KHz mod freq- set for 110.4Khz deviation
20 kHz / 20 rad		19.8	________	20.2	rad	12 MHz-20KHz-400 KHz
1 kHz / 400 rad		396	________	404	rad	33250A 12MHz-1KHz-400 KHz (FM) switch FSMR to phase
Inherent PM Distortion (THD)	Page 1.40 11715A					Carrier FM Freq DEV
1 kHz / 500 rad		-	________	-60	dB	12MHz 1KHz 500Khz
20 kHz / 25 rad		-	________	-60	dB	12MHz 20KHz 500KHz
50 kHz / 10 rad		-	________	-60	dB	33250A 12MHZ - 20KHz - 200 KHz
100 kHz / 5 rad		-	________	-60	dB	12MHZ - 20 KHz - 100 KHz
AM Rejection	Page 1.41					
1 kHz / 50 %		---	________	0.02	rad	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Level Linearity	Page 1.42					
RF Level Relative						
0 dB			Reference		dB	
-6 dB		-0.013	________	+0.013	dB	
-10 dB		-0.015	________	+0.015	dB	
-16 dB		-0.018	________	+0.018	dB	
-20 dB		-0.02	________	+0.02	dB	
-26 dB		-0.023	________	+0.023	dB	
-30 dB		-0.025	________	+0.025	dB	
-40 dB		-0.03	________	+0.03	dB	
-50 dB		-0.035	________	+0.035	dB	
-56 dB		-0.038	________	+0.038	dB	
-66 dB		-0.043	________	+0.043	dB	
-76 dB		-0.048	________	+0.048	dB	
-86 dB		-0.053	________	+0.053	dB	
-96 dB		-0.058	________	+0.058	dB	
-106 dB		-0.063	________	+0.063	dB	
			first time testing at -106 was getting bad reading. Had to lower my 8665B output by 30 dB and raise 8496A by same then it was very very good.			
Power Reference	Page1.45					
Level Uncertainty		0.988	________	1.012	mW	

8665b-8496A - 8494 A - 6dB pad- 8496G -8494G-10dB - RF input
8496A set to 0 through 100dB re-referencing each time
8494A set to 6dB (isolation)
8496G 0 and 10 dB (this is or test attenuatror
8494G 0 and 6 dB test atten

Performance Test Report Option B2

Table 1-R&S FSMR: Performance Test Report Option B2

ROHDE & SCHWARZ	Performance Test Report	Option R&S FSMR-B2	Version: 3 August 2010
Serial number: Test person: Date: Signature:			

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Image frequency rejection,1st IF f_{in}	Page 1.46					
11 MHz		90	________	-	dB	
100 MHz		90	________	-	dB	
1701 MHz		90	________	-	dB	
3001 MHz		90	________	-	dB	
Image frequency rejection 2nd IF f_{in} f_{in} + 808.8 MHz *) f_{in} – 808.8 MHz YIG Filter off	Page 1.46					
R&S FSMR 26 / 43 / 50:						
100 MHz		90	________	-	dB	
YIG Filter on						
R&S FSMR 26:						
3700 MHz		70	________	-	dB	
5000 MHz		70	________	-	dB	
7999 MHz		70	________	-	dB	
26000 MHz *)		70	________	-	dB	
R&S FSMR 43 /50:						
3700 MHz		70	________	-	dB	
5000 MHz		70	________	-	dB	
7999 MHz		70	________	-	dB	
26000 MHz *)		55	________	-	dB	
35000 MHz		70	________	-	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Image frequency rejection 3rd IF f_{in} YIG Filter off **R&S FSMR 26 / 43 / 50:** 100 MHz YIG Filter on **R&S FSMR 26 / 43 / 50:** 4500 MHz	Page	 90 70	 ________ ________	 - -	 dB dB	
1st IF rejection f_{in} 11 MHz 100 MHz 1701 MHz 2990 MHz	Page	 90 90 90 90	 ________ ________ ________ ________	 - - - -	 dB dB dB dB	
2nd IF rejection f_{in} **R&S FSMR 26 / 43 / 50:** 100 MHz YIG Filter on **R&S FSMR 26 / 43 / 50:** 4500 MHz	Page	 90 70	 ________ ________	 - -	 dB dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
3rd-order intercept point f_{in}	Page					
YIG Filter off						
R&S FSMR 26 / 43 / 50:						
28 MHz		17	________	-	dBm	
106 MHz		17	________	-	dBm	
261 MHz		17	________	-	dBm	
640 MHz		22	________	-	dBm	
1000 MHz		22	________	-	dBm	
1700 MHz		22	________	-	dBm	
2500 MHz		22	________	-	dBm	
3590 MHz		22	________	-	dBm	
4001 MHz		6	________	-	dBm	
5001 MHz		8	________	-	dBm	
7999 MHz		8	________	-	dBm	
12000 MHz		8	________	-	dBm	
20000 MHz		8	________	-	dBm	
26000 MHz		8	________	-	dBm	
R&S FSMR 43 / 50:						
27000 MHz		4	________	-	dBm	
32000 MHz		8	________	-	dBm	
38000 MHz		8	________	-	dBm	
YIG Filter on						
R&S FSMR 26 / 43 / 50:						
4001 MHz		12	________	-	dBm	
5001 MHz		12	________	-	dBm	
7999 MHz		12	________	-	dBm	
12000 MHz		12	________	-	dBm	
20000 MHz		12	________	-	dBm	
26000 MHz		12	________	-	dBm	
R&S FSMR 43 / 50:						
27000 MHz		12	________	-	dBm	
32000 MHz		12	________	-	dBm	
38000 MHz		12	________	-	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display normalized to 1 Hz: *) f_{noise}	Page					
20 Hz		-	________	-90	dBm	
90 Hz		-	________	-110	dBm	
900 Hz		-	________	-120	dBm	
9 kHz		-	________	–130	dBm	
95 kHz		-	________	–130	dBm	
999 kHz		-	________	–140	dBm	
9.99 MHz		-	________	–153	dBm	
Noise Display normalized to 1 Hz: *) f_{noise} **R&S FSMR 3:**	Page					
19.99 MHz		-	________	–155	dBm	
49.99 MHz		-	________	–155	dBm	
99.99 MHz		-	________	–155	dBm	
199.9 MHz		-	________	–155	dBm	
499.9 MHz		-	________	–155	dBm	
999.9 MHz		-	________	–155	dBm	
1499 MHz		-	________	–155	dBm	
1999 MHz		-	________	–155	dBm	
2499 MHz		-	________	–153	dBm	
2999 MHz		-	________	–153	dBm	
3599 MHz		-	________	–152	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display normalized to 1 Hz: *) f_{noise}	Page					
Read out marker corrected by -30 dB for 1 KHz measurement to 1Hz specification!!!!!!!!!!!						
YIG Filter off						
R&S FSMR 26:						
3601 MHz		-	________	–151	dBm	
6999 MHz		-	________	–151	dBm	
9999 MHz		-	________	–150	dBm	
12999 MHz		-	________	–150	dBm	
17999 MHz		-	________	–149	dBm	
21999 MHz		-	________	–147	dBm	
26499 MHz		-	________	–145	dBm	
R&S FSMR 43 / 50:						
3601 MHz		-	________	–151	dBm	
6999 MHz		-	________	–151	dBm	
9999 MHz		-	________	–150	dBm	
12999 MHz		-	________	–150	dBm	
17999 MHz		-	________	–149	dBm	
21999 MHz		-	________	–148	dBm	
26499 MHz		-	________	–147	dBm	
26799 MHz		--	________	–141	dBm	
30999 MHz		-	________	–141	dBm	
34999 MHz		-	________	–136	dBm	
38999 MHz		-	________	–136	dBm	
42999 MHz		-	________	–133	dBm	
45999 MHz *)		-	________	–133	dBm	
47499 MHz *)		--	________	–130	dBm	
49999 MHz *)		-	________	–130	dBm	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display normalized to 1 Hz: *) f_{noise}						
YIG Filter on						
R&S FSMR 26:						
3601 MHz		-	________	-151	dBm	
6999 MHz		-	________	-151	dBm	
9999 MHz		-	________	-149	dBm	
12999 MHz		-	________	-149	dBm	
17999 MHz		-	________	-145	dBm	
21999 MHz		-	________	-145	dBm	
26499 MHz		-	________	-143	dBm	
R&S FSMR 43 / 50:						
3601 MHz		-	________	-148	dBm	
6999 MHz		-	________	-148	dBm	
9999 MHz		-	________	-148	dBm	
12999 MHz		-	________	-148	dBm	
17999 MHz		-	________	-146	dBm	
21999 MHz		-	________	-145	dBm	
26499 MHz		-	________	-143	dBm	
26799 MHz		-	________	-135	dBm	
30999 MHz		-	________	-135	dBm	
34999 MHz		-	________	-130	dBm	
38999 MHz		-	________	-130	dBm	
42999 MHz		-	________	-128	dBm	
45999 MHz **)		-	________	-128	dBm	
47499 MHz **)		--	________	-125	dBm	
49999 MHz **)		-	________	-125	dBm	
**) not with R&S FSMR 43						
*) R&S FSMR 26: If option R&S FSMR-B23 is installed, add 2 dB up to 8 GHz and 3 dB up to 26 GHz R&S FSMR 26 / 43 / 50: If option FSU-B24 is installed, see performance test protocol of FSU-B24						
Level accuracy at 128 MHz. –30 dBm	Page	-0.2	________	+0.2	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF Attenuation 10 dB DC coupling, f_{fresp}	Page					
R&S FSMR 3/26/43/50:						
1 MHz		-0.5	________	+0.5	dB	
10 MHz		-0.3	________	+0.3	dB	
50 MHz		-0.3	________	+0.3	dB	
100 MHz		-0.3	________	+0.3	dB	
200 MHz		-0.3	________	+0.3	dB	
300 MHz		-0.3	________	+0.3	dB	
400 MHz		-0.3	________	+0.3	dB	
500 MHz		-0.3	________	+0.3	dB	
600 MHz		-0.3	________	+0.3	dB	
700 MHz		-0.3	________	+0.3	dB	
800 MHz		-0.3	________	+0.3	dB	
900 MHz		-0.3	________	+0.3	dB	
1000 MHz		-0.3	________	+0.3	dB	
1500 MHz		-0.3	________	+0.3	dB	
2000 MHz		-0.3	________	+0.3	dB	
2500 MHz		-0.3	________	+0.3	dB	
3000 MHz		-0.3	________	+0.3	dB	
3599 MHz		-0.3	________	+0.3	dB	
Frequency response RF Attenuation 10 dB DC coupling, YIG fliter = OFF f_{fresp}						
R&S FSMR 26 / 43 / 50:						
3610 MHz		-1	________	+1	dB	
4000 MHz		-1	________	+1	dB	
4500 MHz		-1	________	+1	dB	
5000 MHz		-1	________	+1	dB	
5500 MHz		-1	________	+1	dB	
6000 MHz		-1	________	+1	dB	
6500 MHz		-1	________	+1	dB	
7000 MHz		-1	________	+1	dB	
7990 MHz		-1.5	________	+1.5	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response	Page					
RF attenuation 10 dB						
DC coupling						
YIG fliter = OFF						
f_{resp}						
R&S FSMR 26 / 43 /						
50:		-1.5	________	+1.5	dB	
9000 MHz		-1.5	________	+1.5	dB	
10000 MHz		-1.5	________	+1.5	dB	
11000 MHz		-1.5	________	+1.5	dB	
12000 MHz		-1.5	________	+1.5	dB	
13000 MHz		-1.5	________	+1.5	dB	
14000 MHz		-1.5	________	+1.5	dB	
15000 MHz		-1.5	________	+1.5	dB	
16000 MHz		-1.5	________	+1.5	dB	
17000 MHz		-1.5	________	+1.5	dB	
18000 MHz		-1.5	________	+1.5	dB	
19000 MHz		-1.5	________	+1.5	dB	
20000 MHz		-2	________	+2	dB	
21000 MHz		-2	________	+2	dB	
22000 MHz		-2	________	+2	dB	
23000 MHz		-2	________	+2	dB	
24000 MHz		-2	________	+2	dB	
25000 MHz						
26000 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF attenuation 10 dB DC coupling YIG fliter = OFF f_{resp}						
R&S FSMR 43 / 50:						
27000 MHz		-2	________	+2	dB	
28000 MHz		-2	________	+2	dB	
29000 MHz		-2	________	+2	dB	
30000 MHz		-2	________	+2	dB	
31000 MHz		-2	________	+2	dB	
32000 MHz		-2	________	+2	dB	
33000 MHz		-2	________	+2	dB	
34000 MHz		-2	________	+2	dB	
35000 MHz		-2	________	+2	dB	
36000 MHz		-2	________	+2	dB	
37000 MHz		-2	________	+2	dB	
38000 MHz		-2	________	+2	dB	
39000 MHz		-2	________	+2	dB	
40000 MHz		-2.5	________	+2.5	dB	
41000 MHz		-2.5	________	+2.5	dB	
42000 MHz		-2.5	________	+2.5	dB	
43000 MHz *)		-2.5	________	+2.5	dB	
44000 MHz *)		-2.5	________	+2.5	dB	
45000 MHz *)		-2.5	________	+2.5	dB	
46000 MHz *)		-2.5	________	+2.5	dB	
47000 MHz *)		-2.5	________	+2.5	dB	
48000 MHz *)		-2.5	________	+2.5	dB	
49000 MHz *)		-2.5	________	+2.5	dB	
*) not with R&S FSMR 43						

Characteristic	**Included in**	**Min. value**	**Actual value**	**Max. value**	**Unit**	**Tolerance**
Frequency response						
RF Attenuation 10 dB						
DC coupling,						
YIG fliter = ON						
f_{fresp}						
R&S FSMR 26 / 43 /						
50:		-1.5	________	+1.5	dB	
3610 MHz		-1.5	________	+1.5	dB	
4000 MHz		-1.5	________	+1.5	dB	
4500 MHz		-1.5	________	+1.5	dB	
5000 MHz		-1.5	________	+1.5	dB	
5500 MHz		-1.5	________	+1.5	dB	
6000 MHz		-1.5	________	+1.5	dB	
6500 MHz		-1.5	________	+1.5	dB	
7000 MHz		-2	________	+2	dB	
7990 MHz						
Frequency response	Page					
RF attenuation 10 dB						
DC coupling						
YIG fliter = ON						
f_{fresp}						
R&S FSMR 26 / 43 / 50:						
9000 MHz		-2	________	+2	dB	
10000 MHz		-2	________	+2	dB	
11000 MHz		-2	________	+2	dB	
12000 MHz		-2	________	+2	dB	
13000 MHz		-2	________	+2	dB	
14000 MHz		-2	________	+2	dB	
15000 MHz		-2	________	+2	dB	
16000 MHz		-2	________	+2	dB	
17000 MHz		-2	________	+2	dB	
18000 MHz		-2	________	+2	dB	
19000 MHz		-2	________	+2	dB	
20000 MHz		-2	________	+2	dB	
21000 MHz		-2	________	+2	dB	
22000 MHz		-2.5	________	+2.5	dB	
23000 MHz		-2.5	________	+2.5	dB	
24000 MHz		-2.5	________	+2.5	dB	
25000 MHz		-2.5	________	+2.5	dB	
26000 MHz		-2.5	________	+2.5	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response RF attenuation 10 dB DC coupling YIG fliter = ON f_{fresp}						
R&S FSMR 43 / 50:						
27000 MHz		-2.5	________	+2.5	dB	
28000 MHz		-2.5	________	+2.5	dB	
29000 MHz		-2.5	________	+2.5	dB	
30000 MHz		-2.5	________	+2.5	dB	
31000 MHz		-2.5	________	+2.5	dB	
32000 MHz		-2.5	________	+2.5	dB	
33000 MHz		-2.5	________	+2.5	dB	
34000 MHz		-2.5	________	+2.5	dB	
35000 MHz		-2.5	________	+2.5	dB	
36000 MHz		-2.5	________	+2.5	dB	
37000 MHz		-2.5	________	+2.5	dB	
38000 MHz		-2.5	________	+2.5	dB	
39000 MHz		-2.5	________	+2.5	dB	
40000 MHz		-3	________	+3	dB	
41000 MHz		-3	________	+3	dB	
42000 MHz		-3	________	+3	dB	
43000 MHz *)		-3	________	+3	dB	
44000 MHz *)		-3	________	+3	dB	
45000 MHz *)		-3	________	+3	dB	
46000 MHz *)		-3	________	+3	dB	
47000 MHz *)		-3	________	+3	dB	
48000 MHz *)		-3	________	+3	dB	
49000 MHz *)		-3	________	+3	dB	
*) not with R&S FSMR 43						

Performance Test Report Option B9

Table 1-R&S FSMR: Performance Test Report Option B9, B12

ROHDE & SCHWARZ	Performance Test Report	Option B9	Version
Serial number:			
Option B12 installed: yes / no			
Test person:			
Date:			
Signature:			

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Level accuracy of the output level at 128 MHz:	Page					
Without option B12						
0 dBm		- 1	________	+ 1	dBm	
- 5 dBm		- 6	________	- 4	dBm	
-10 dBm		- 11	________	- 9	dBm	
-15 dBm		- 16	________	- 14	dBm	
-20 dBm		– 21	________	- 19	dBm	
With option B12						
0 dBm		– 1	________	+ 1	dBm	
-10 dBm		– 11	________	– 9	dBm	
-20 dBm		– 21	________	– 19	dBm	
-40 dBm		– 41	________	– 39	dBm	

Characteristic	**Included in**	**Min. value**	**Actual value**	**Max. value**	**Unit**	**Tolerance**
Frequency response Tracking generator 100 kHz to 3.6 GHz output level, referenced to 128 MHz:	Page					
Without option B12						
0 dBm		- 3	________	+ 3	dB	
- 5 dBm		– 3	________	+ 3	dB	
– 10 dBm		– 3	________	+ 3	dB	
– 15 dBm		– 3	________	+ 3	dB	
– 20 dBm		– 3	________	+ 3	dB	
With option B12						
0 dBm		- 4	________	+ 4	dB	
-10 dBm		– 4	________	+ 4	dB	
-20 dBm		– 4	________	+ 4	dB	
-40 dBm		– 4	________	+ 4	dB	
Dynamic range Tracking generator at 128 MHz:	Page					
reference level		- 1	________	+ 1	dBm	
isolation		-	________	- 100	dBc	
Checking modulation Tracking generator I/Q modulation +90 ° output level:	Page					
Signal 1001 MHz		- 3	________	+ 3	dBm	
residual carrier		-	________	- 30	dBc	
sideband 999 MHz		-	________	- 30	dBc	
I/Q modulation -90 ° output level:						
Signal 999 MHz		- 3	________	+ 3	dBm	
residual carrier		-	________	- 30	dBc	
sideband 1001 MHz		-	________	- 30	dBc	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Checking Modulation Tracking generator AM modulation Carrier level Sgnl spacing 1001 MHz Signal spacing 999 MHz	Page	- 3 - 8 - 8	________ ________ ________	+ 3 - 4 - 4	dBm dBc dBc	
Checking modulation Tracking generator FM modulation Carrier level Sgnl spcng 1000.1 MHz Sgnl spcng 999.9 MHz	Page	- 5 - 5 - 5	________ ________ ________	+ 1 - 3 - 3	dBm dBc dBc	

Performance Test Report Option B23

Table 1-1 Performance Test Report Option B23

ROHDE & SCHWARZ	Performance Test Report	Option B23	Version 10-08-03
Serial number:			
Test person:			
Date:			
Sign:			

Characteristic	**included in**	**Min. value**	**Actual value**	**Max. value**	**Unit**	**Tolerance**
Noise Display normalized to 1 Hz preamplifier = ON YIG filter = OFF f_{noise}	Page					
3601 MHz		-	________	-160	dBm	
3999 MHz		-	________	-160	dBm	
4499 MHz		-	________	-160	dBm	
4999 MHz		-	________	-160	dBm	
5499 MHz		-	________	-160	dBm	
5999 MHz		-	________	-160	dBm	
6499 MHz		-	________	-160	dBm	
6999 MHz		-	________	-160	dBm	
7999 MHz		-	________	-160	dBm	
8999 MHz		-	________	-157	dBm	
9999 MHz		-	________	-157	dBm	
10999 MHz		-	________	-157	dBm	
11999 MHz		-	________	-157	dBm	
12999 MHz		-	________	-157	dBm	
13999 MHz		-	________	-155	dBm	
14999 MHz		-	________	-155	dBm	
15999 MHz		-	________	-155	dBm	
16999 MHz		-	________	-155	dBm	
17999 MHz		-	________	-155	dBm	
18999 MHz		-	________	-152	dBm	
19999 MHz		-	________	-152	dBm	
20999 MHz		-	________	-152	dBm	
21999 MHz		-	________	-152	dBm	
22999 MHz		-	________	-148	dBm	
23999 MHz		-	________	-148	dBm	
24999 MHz		-	________	-148	dBm	
25999 MHz		-	________	-148	dBm	
26499 MHz		-	________	-148	dBm	

Characteristic	included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response Preamplifier = ON f_{fresp}	Page					
3610 MHz		-2	________	+2	dB	
4000 MHz		-2	________	+2	dB	
4500 MHz		-2	________	+2	dB	
5000 MHz		-2	________	+2	dB	
5500 MHz		-2	________	+2	dB	
6000 MHz		-2	________	+2	dB	
6500 MHz		-2	________	+2	dB	
7000 MHz		-2	________	+2	dB	
8000 MHz		-2	________	+2	dB	
9000 MHz		-2.5	________	+2.5	dB	
10000 MHz		-2.5	________	+2.5	dB	
11000 MHz		-2.5	________	+2.5	dB	
12000 MHz		-2.5	________	+2.5	dB	
13000 MHz		-2.5	________	+2.5	dB	
14000 MHz		-2.5	________	+2.5	dB	
15000 MHz		-2.5	________	+2.5	dB	
16000 MHz		-2.5	________	+2.5	dB	
17000 MHz		-2.5	________	+2.5	dB	
18000 MHz		-2.5	________	+2.5	dB	
19000 MHz		-2.5	________	+2.5	dB	
20000 MHz		-2.5	________	+2.5	dB	
21000 MHz		-2.5	________	+2.5	dB	
22000 MHz		-2.5	________	+2.5	dB	
23000 MHz		-3.0	________	+3.0	dB	
24000 MHz		-3.0	________	+3.0	dB	
25000 MHz		-3.0	________	+3.0	dB	
26000 MHz		-3.0	________	+3.0	dB	
26490 MHz		-3.0	________	+3.0	dB	

Performance Test Report Option R&S FSU-B24

Table 1-2: Performance Test Report Option R&S FSU-B24

ROHDE & SCHWARZ	Performance Test Report	Option R&S FSU-B24	Version 10-08-03
Serial number:			
Test person:			
Date:			
Signature:			

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display without R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF f_{noise}	Page 1.14					
R&S FSMR 26 / 43 / 50:						
20 Hz		-	________	-90	dBm	
90 Hz		-	________	-110	dBm	
900 Hz		-	________	-120	dBm	
9 kHz		-	________	–130	dBm	
95 kHz		-	________	–130	dBm	
999 kHz		-	________	–140	dBm	
9.99 MHz		-	________	–150	dBm	
19.99 MHz		-	________	–151	dBm	
49.99 MHz		-	________	–151	dBm	
99.99 MHz		-	________	–151	dBm	
199.9 MHz		-	________	–151	dBm	
499.9 MHz		-	________	–151	dBm	
999.9 MHz		-	________	–151	dBm	
1499 MHz		-	________	–151	dBm	
1999 MHz		-	________	–151	dBm	
2499 MHz		-	________	–149	dBm	
2999 MHz		-	________	–149	dBm	
3599 MHz		-	________	–149	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display without R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF f_{noise}	Page 1.14					
R&S FSMR 26:						
3601 MHz		-	________	-150	dBm	
7999 MHz		-	________	-150	dBm	
9999 MHz		-	________	-148	dBm	
12999 MHz		-	________	-148	dBm	
17999 MHz		-	________	-147	dBm	
21999 MHz		--	________	–146	dBm	
26499 MHz		-	________	–145	dBm	
Noise Display without R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF f_{noise}	Page 1.14					
R&S FSMR 43 / 50:						
3601 MHz		-	________	-150	dBm	
7999 MHz		-	________	-150	dBm	
9999 MHz		-	________	-147	dBm	
12999 MHz		-	________	-147	dBm	
17999 MHz		-	________	-147	dBm	
21999 MHz		--	________	–143	dBm	
26999 MHz		-	________	-140	dBm	
31999 MHz		-	________	-140	dBm	
34999 MHz		-	________	-137	dBm	
39999 MHz		-	________	-137	dBm	
41999 MHz		-	________	-128	dBm	
45999 MHz *)		-	________	–128	dBm	
47499 MHz *)		--	________	–125	dBm	
49999 MHz *)		-	________	-125	dBm	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display without R&S FSMR-B2 normalized to 1 Hz preamplifier = ON f_{noise}	Page 1.60					
R&S FSMR 26 / 43 / 50						
101 kHz		-	________	–140	dBm	
999 kHz		-	________	–150	dBm	
9.99 MHz		-	________	–161	dBm	
19.99 MHz		-	________	–163	dBm	
49.99 MHz		-	________	–163	dBm	
99.99 MHz		-	________	–163	dBm	
199.9 MHz		-	________	–163	dBm	
499.9 MHz		-	________	–163	dBm	
999.9 MHz		-	________	–163	dBm	
1499 MHz		-	________	–163	dBm	
1999 MHz		-	________	–163	dBm	
2499 MHz		-	________	–161	dBm	
2999 MHz		-	________	–161	dBm	
3599 MHz		-	________	–161	dBm	
3601 MHz		-	________	–160	dBm	
6999 MHz		-	________	–160	dBm	
9999 MHz		-	________	–160	dBm	
12999 MHz		-	________	–160	dBm	
17999 MHz		-	________	–160	dBm	
21999 MHz		-	________	–160	dBm	
26499 MHz		-	________	–157	dBm	
Noise Display without R&S FSMR-B2 normalized to 1 Hz preamplifier = ON f_{noise}	Page 1.60					
R&S FSMR 43 / 50:						
26799 MHz		-	________	-155	dBm	
30999 MHz		-	________	-155	dBm	
34999 MHz		-	________	-155	dBm	
38999 MHz		-	________	-155	dBm	
39999 MHz		-	________	-155	dBm	
42999 MHz		-	________	-147	dBm	
45999 MHz *)		-	________	-147	dBm	
47499 MHz *)		-	________	-142	dBm	
49999 MHz *)		-	________	-142	dBm	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = OFF f_{noise}	Page 1.14					
R&S FSMR 26 / 43 / 50:						
20 Hz		-	________	-90	dBm	
90 Hz		-	________	-110	dBm	
900 Hz		-	________	-120	dBm	
9 kHz		-	________	–130	dBm	
95 kHz		-	________	–130	dBm	
999 kHz		-	________	–140	dBm	
9.99 MHz		-	________	–150	dBm	
19.99 MHz		-	________	–151	dBm	
49.99 MHz		-	________	–151	dBm	
99.99 MHz		-	________	–151	dBm	
199.9 MHz		-	________	–151	dBm	
499.9 MHz		-	________	–151	dBm	
999.9 MHz		-	________	–151	dBm	
1499 MHz		-	________	–151	dBm	
1999 MHz		-	________	–151	dBm	
2499 MHz		-	________	–149	dBm	
2999 MHz		-	________	–149	dBm	
3599 MHz		-	________	–149	dBm	
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = OFF f_{noise}	Page 1.60					
R&S FSMR 26:						
3601 MHz		-	________	-149	dBm	
7999 MHz		-	________	-149	dBm	
9999 MHz		-	________	-146	dBm	
12999 MHz		-	________	-146	dBm	
17999 MHz		-	________	-144	dBm	
21999 MHz		--	________	–142	dBm	
26499 MHz		-	________	–140	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = OFF f_{noise}	Page 1.14					
R&S FSMR 43 / 50:						
3601 MHz		-	________	-145	dBm	
6999 MHz		-	________	-145	dBm	
9999 MHz		-	________	-145	dBm	
12999 MHz		-	________	-145	dBm	
17999 MHz		-	________	-140	dBm	
21999 MHz		--	________	–140	dBm	
24999 MHz		-	________	–140	dBm	
27999 MHz		-	________	-132	dBm	
31999 MHz		-	________	-132	dBm	
34999 MHz		-	________	-127	dBm	
39999 MHz		-	________	-127	dBm	
42999 MHz		-	________	-120	dBm	
45999 MHz *)		--	________	–120	dBm	
47999 MHz *)		-	________	–115	dBm	
49999 MHz *)		-	________	-115	dBm	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = ON YIG filter = OFF f_{noise}	Page 1.60					
R&S FSMR 26 / 43 / 50						
101 kHz		-	________	–140	dBm	
999 kHz		-	________	–150	dBm	
9.99 MHz		-	________	–161	dBm	
19.99 MHz		-	________	–163	dBm	
49.99 MHz		-	________	–163	dBm	
99.99 MHz		-	________	–163	dBm	
199.9 MHz		-	________	–163	dBm	
499.9 MHz		-	________	–163	dBm	
999.9 MHz		-	________	–163	dBm	
1499 MHz		-	________	–163	dBm	
1999 MHz		-	________	–163	dBm	
2499 MHz		-	________	–161	dBm	
2999 MHz		-	________	–161	dBm	
3599 MHz		-	________	–161	dBm	
3601 MHz		-	________	–162	dBm	
6999 MHz		-	________	–160	dBm	
9999 MHz		-	________	–160	dBm	
12999 MHz		-	________	–160	dBm	
17999 MHz		-	________	–160	dBm	
21999 MHz		-	________	–160	dBm	
26499 MHz		-	________	–157	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = ON YIG filter = OFF f_{noise}	Page 1.60					
R&S FSMR 43 / 50:						
26799 MHz		-	________	-155	dBm	
30999 MHz		-	________	-155	dBm	
34999 MHz		-	________	-155	dBm	
38999 MHz		-	________	-155	dBm	
39999 MHz		-	________	-155	dBm	
42999 MHz		-	________	-145	dBm	
45999 MHz *)		-	________	-145	dBm	
47999 MHz *)		-	________	-142	dBm	
49999 MHz *)		-	________	-142	dBm	
*) not with R&S FSMR 43						
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = ON f_{noise}	Page 1.14					
R&S FSMR 26 / 43 / 50:						
20 Hz		-	________	-90	dBm	
90 Hz		-	________	-110	dBm	
900 Hz		-	________	-120	dBm	
9 kHz		-	________	–130	dBm	
95 kHz		-	________	–130	dBm	
999 kHz		-	________	–140	dBm	
9.99 MHz		-	________	–150	dBm	
19.99 MHz		-	________	–151	dBm	
49.99 MHz		-	________	–151	dBm	
99.99 MHz		-	________	–151	dBm	
199.9 MHz		-	________	–151	dBm	
499.9 MHz		-	________	–151	dBm	
999.9 MHz		-	________	–151	dBm	
1499 MHz		-	________	–151	dBm	
1999 MHz		-	________	–151	dBm	
2499 MHz		-	________	–149	dBm	
2999 MHz		-	________	–149	dBm	
3599 MHz		-	________	–149	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = ON f_{noise}	Page 1.60					
R&S FSMR 26:						
3601 MHz		-	________	-148	dBm	
7999 MHz		-	________	-148	dBm	
9999 MHz		-	________	-145	dBm	
12999 MHz		-	________	-145	dBm	
17999 MHz		-	________	-144	dBm	
21999 MHz		--	________	–142	dBm	
26499 MHz		-	________	–138	dBm	
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = OFF YIG filter = ON f_{noise}	Page 1.14					
R&S FSMR 43 / 50:						
3601 MHz		-	________	-145	dBm	
7999 MHz		-	________	-145	dBm	
9999 MHz		-	________	-142	dBm	
12999 MHz		-	________	-142	dBm	
17999 MHz		-	________	-142	dBm	
21999 MHz		--	________	–138	dBm	
24999 MHz		-	________	–138	dBm	
27999 MHz		-	________	-130	dBm	
31999 MHz		-	________	-130	dBm	
35999 MHz		-	________	-125	dBm	
39999 MHz		-	________	-125	dBm	
42999 MHz		-	________	-115	dBm	
45999 MHz *)		--	________	–115	dBm	
47999 MHz *)		-	________	–110	dBm	
49999 MHz *)		-	________	-110	dBm	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = ON YIG filter = ON f_{noise}	Page 1.60					
R&S FSMR 26 / 43 / 50						
101 kHz		-	________	–140	dBm	
999 kHz		-	________	–150	dBm	
9.99 MHz		-	________	–161	dBm	
19.99 MHz		-	________	–163	dBm	
49.99 MHz		-	________	–163	dBm	
99.99 MHz		-	________	–163	dBm	
199.9 MHz		-	________	–163	dBm	
499.9 MHz		-	________	–163	dBm	
999.9 MHz		-	________	–163	dBm	
1499 MHz		-	________	–163	dBm	
1999 MHz		-	________	–163	dBm	
2499 MHz		-	________	–161	dBm	
2999 MHz		-	________	–161	dBm	
3599 MHz		-	________	–161	dBm	
3601 MHz		-	________	–162	dBm	
6999 MHz		-	________	–162	dBm	
9999 MHz		-	________	–162	dBm	
12999 MHz		-	________	–162	dBm	
17999 MHz		-	________	–162	dBm	
21999 MHz		-	________	–162	dBm	
26499 MHz		-	________	–162	dBm	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display with R&S FSMR-B2 normalized to 1 Hz preamplifier = ON YIG filter = ON f_{noise}	Page 1.60					
R&S FSMR 43 / 50:						
26999 MHz		-	________	-155	dBm	
30999 MHz		-	________	-155	dBm	
34999 MHz		-	________	-155	dBm	
38999 MHz		-	________	-155	dBm	
39999 MHz		-	________	-155	dBm	
42999 MHz		-	________	-145	dBm	
45999 MHz *)		-	________	-145	dBm	
47999 MHz *)		-	________	-142	dBm	
49999 MHz *)		-	________	-142	dBm	
*) not with R&S FSMR 43						
Level accuracy RF input 1 at 128 MHz. –30 dBm	Page					
preamplifier = ON		-0.3	________	+0.3	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response <3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON	Page					
f_{fresp} **R&S FSMR 26 / 43 / 50:**						
1 MHz		-0.8	________	+0.8	dB	
10 MHz		-0.6	________	+0.6	dB	
50 MHz		-0.6	________	+0.6	dB	
100 MHz		-0.6	________	+0.6	dB	
200 MHz		-0.6	________	+0.6	dB	
300 MHz		-0.6	________	+0.6	dB	
400 MHz		-0.6	________	+0.6	dB	
500 MHz		-0.6	________	+0.6	dB	
600 MHz		-0.6	________	+0.6	dB	
700 MHz		-0.6	________	+0.6	dB	
800 MHz		-0.6	________	+0.6	dB	
900 MHz		-0.6	________	+0.6	dB	
1000 MHz		-0.6	________	+0.6	dB	
1500 MHz		-0.6	________	+0.6	dB	
2000 MHz		-0.6	________	+0.6	dB	
2500 MHz		-0.6	________	+0.6	dB	
3000 MHz		-0.6	________	+0.6	dB	
3599 MHz		-0.6	________	+0.6	dB	
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = OFF	Page					
f_{fresp} **R&S FSMR 26 / 43 / 50:**						
3610 MHz		-2.0	________	+2.0	dB	
4000 MHz		-2.0	________	+2.0	dB	
4500 MHz		-2.0	________	+2.0	dB	
5000 MHz		-2.0	________	+2.0	dB	
5500 MHz		-2.0	________	+2.0	dB	
6000 MHz		-2.0	________	+2.0	dB	
6500 MHz		-2.0	________	+2.0	dB	
7000 MHz		-2.0	________	+2.0	dB	
7500 MHz		-2.0	________	+2.0	dB	
7990MHz		-2.0	________	+2.0	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = OFF						
f_{fresp}						
R&S FSMR 26 / 43 / 50:		-2.5	________	+2.5	dB	
9000 MHz		-2.5	________	+2.5	dB	
10000 MHz		-2.5	________	+2.5	dB	
11000 MHz		-2.5	________	+2.5	dB	
12000 MHz		-2.5	________	+2.5	dB	
13000 MHz		-2.5	________	+2.5	dB	
14000 MHz		-2.5	________	+2.5	dB	
15000 MHz		-2.5	________	+2.5	dB	
16000 MHz		-2.5	________	+2.5	dB	
17000 MHz		-2.5	________	+2.5	dB	
18000 MHz		-2.5	________	+2.5	dB	
19000 MHz		-2.5	________	+2.5	dB	
20000 MHz		-2.5	________	+2.5	dB	
21000 MHz		-3.0	________	+3.0	dB	
22000 MHz		-3.0	________	+3.0	dB	
23000 MHz		-3.0	________	+3.0	dB	
24000 MHz		-3.0	________	+3.0	dB	
25000 MHz						
26000 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = OFF						
f_{fresp} **R&S FSMR 43 / 50:**						
27000 MHz		-3.0	________	+3.0	dB	
28000 MHz		-3.0	________	+3.0	dB	
29000 MHz		-3.0	________	+3.0	dB	
30000 MHz		-3.0	________	+3.0	dB	
31000 MHz		-3.0	________	+3.0	dB	
32000 MHz		-3.0	________	+3.0	dB	
33000 MHz		-3.0	________	+3.0	dB	
34000 MHz		-3.0	________	+3.0	dB	
35000 MHz		-3.0	________	+3.0	dB	
36000 MHz		-3.0	________	+3.0	dB	
37000 MHz		-3.0	________	+3.0	dB	
38000 MHz		-3.0	________	+3.0	dB	
39000 MHz		-3.0	________	+3.0	dB	
40000 MHz		-3.5	________	+3.5	dB	
41000 MHz		-3.5	________	+3.5	dB	
42000 MHz		-3.5	________	+3.5	dB	
43000 MHz *)		-3.5	________	+3.5	dB	
44000 MHz *)		-3.5	________	+3.5	dB	
45000 MHz *)		-3.5	________	+3.5	dB	
46000 MHz *)		-3.5	________	+3.5	dB	
47000 MHz *)		-3.5	________	+3.5	dB	
48000 MHz *)		-3.5	________	+3.5	dB	
49000 MHz *)		-3.5	________	+3.5	dB	
*) not with R&S FSMR 43						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = ON	Page 1.14					
f_{fresp} **R&S FSMR 26 / 43 / 50:**						
3610 MHz		-2.5	________	+2.5	dB	
4000 MHz		-2.5	________	+2.5	dB	
4500 MHz		-2.5	________	+2.5	dB	
5000 MHz		-2.5	________	+2.5	dB	
5500 MHz		-2.5	________	+2.5	dB	
6000 MHz		-2.5	________	+2.5	dB	
6500 MHz		-2.5	________	+2.5	dB	
7000 MHz		-2.5	________	+2.5	dB	
7500 MHz		-2.5	________	+2.5	dB	
7990MHz		-2.5	________	+2.5	dB	

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = ON						
f_{fresp}						
R&S FSMR 26 / 43 / 50:		-3	________	+3	dB	
9000 MHz		-3	________	+3	dB	
10000 MHz		-3	________	+3	dB	
11000 MHz		-3	________	+3	dB	
12000 MHz		-3	________	+3	dB	
13000 MHz		-3	________	+3	dB	
14000 MHz		-3	________	+3	dB	
15000 MHz		-3	________	+3	dB	
16000 MHz		-3	________	+3	dB	
17000 MHz		-3	________	+3	dB	
18000 MHz		-3	________	+3	dB	
19000 MHz		-3	________	+3	dB	
20000 MHz		-3	________	+3	dB	
21000 MHz		-3.5	________	+3.5	dB	
22000 MHz		-3.5	________	+3.5	dB	
23000 MHz		-3.5	________	+3.5	dB	
24000 MHz		-3.5	________	+3.5	dB	
25000 MHz						
26000 MHz						

Characteristic	Included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response >3.6 GHz RF Attenuation 10 dB DC coupling preamplifier = ON YIG filter = ON						
f_{fresp} **R&S FSMR 43 / 50:**						
27000 MHz		-3.5	________	+3.5	dB	
28000 MHz		-3.5	________	+3.5	dB	
29000 MHz		-3.5	________	+3.5	dB	
30000 MHz		-3.5	________	+3.5	dB	
31000 MHz		-3.5	________	+3.5	dB	
32000 MHz		-3.5	________	+3.5	dB	
33000 MHz		-3.5	________	+3.5	dB	
34000 MHz		-3.5	________	+3.5	dB	
35000 MHz		-3.5	________	+3.5	dB	
36000 MHz		-3.5	________	+3.5	dB	
37000 MHz		-3.5	________	+3.5	dB	
38000 MHz		-3.5	________	+3.5	dB	
39000 MHz		-3.5	________	+3.5	dB	
39000 MHz		-3.5	________	+3.5	dB	
40000 MHz		-3.5	________	+3.5	dB	
41000 MHz		-4.0	________	+4.0	dB	
42000 MHz		-4.0	________	+4.0	dB	
43000 MHz *)		-4.0	________	+4.0	dB	
44000 MHz *)		-4.0	________	+4.0	dB	
45000 MHz *)		-4.0	________	+4.0	dB	
46000 MHz *)		-4.0	________	+4.0	dB	
47000 MHz *)		-4.0	________	+4.0	dB	
48000 MHz *)		-4.0	________	+4.0	dB	
49000 MHz *)		-4.0	________	+4.0	dB	
*) not with R&S FSMR 43						

Performance Test Report Option B25

Table 1-R&S FSMR: Performance Test Report Option B25

ROHDE & SCHWARZ	Performance Test Report	Option B25	Version
Serial number:			
Test person:			
Date:	Mean correct by -30 dB for the 1 KHz to 1 Hz spec		
Signature:			

Characteristic	included in	Min. value	Actual value	Max. value	Unit	Tolerance
Noise Display normalized to 1 Hz with Preamplifier (B25) f_{noise}	Page					
10.99 MHz		-	________	-162 / -160*)	dBm	
19.99 MHz		-	________	-162	dBm	
49.99 MHz		-	________	-162	dBm	
99.99 MHz		-	________	-162	dBm	
199.9 MHz		-	________	-162	dBm	
499.9 MHz		-	________	-162	dBm	
999.9 MHz		-	________	-162	dBm	
1499 MHz		-	________	-162	dBm	
1999 MHz		-	________	-162	dBm	
2499 MHz		-	________	-160	dBm	
2999 MHz		-	________	-160	dBm	
3599 MHz		-	________	-160	dBm	
				*) -160 for R&S FSMR 50		
Level accuracy with Preamplifier (B25) at 128 MHz, -30 dBm	Page	-0.3	________	+0.3	dB	

Characteristic	included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency response with preamplifier (B25) f_{fresp}	Page					
10 MHz		-1	________	+1	dB	
50 MHz		-0.6	________	+0.6	dB	
100 MHz		-0.6	________	+0.6	dB	
200 MHz		-0.6	________	+0.6	dB	
300 MHz		-0.6	________	+0.6	dB	
400 MHz		-0.6	________	+0.6	dB	
500 MHz		-0.6	________	+0.6	dB	
600 MHz		-0.6	________	+0.6	dB	
700 MHz		-0.6	________	+0.6	dB	
800 MHz		-0.6	________	+0.6	dB	
900 MHz		-0.6	________	+0.6	dB	
1000 MHz		-0.6	________	+0.6	dB	
1500 MHz		-0.6	________	+0.6	dB	
2000 MHz		-0.6	________	+0.6	dB	
2500 MHz		-0.6	________	+0.6	dB	
2990 MHz		-0.6	________	+0.6	dB	
3590 MHz		-0.6	________	+0.6	dB	
Frequency Response elec. attenuator (B25) E_{ATT} = 5 dB f_{fresp}	Page					
10 MHz		-1	________	+1	dB	
50 MHz		-0.6	________	+0.6	dB	
100 MHz		-0.6	________	+0.6	dB	
200 MHz		-0.6	________	+0.6	dB	
300 MHz		-0.6	________	+0.6	dB	
400 MHz		-0.6	________	+0.6	dB	
500 MHz		-0.6	________	+0.6	dB	
600 MHz		-0.6	________	+0.6	dB	
700 MHz		-0.6	________	+0.6	dB	
800 MHz		-0.6	________	+0.6	dB	
900 MHz		-0.6	________	+0.6	dB	
1000 MHz		-0.6	________	+0.6	dB	
1500 MHz		-0.6	________	+0.6	dB	
2000 MHz		-0.6	________	+0.6	dB	
2500 MHz		-0.6	________	+0.6	dB	
2990 MHz		-0.6	________	+0.6	dB	
3590 MHz		-0.6	________	+0.6	dB	

Characteristic	included in	Min. value	Actual value	Max. value	Unit	Tolerance
Frequency Response elec. attenuator (B25) E_{ATT} = 10 dB f_{fresp}	Page					
10 MHz		-1	________	+1	dB	
50 MHz		-0.6	________	+0.6	dB	
100 MHz		-0.6	________	+0.6	dB	
200 MHz		-0.6	________	+0.6	dB	
300 MHz		-0.6	________	+0.6	dB	
400 MHz		-0.6	________	+0.6	dB	
500 MHz		-0.6	________	+0.6	dB	
600 MHz		-0.6	________	+0.6	dB	
700 MHz		-0.6	________	+0.6	dB	
800 MHz		-0.6	________	+0.6	dB	
900 MHz		-0.6	________	+0.6	dB	
1000 MHz		-0.6	________	+0.6	dB	
1500 MHz		-0.6	________	+0.6	dB	
2000 MHz		-0.6	________	+0.6	dB	
2500 MHz		-0.6	________	+0.6	dB	
2990 MHz		-0.6	________	+0.6	dB	
3590 MHz		-0.6	________	+0.6	dB	
Frequency Response elec. attenuator (B25) E_{ATT} = 15 dB f_{fresp}	Page					
10 MHz		-1	________	+1	dB	
50 MHz		-0.6	________	+0.6	dB	
100 MHz		-0.6	________	+0.6	dB	
200 MHz		-0.6	________	+0.6	dB	
300 MHz		-0.6	________	+0.6	dB	
400 MHz		-0.6	________	+0.6	dB	
500 MHz		-0.6	________	+0.6	dB	
600 MHz		-0.6	________	+0.6	dB	
700 MHz		-0.6	________	+0.6	dB	
800 MHz		-0.6	________	+0.6	dB	
900 MHz		-0.6	________	+0.6	dB	
1000 MHz		-0.6	________	+0.6	dB	
1500 MHz		-0.6	________	+0.6	dB	
2000 MHz		-0.6	________	+0.6	dB	
2500 MHz		-0.6	________	+0.6	dB	
2990 MHz		-0.6	________	+0.6	dB	
3590 MHz		-0.6	________	+0.6	dB	

Characteristic	included in	Min. value	Actual value	Max. value	Unit	Tolerance
3rd-order intercept point with elec. att. f_{in}	Page					
28 MHz		17	________	-	dBm	
106 MHz		17	________	-	dBm	
261 MHz		17	________	-	dBm	
640 MHz		20	________	-	dBm	
1000 MHz		20	________	-	dBm	
1700 MHz		20	________	-	dBm	
2500 MHz		20	________	-	dBm	
3590 MHz		20	________	-	dBm	
Attenuator accuracy a_{ATT}	Page					
0 dB		-9.8	________	-10.2	dB	
5 dB		-4.8	________	-5.2	dB	
10 dB		-	reference	-	-	
15 dB		+4.8	________	+5.2	dB	
20 dB		+9.8	________	+10.2	dB	
25 dB		+14.8	________	+15.2	dB	
30 dB		+19.8	________	+20.2	dB	
35 dB		+24.8	________	+25.2	dB	
40 dB		+29.8	________	+30.2	dB	
45 dB		+34.8	________	+35.2	dB	
50 dB		+39.8	________	+40.2	dB	
55 dB		+44.8	________	+45.2	dB	
60 dB		+49.8	________	+50.2	dB	
65 dB		+54.8	________	+55.2	dB	
70 dB		+59.8	________	+60.2	dB	
75 dB		+64.8	________	+65.2	dB	
Electronic Attenuator accuracy a_{ATT}	Page					
0 dB		-0.2	________	+0.2	dB	
5 dB		+4.8	________	+5.2	dB	
10 dB		+9.8	________	+10.2	dB	
15 dB		+14.8	________	+15.2	dB	
20 dB		+19.8	________	+20.2	dB	
25 dB		+24.8	________	+25.2	dB	
30 dB		+29.8	________	+30.2	dB	

Contents - Chapter 2 "Adjustment"

2 Adjustment

This chapter describes the adjustment of the reference sources as well as the software-controlled adjustment of individual module data following module replacement.

The R&S FSMR permits the following manual adjustments:

- Adjustment of the 10 MHz reference oscillator which determines the frequency accuracy of the R&S FSMR
- Adjustment of the 128 MHz calibration source which determines the level accuracy of the R&S FSMR
- Adjustment of the 50 MHz power reference

The adjustment permits the data integrity of the instrument to be maintained and restored.

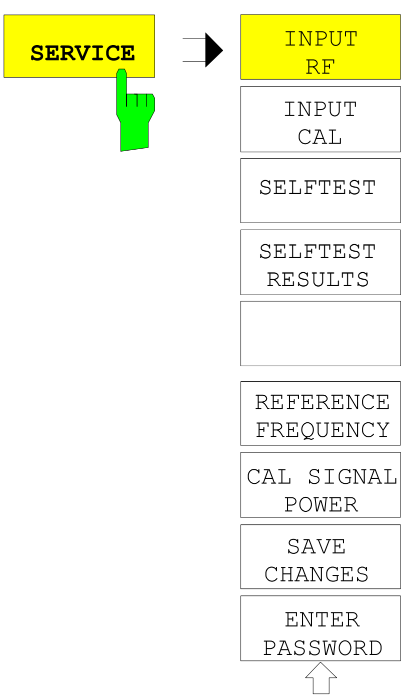
Manual adjustments must be performed at an ambient temperature of between +20 °C and +30 °C after the instrument has warmed up.

After the adjustment and an internal total calibration has been performed, the R&S FSMR is ready for use and offers full data integrity.

Service Menu

The service functions for adjusting the boards are only usable after the entry of a password to prevent impairment of instrument functionality by unintended data changes.

SETUP menu:



The *SERVICE* softkey opens a submenu for selecting the service function

Entering Password

SETUP SERVICE submenu:

The *ENTER PASSWORD* softkey allows the entry of a password.

The R&S FSMR contains a variety of service functions which, if incorrectly used, can impair the functionality of the analyzer. These functions are normally not accessible and are only usable after the entry of a password.

The password permits data to be changed that is required in order to calibrate or repair the instrument (for example, reference frequency adjustment, level adjustment, general board data). The password is "894129".

IEC/IEEE-bus command: `SYST:PASS "<Password>"`

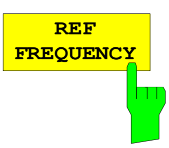
Adjustment Functions

NOTICE

Risk of deterioration of instrument / measurement accuracy

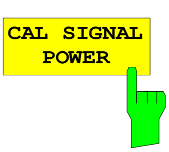
The realignment should be carried out by qualified personnel since any change considerably influences the measurement accuracy of the instrument. This is the reason why the softkeys REF FREQUENCY, CAL SIGNAL POWER and SAVE CHANGES can only be accessed after entering a password

SETUP SERVICE submenu:



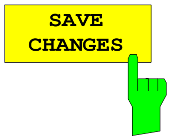
The *REF FREQUENCY* softkey opens the data input for the adjustment of the reference frequency. Values can be selected between 0 and 255 (without option R&S FSU-B4 OCXO) or between 0 to 4095 (with option R&S FSU-B4 OXCO). They modify the setting of the associated D/A converter. The setting is first stored in the volatile memory. The *SAVE CHANGES* softkey is used to store the setting permanently in nonvolatile memory.

IEC/IEEE-bus command: `SENS:ROSC:INT:TUN 155`



The *CAL SIGNAL POWER* softkey opens the data input for the adjustment of the currently set level of the calibration signal (0 dBm or -30 dBm, compare *INPUT CAL* softkey). Values can be selected between 0 and 255. They modify the setting of the associated D/A converter. The setting is first stored in the volatile memory. The *SAVE CHANGES* softkey is used to store the setting permanently in nonvolatile memory.

IEC/IEEE-bus command: --



The *SAVE CHANGES* softkey stores the modifications in the nonvolatile memory of the instrument. Since these modifications considerably influence the measurement accuracy of the instrument, confirmation by the user is requested before storing.

IEC/IEEE-bus command: `SENS:ROSC:INT:TUN:SAV`

Manual Adjustment

This section explains the measuring instruments and auxiliary means required when manually adjusting the R&S FSMR the appropriate preparations of the instrument as well as the individual adjustments.

Test Instructions

- The adjustment of the analyzer must be done after a warm-up time of at least 30 minutes and overall calibration. Only in this case can compliance with the guaranteed data be ensured.
- Inputs for setting the R&S FSMR during measurements are shown as following:

  [**<KEY>**] Press a key on the front panel, e.g. **[SPAN]**

  [<SOFTKEY>] Press a softkey, e.g. [MARKER -> PEAK]

  [<**nn unit**>] Enter a value and terminate by entering the unit, e.g. [**12 kHz**]

  Successive entries are separated by [:], e.g. [**BW** : RES BW MANUAL : **3 kHz**]

Measuring Equipment and Accessories

Table 2-1 Measuring equipment and accessories for manually adjusting the FSMR

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
1	Frequency counter	error < $1x10^{-9}$, frequency range up to 10 MHz	Advantest R5361B with option 23		Frequency Accuracy of Reference Oscillator
2	Signal generator	frequency range to 1 GHz: output level -10 dBm	R&S SMHU	0835.8011.52	Calibration Source 128 MHz Frequency Accuracy of Reference Oscillator
3	Power meter		R&S NRVD	0857.8008.02	Calibration Source 128 MHz
4	Power sensor	1 MHz to 3 GHz RSS ≤ 0.8% meter noise ≤ 20 pW	R&S NRV-Z4	0828.3618.02	Calibration Source 128 MHz Power Reference

Adjusting Level Measurement Accuracy

Test equipment:	- Signal generator (Section "Measuring Equipment", item 2): frequency 128 MHz level -30 dBm - Power meter (Section "Measuring Equipment", item 3) - Power sensor (Section "Measuring Equipment", item 4) frequency 128 MHz maximum power $P_{max} \geq 1$ µW meter noise ≤ 20 pW RSS ≤ 0.8% referred to indicated power impedance Z = 50 Ω
Power meter settings:	➢ Connect power sensor to power meter and carry out function ´ZERO´ when no signal is applied to the power sensor. ➢ Connect power sensor to RF output of signal generator.
Signal generator settings:	- Frequency 128 MHz - Level –30 dBm ± 0.05 dB ➢ Use power meter for exact level adjustment.
Test setup:	➢ Connect RF output of the signal generator to RF input of the R&S *FSMR*.
Overall calibration of the R&S *FSMR*:	- [**PRESET**] - [**CAL** : CAL TOTAL]
R&S *FSMR* settings:	- [**FREQ** : CENTER : **128 MHz**] - [**SPAN** : **15 kHz**] - [**BW** : RES BW MANUAL : **10 kHz**] - [**BW** : VID BW MANUAL : **1 kHz**] - [**TRACE** : DETEKTOR : RMS] - [**AMPT** : REF LEVEL : **-20 dBm**] - [**AMPT** : RF ATTEN MANUAL : **10 dB**]
Reference measurement	➢ Set marker to peak of signal - [**MKR SEARCH** : PEAK] ➢ Set reference to peak of signal - [**MKR** : REFERENCE FIXED] ➢ Switch internal reference generator to RF input - [**SETUP** : SERVICE : INPUT CAL] ➢ Set marker to peak of signal - [**MKR ⇒** : PEAK]
Adjustment:	The reading ´Delta [T1 FXD]´ displays the difference between the output level of the signal generator and the level of the calibration source.

NOTICE

The following realignment changes the level of the internal calibration source. Since this adjustment influences the level measurement accuracy of the R&S FSMR it is strongly recommended that this adjustment be performed only if the level is not within the tolerance.

R&S FSMR settings:

- [**SETUP :** SERVICE : ENTER PASSWORD : **894129 ENTER**]
- [**SETUP :** SERVICE : CAL SIGNAL POWER]

➢ The correction value for the calibration signal level will be displayed in the data entry field. Change the value with the step keys or spin wheel until the marker reading ´Delta [T1 FXD]´ displays a value of $0 \pm 0{,}05$ dB.

Store value in instrument

- [**SETUP :** SERVICE : SAVE CHANGES]

➢ Confirm message on display with ´YES´ . The correction values will be stored in non-volatile memory on the boards.

Note: *The changed level of the calibration source will be used with the following total calibration.*

- [**CAL :** TOTAL CALIBRATION]
- [**CAL :** CALIBRATION RESULTS]

➢ Check the calibration results. The calibration must be performed with the status ´PASSED`.

Adjusting Frequency Accuracy

Preparation:

The measurement can be performed either with a signal generator at connector RF INPUT (front of the R&S FSMR) at 1 GHz or at connector EXT REF OUT (rear of the R&S FSMR) at 10 MHz using a frequency counter.
To be adjusted, the R&S FSMR must be set to internal reference.

Note: *The measurement at 1 GHz can be performed with a lower frequency counter resolution in order to achieve faster adjustment.*

Preparations for adjustment with signal generator:

Test equipment:

- Signal generator (Section "Measuring Equipment", item 2):

frequency	1000 MHz
level	-20 dBm
frequency accuracy	$<1x10^{-9}$

If the frequency accuracy of the signal generator is not sufficient, adjust the frequency with a frequency counter to the correct frequency before the adjustment.

Test setup:

➢ Connect the RF output of the signal generator to RF input of the R&S FSMR

R&S FSMR settings:

- [**PRESET**]
- [**FREQ** : CENTER : **1 GHz**]
- [**SPAN** : **0 Hz**]
- [**BW** : RES BW MANUAL : **1 MHz**]
- [**AMPT** : REF LEVEL : **-20 dBm**]
- [**AMPT** : RF ATTEN MANUAL : **10 dB**]
- [**SETUP** : REFERENCE INT / EXT]

➢ Toggle to internal reference (INT)

Note: *Before the following measurement, the R&S FSMR must warm up for at least 30 minutes to heat the reference oscillator.*

Measurement:

➢ Switch on marker frequency counting:
- [**MKR** : SIGNAL COUNT]

➢ Set the necessary resolution:

Model without OCXO (Option B4) 1 GHz ± 1 kHz
- [**MKR** : **NEXT** : CNT RESOL 100 HZ]

Model with OCXO (Option B4) 1 GHz ± 100 Hz
- [**MKR** : **NEXT**: CNT RESOL 10 HZ]

Preparation for adjustment with frequency counter:

Test equipment:

Frequency counter (Section "Measuring Equipment", item 1):
error < $1x10^{-9}$
frequency range up to 10 MHz

Test setup:

➢ Connect frequency counter to 10 MHz reference output of the R&S FSMR (rear panel).

R&S FSMR settings:

- [**SETUP** : REFERENCE INT / EXT]

➢ Toggle to internal reference (INT).

Frequency counter settings:

➢ Set the necessary resolution:
model without OCXO (option B4): 1 Hz
model with OCXO (option B4): 0.1 Hz

Note:

Before the following measurement, the R&S FSMR must warm up at least 30 minutes to heat the reference oscillator.

Measurement:

➢ Measure frequency with frequency counter:

Nominal frequency:
model without OCXO (option R&S FSU-B4)........10 MHz ± 10 Hz
model with OCXO (option R&S FSU-B4)..............10 MHz ± 1 Hz

Adjustment:

The following adjustment changes the frequency of the internal reference source. Since this adjustment influences the frequency accuracy of the R&S ESCI, it is strongly recommended that this adjustment be performed only if the frequency is not within the tolerance.

R&S FSMR settings:

- [**SETUP :** SERVICE : ENTER PASSWORD : **894129 ENTER**]
- [**SETUP :** SERVICE : REF FREQUENCY]

➢ The correction value for the reference frequency adjustment will be displayed in the data entry field. Change the value with the step keys or spin wheel until the frequency counter reading or the marker count reading displays a value within the tolerance.

Store value in instrument

- [**SETUP :** SERVICE : SAVE CHANGES]

➢ Confirm message on display with ´YES´ . The correction values will be stored in non-volatile memory on the boards.

Adjusting Power Reference

Test equipment:	- Power meter (Section "Measuring Equipment", item 3) - Power sensor (Section "Measuring Equipment", item 4)
Power Meter settings:	➢ Connect power sensor to power meter and carry out function ´ZERO´ when no signal is applied to the power sensor. ➢ Set the Power Meter Cal Factor to the appropriate value for the Power Sensor for 50 MHz.
Test setup:	➢ Connect the power sensor to the power reference output of the R&S FSMR.
R&S FSMR settings:	- [**PRESET**] - [**SETUP** : SERVICE : ENTER PASSWORD : **894129 ENTER**] - [**SETUP** : SERVICE : NEXT : POWER REF ON] - [**SETUP** : SERVICE : NEXT : POWER REF ADJ ↓]
Measurement:	Read out level value at the power meter display.
Adjustment:	- [POWER REF COARSE] ➢ The correction value (coarse) for the power reference adjustment will be displayed in the data entry field. Change the value with the step keys or spin wheel until the power meter reading displays a value of 0 dBm (+/- 0.004 dB). - [POWER REF FINE] ➢ The correction value (fine) for the power reference adjustment will be displayed in the data entry field. Change the value with the step keys or spin wheel until the power meter reading displays a value of 0 dBm (+/- 0.003 dB). ➢ Verify level and repeat steps if necessary.
Store value in instrument	- [SAVE CHANGES] ➢ Confirm message on display with ´YES´ . The correction values will be stored in non-volatile memory on the boards.

Adjustment of Module Data

All boards of the R&S FSMR contain EEPROMS for storing board data.
In addition to some standard information such as module name, serial number, hardware status and date of manufacture, these stored data items contain important pieces of information within value tables from module pre-testing, e.g. frequency responses for module error data. When a cold start is performed, this EEPROM data is read out and stored on hard disk. During normal operation, the data set stored on hard disk is always used.

In order to synchronize the data stored in EEPROMs on the respective modules with the complete instrument, a cold start must be performed after each module replacement so that the module data will be updated.

The complete contents of the new module are read from the EERPOM and copied to the hard disk of the R&S FSMR. The existing calibration data (results from the latest total calibration) are deleted and the instruments displays UNCAL. Thus, the R&S FSMR must always be calibrated again after a module is replaced (softkey *CAL TOTAL*).
After a full calibration has been completed successfully, a backup of the EEPROM files to hard disk must be performed using a service function.

Settings on the R&S FSMR:	- [**SETUP :** SERVICE : ENTER PASSWORD : **30473035 ENTER**] - [**SETUP :** SERVICE : SERVICE FUNCTION : **3.0.11 ENTER**]

If the IF filter module has been replaced, the calibration data should also be copied back to the EEPROM:

Settings on the R&S FSMR:	- [**SETUP :** SERVICE : SERVICE FUNCTION : **3.0.7 ENTER**]

If an option module is removed from an instrument (downgrade), the EEPROM file associated with the module as well as any ".bak" file(s) present under path D:\r_s\instr\eeprom\ and C:\r_s\instr\eeprom\backup must be deleted.

Frequency Response Correction

With some boards (see chapter 3, section "Module Replacement"), frequency response correction is necessary in addition to the automatic adjustment of module data. This correction is performed by means of software. The program is available on the GLORIS server.
For information on when to perform the frequency response correction, see chapter 3, section "Module Replacement".

Contents - Chapter 3 "Repair"

Figures

Tables

3 Repair

This chapter describes the design of the R&S FSMR, simple measures for repair and troubleshooting and the replacement of modules. For troubleshooting and diagnostics, a selftest is available that can be used to poll diagnostic voltages of the modules and signal limit violations.

The firmware update and the installation of options are described in chapter 4 of this service manual.

Instrument Design and Function Description

A detailed schematic of the R&S FSMR design is presented in the block diagrams below and in the exploded views (see also chapter 5).
The following description of instrument functions refers to the block diagram.

Block Diagram

See also chapter 5 illustrations for a detailed block diagram.

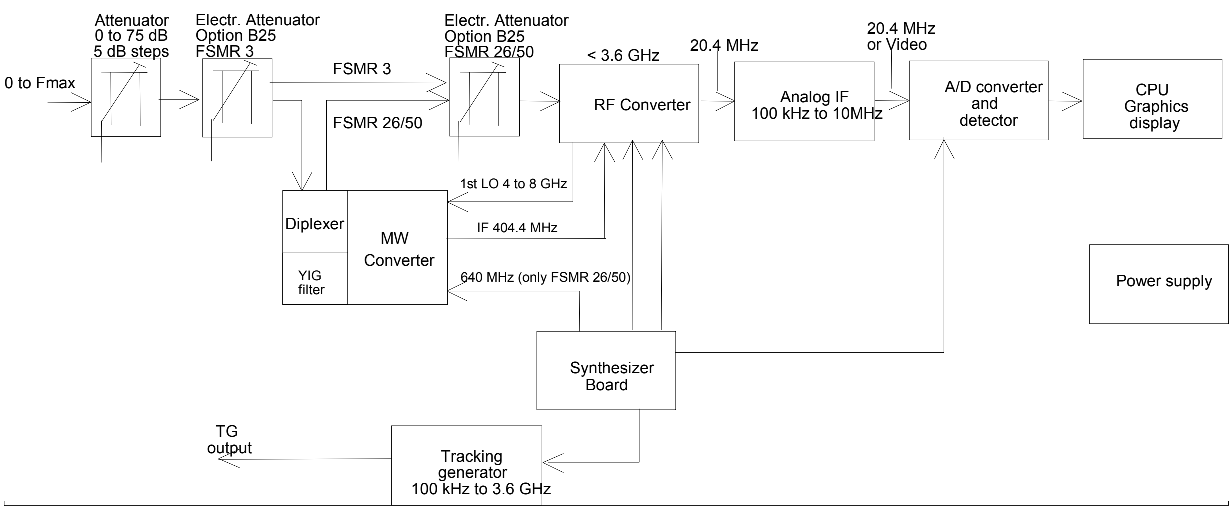


Fig. 3-1 Block diagram of instrument

Description of Block Diagram

The R&S FSMR is a triple-conversion superhet receiver (double-conversion for receive frequencies >3.6 GHz) for the frequency range 20 Hz to 3.6 GHz, 26,5 or 50 GHz (depending on the instrument model). The signals are processed by one RF board (two for models > 3.6 GHz), one IF board, one signal detection board and a controller consisting of a Pentium industry PC, an I/O interface and a graphics controller. The instrument can be upgraded to meet future requirements by retrofitting options in the analog and digital sections.

The input signal is reduced in level by the attenuator and routed to the RF modules depending on the instrument type. In instruments with option R&S FSU-B25 (electronic attenuator), this module follows in the signal path. In 3.6 GHz models, the attenuator is followed by the RF converter; in the high-frequency models, a diplexer is connected in between. The high-frequency signal component >3.6 GHz is routed to the microwave converter module following the diplexer. The IF module is the same in all instrument models, and likewise for the signal path through signal detection to the display.

The internal reference and calibration signals are generated in the frequency and level reference part on the synthesizer board. Here the 128 MHz reference frequency is generated and made available to the instrument as a reference frequency, and a level-controlled output signal is generated as an internal level reference for instrument calibration.

A detailed description of the modules is given in the following.

Attenuator

The RF signal passes from the input connector via the input switch to the attenuator, which can be set. The input signal is applied to the switch as well as a 128 MHz signal, which has a close-tolerance level of -30 dBm for calibration purposes or 0 dBm for the selftest of the instrument. Different attenuators are used: the 8 GHz attenuator in the R&S FSMR 3 and the microwave attenuators up to 26 GHz or 50 GHz. All attenuators switch in steps of 5 dB and have maximum total attenuation of 75 dB; the 8 and 26 GHz attenuators contain an AC coupling that can be bypassed. The lower limit frequency of AC coupling is 1 MHz with the 8 GHz attenuator and < 10 MHz with the attenuator in the R&S FSMR 26; models > 26 GHz are permanently DC-coupled.

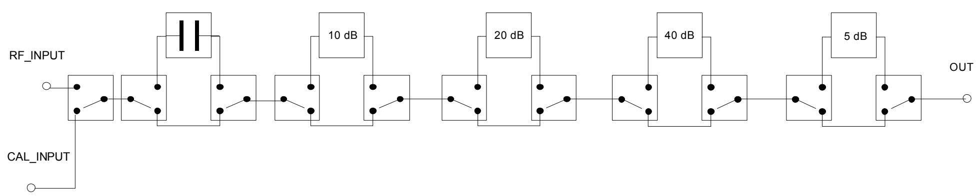


Fig. 3-2 Input attenuator

Electronic Attenuator (Option R&S FSU-B25)

The electronic attenuator is inserted in the signal path after the attenuator. It consists of a mechanical 5 dB attenuator pad, an electronic input attenuator, which can be switched from 0 to 30 dB in steps of 5 dB, and a switchable 20 dB preamplifier to reduce the noise figure of the R&S FSMR.

RF to IF Conversion for Frequencies < 3.6 GHz – RF Converter

The RF converter is used to convert the signal in the reception range from 20 Hz to 3.6 GHz to a low intermediate frequency of 20.4 MHz.
The balanced input mixer first converts the input signal to an intermediate frequency of approx. 4.63 GHz. The symmetric design reduces second-order intermodulation.

The first local oscillator in the frequency range 4.63 to 8.23 GHz is implemented with a YIG-tuned oscillator. This oscillator is synchronized via several dividers to the signal from the synthesizer module (600 to 620 MHz). The balanced output of the first mixer is amplified with two bipolar transistors to prevent 1/f noise. This balanced signal is fed to a three-stage filter with dielectric resonators. Flatness and group delay of the filter are optimized for broadband vector analysis in a bandwidth of 30 MHz. The filter feeds a second mixer, which converts the signal to the second IF of 404.4 MHz. The balanced output is amplified with two amplifiers to reduce intermodulation products. The output signals from the two amplifiers are combined in a transformer to form an unbalanced signal. Due to the symmetric design, there is no need for transformers in the mixers so that the conversion loss is reduced.

The second IF can be filtered to a bandwidth of 10 or 20 MHz using two five-stage filters with ceramic resonators. A bypass for a 50 MHz bandwidth (= 3 dB bandwidth of the first IF filter) can be selected also. The signal is fed to the third mixer via an attenuator pad that can be switched in steps of 1 dB. With 30 MHz FFT span, the K2 of the 3rd mixer causes spurious noise within the band. Therefore, the level has to be reduced before this mixer stage if high input levels are used (> -25 dBm). The attenuator can also be used to drive the input mixer up to +10 dBm, thus allowing a better dynamic range in phase noise or spurious measurements with a large carrier offset (> 1 MHz).

Fast overload detectors are used to detect compression in the stages of the first and second intermediate frequencies. The bandwidth of these detectors is above 100 MHz so that pulse signals can be detected as well with a preselector of the same width. The output signal of the detector on the second IF is also used with a logarithmic amplifier as an RF power trigger with a dynamic range of 70 dB.

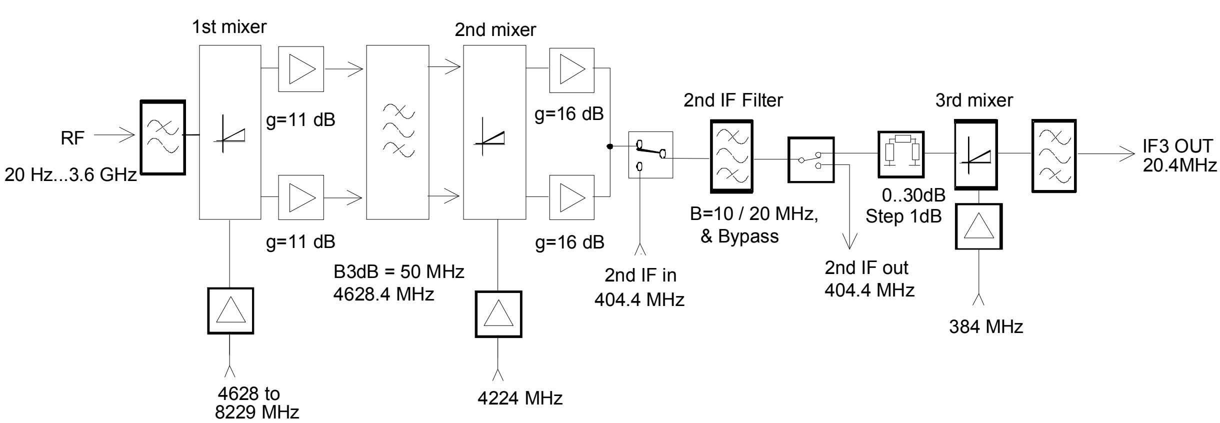


Fig. 3-3 Conversion of the RF to the third IF from 20 Hz to 3.6 GHz

RF to IF Conversion for Frequencies > 3.6 GHz - MW Converter

The high-frequency models of the R&S FSMR (frequency range > 3.6 GHz) also comprise a microwave converter board. After the RF attenuator, the input signals are fed to the microwave converter and split up in the diplexer to frequencies below 3.6 GHz and above 3.6 GHz. Signals below 3.6 GHz are forwarded to the RF converter like in the R&S FSMR. Signals above 3.6 GHz are taken via the YIG filter (option FSMR-B2) to the mixer, where they are directly converted to the 2nd IF of 404.4 MHz. In the range >26 GHz, the signals are converted to the 404.4 MHz IF in two stages. The YIG filter can be bypassed by means of a relay.

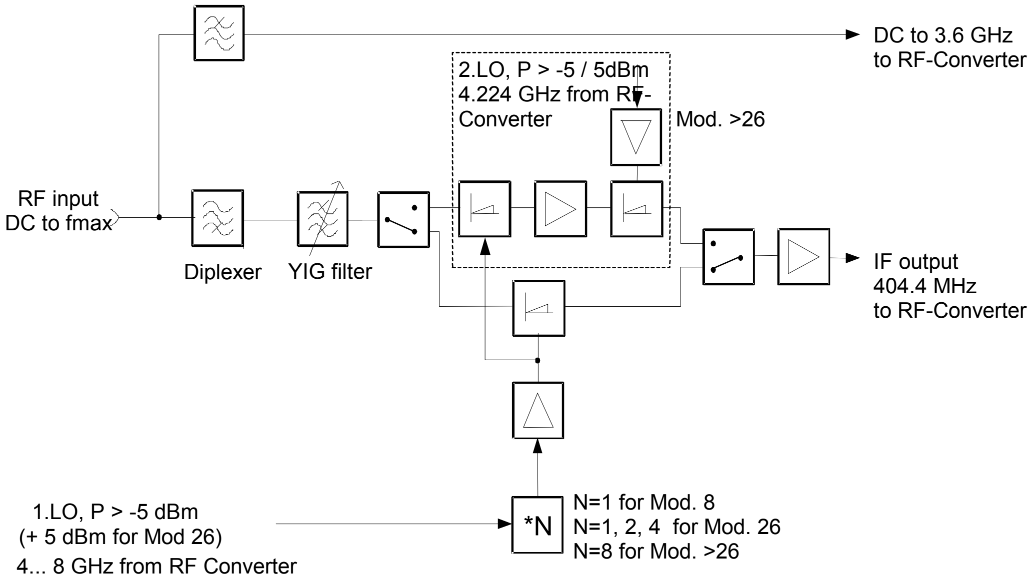


Fig. 3-4 Conversion of the RF to the IF from 3.6 GHz

The first LO converts the input frequency to the 404.4 MHz IF. For this purpose, the LO signal (4 GHz to 8 GHz) generated in the RF converter is amplified to the required LO level. The R&S FSMR 26 has two additional doubler stages that can be bypassed and generate the LO signal for conversion to 26.5 GHz. Models >26 GHz have an additional doubler stage. The eight-way LO converts the signals to an initial IF of 3819.6 MHz or 4628.4 MHz. The second LO then converts the signal to the 404.4 MHz IF.

The basic model is equipped with the necessary interfaces (IF input 404.4 MHz, LO output 4 to 7.6 GHz) for extending the frequency range by simply adding a microwave converter.

IF Filter Module

The RF converter is followed by the analog IF filter module:

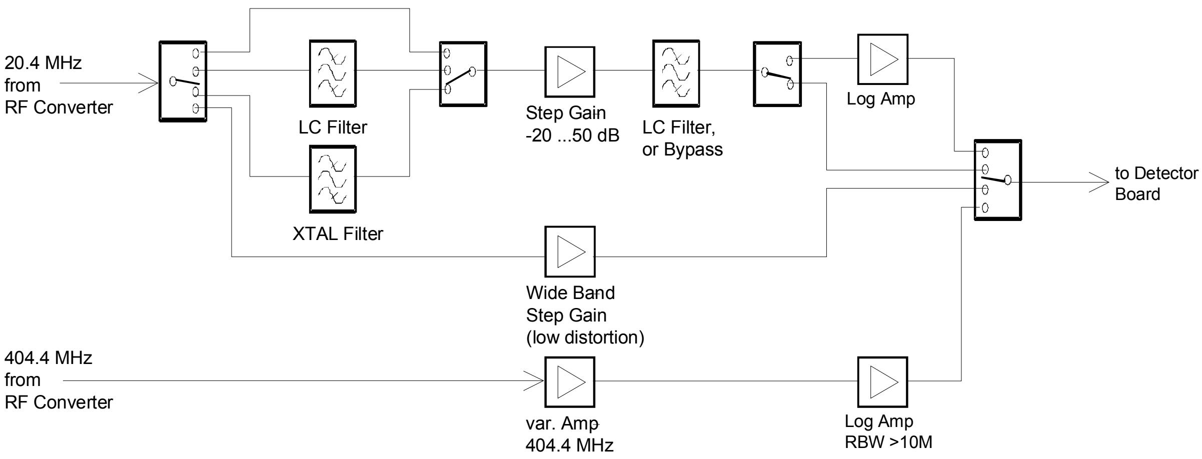


Fig. 3-5 IF filter

The R&S FSMR offers resolution bandwidths from 1 Hz to 20 MHz in steps of 1/2/3/5. For the bandwidths above 5 MHz, the selection filter is provided in the RF converter. There is no selection at the 20.4 MHz IF; a logarithmic amplification to 404.4 MHz is performed.
The tunable bandwidths 100 kHz to 5 MHz are at the 3rd IF (20.4 MHz) on the IF filter module. The bandwidths 100 kHz to 5 MHz are provided by 5 LC circuits.
The step gain can be set from -20 to 50 dB in 0.1 dB steps and is adjusted as a function of the reference level and the input attenuation.
The IF filters are followed by a log detector to obtain the dynamic range of the display.
A limiting amplifier in the log amp provides the TTL output for the frequency counter.

With a 10 MHz bandwidth, the LC filters are bypassed; however, step gain and log amp are used as with the analog bandwidths between 200 kHz and 5 MHz.
For the digital resolution filters from 10 Hz to 100 kHz, the 20.4 MHz IF signal at the IF filter output is routed to the A/D converter. With bandwidths below or equal to 30 kHz, a two-stage crystal filter is used to prevent the step gain and the ADC from being overdriven. This filter can be tuned from about 2.5 to 70 kHz in bandwidth. With the bandwidths 50 kHz and 100 kHz, the LC filter is set to about 400 kHz for the same reason.

The R&S FSMR contains an AM/FM demodulator on the IF filter. In the spectrum analysis mode, the signal applied at the position of the reference marker can be demodulated during the sweep. For this purpose, the R&S FSMR stops the frequency sweep for a selectable period of time and demodulates the input signal. The volume is set using the spinwheel on the front panel (AF OUTPUT). The demodulator bandwidth corresponds to that of the input filter in the case of digital filters. To ensure good reception, the 30-kHz filter should be used, with the filter preceding the demodulator being at approx. 70 kHz.

Processing of Measured Data - Detector Board

The sections below explain the signal and data paths required for result processing in the various operating modes:

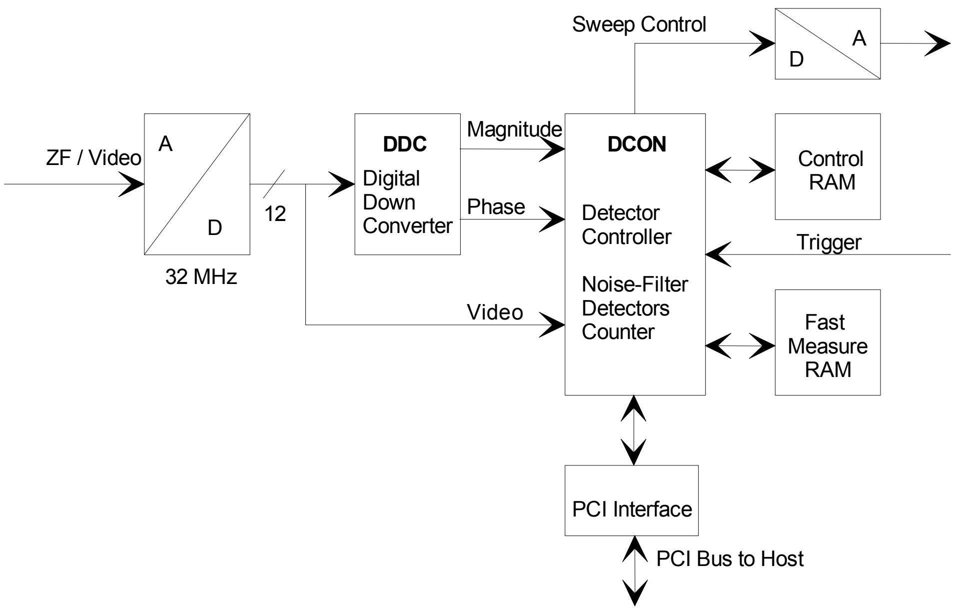


Fig. 3-6 Processing of measured data (basic unit)

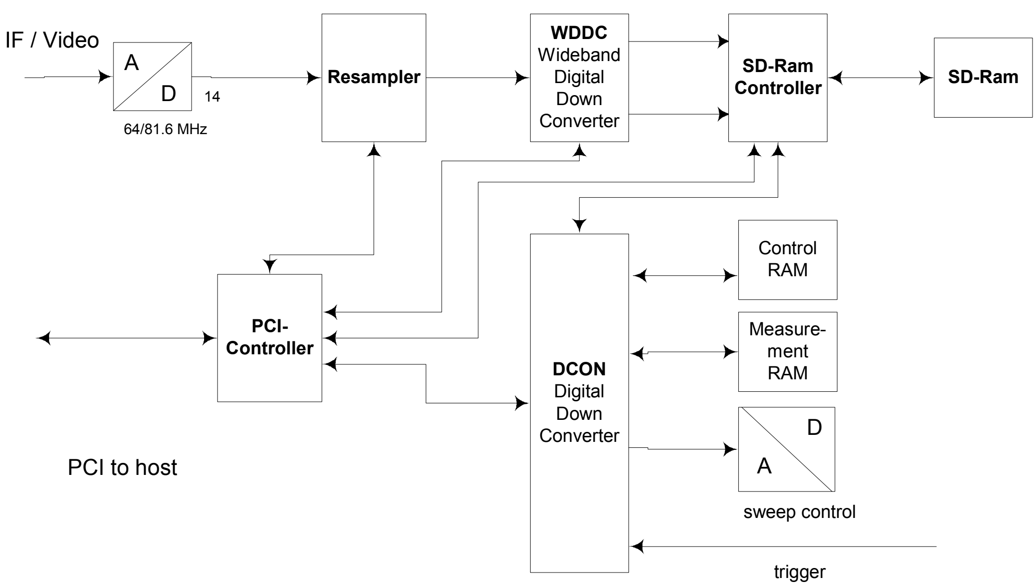


Fig. 3-7 Processing of measured data with option FSMR-B73

Spectrum Analysis Using an RBW >100 kHz

In this mode, only the analog resolution filters on the IF filter board are used. The signal applied to the A/D converter via the input IF/Video is therefore already a log video signal. The signal is continuously sampled at 32 MHz (64 MHz with option FSMR-B73)in the ADC and digitized.
The signal path is now directly routed to the DCON.

In the DCON, the data is directly applied to the noise filter. The noise filter is used to limit the video bandwidth or to average the noise content. The signal path is routed to the detector logic where the results are processed, i.e. peak max, peak min, sample, average and RMS values as well as the number of measured max. peak, min. peak, sample, average, RMS and quasi peak values are determined.

With measurement data rates > 1 MHz, detector data has to be stored in the measurement RAM because online storage is no longer possible at these high speeds. Upon completion of the sweep, the sweep data is read by the host from the measurement RAM, processed and displayed.

Spectrum Analysis Using an RBW ≤ 100 kHz

In this operating mode the resolution bandwidths are generated digitally with the aid of the DDC/WDDC (digital down converter). The IF filter module provides an IF signal pre-filtered at 20.4 MHz. The DDC/WDDC mixes the input signal into the complex baseband using an NCO, and then filters the obtained I/Q signal via an HDF (high decimation filter) and an FIR (finite impulse response) filter. The magnitude and phase are calculated from the I/Q data and transferred to a second gate array in the DCON. As in operating mode RBW > 100 kHz, the signal is video-filtered and weighted depending on the set detector.

FFT Bandwidths

In FFT bandwidth mode, the synthesizer is set to the desired frequency via the DCON which also generates the tuning voltages for the analog hardware. The signal path is routed via ADC, Corr RAM and DDC/WDDC. The DDC/WDDC first mixes the input IF into the baseband using an NCO; then the obtained I/Q signal is filtered in a HDF (**h**igh **d**ecimation **f**ilter) and FIR stage (**f**inite **i**mpulse **r**esponse). The I/Q output data is then stored by the DDC/WDDC in the I/Q RAM. With data logging completed, the I/Q data from the I/Q RAM is transferred to the host via DDC and PCI interface FPGA. The host then performs the FFT for this sweep section.

Video Bandwidths (VBW)

The video filters of the R&S FSMR can be adjusted between 1 Hz and 10 MHz in steps of 1/2/3/5. They are designed as a digital lowpass filter for the video signal. The video bandwidth can either be coupled to the resolution bandwidth (= default setting) or manually set to a fixed value.

Detectors

The R&S FSMR uses a detector for the positive peak (peak+) and one for the negative peak value (peak-). In the sample mode, the video signal can also be directly sampled by the A/D converter without a peak detector being required. *Quasi-Peak, Average* and *RMS* detectors are available in addition. The RMS detector forms the rms value of the input signal for one point in the display during the measurement time.

1st Local Oscillator- RF Converter

The 1st local oscillator is a YIG oscillator on the RF converter. It is synchronized via a fractional N divider to the synthesizer signal of 600 to 620 MHz or 20 to 40 MHz. This signal can be set with very high resolution in steps of less than MHz. With 20 to 40 MHz, a whole octave can be swept with one divider setting. This setting is used with a fast sweep time over big spans. The 600 MHz setting is used with spans below 200 MHz because of the better phase noise.

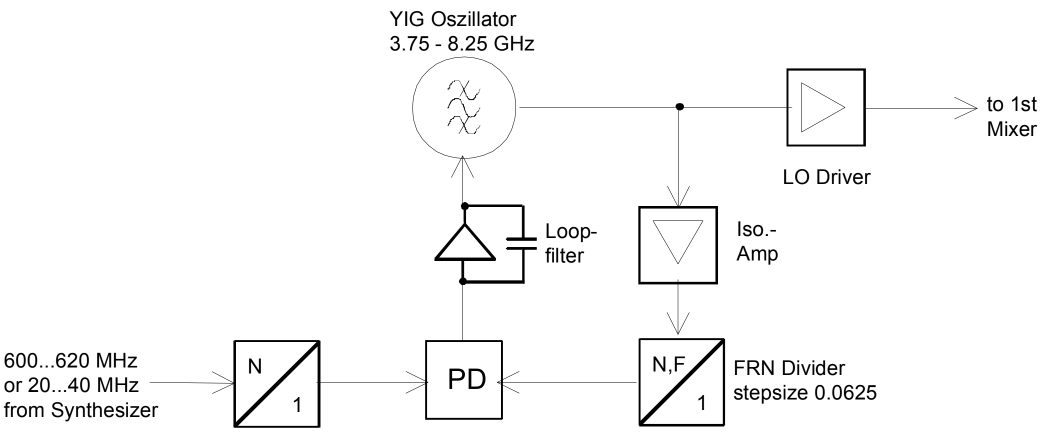


Fig. 3-8 Synchronization of 1st local oscillator

2nd Local Oscillator - Synthesizer

The second local oscillator is a DRO (dielectric resonator oscillator) on the synthesizer board at 4224 MHz. This oscillator is synchronized to a harmonic of the 3rd LO (384 MHz). This type of oscillator features excellent phase noise values.

3rd Local Oscillator- Synthesizer

The third oscillator is a VCO with ceramic resonator, which is synchronized via a mixer to the third harmonic of the crystal oscillator at 128 MHz.

Reference Frequency 128 MHz – Synthesizer

This reference is generated on the synthesizer board. To ensure perfect phase noise performance, an SC cut crystal is used as a resonator. The oscillator is synchronized with a bandwidth of approx. 30 Hz to the internal 10 MHz reference or to an external reference.

Harmonics of this signal are used for the synchronization of the 3rd local oscillator and the sweep oscillator 600 to 620 MHz.

It is also used to generate the 128 MHz calibration signal via automatic level control. The level can be switched between 0 dBm and -30 dBm and adjusted with a D/A converter.
A 4:1 divider generates the 32MHz clock for the detector board (A/D converter).

Reference Frequency 10 MHz – Synthesizer

The reference frequency is generated by an OCXO, and the frequency is adjustable by a D/A converter. If the external reference input is used, this OCXO is switched off and the external signal is used instead.

OCXO Reference (Option R&S FSU-B4)

The R&S FSMR contains the option R&S FSU-B4, an oven-controlled reference oscillator with extra low aging and improved phase noise at 10 Hz offset. If the option is installed, this OCXO is used instead of the OCXO on the synthesizer board. If an external reference is used, both OCXOs are switched off. The heater of the B4 option stays on.

Sweep VCO - Synthesizer

The sweep VCO on the synthesizer board is used to synchronize the YIG oscillator on the RF converter. An oscillator with ceramic resonator at approx. 600 MHz is used. This VCO can be tuned over quite a small range of about 20 MHz for good phase noise performance. A bigger tuning range would reduce the quality factor of the resonator. The oscillator is mixed with a comb line of the 128 MHz crystal oscillator to an IF between 20 and 40 MHz. Via this IF, the VCO is synchronized to a digitally generated signal from a fractional N divider. This signal can be tuned in steps of smaller than 1 MHz in frequency. For small spans with a good phase-noise performance, the YIG oscillator is synchronized to the VCO, for fast sweeps and a big span to the IF.

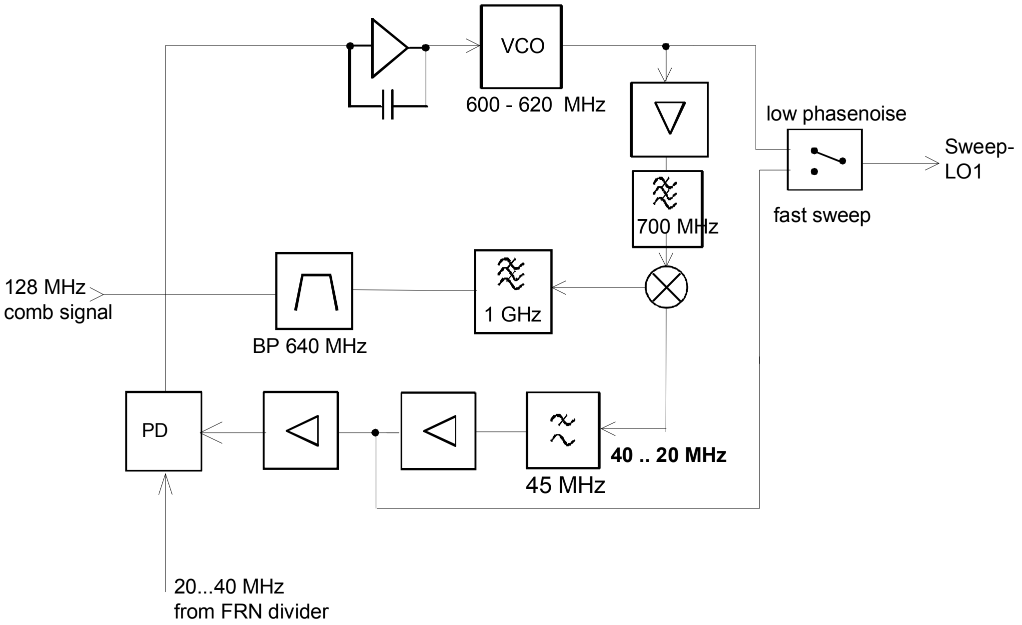


Fig. 3-9 Sweep synthesizer

Audio Input - Power Reference

The module Baseband/Calgen contains a frontend for the audio input and a 50 MHz signal generator. It generates a 1 mW signal as power reference via automatic level control. The level can be adjusted with a D/A converter.

Front Panel

The front panel consists of a mounting plate that accommodates the LCD, the keyboard mat with the membrane and the spinwheel. The case panel incorporates the front-module controller.

LCD

The colour LCD provides visible output of any information, measurements, etc, to the user. The resolution of the LCD is 800 * 600 pixels (SVGA).

The display includes a cold cathode tube for illumination. The high voltage required for this purpose is generated in an extra DC/AC converter mounted next to the display on the mounting plate and connected both to the display and the controller board via a cable.

Keyboard

The keyboard consisting of a keyboard mat and a membrane releases a contact when the rubber key is pressed. Two LEDs for the STANDBY/ON key (yellow for STANDBY/green for ON) are also accommodated on this membrane.
The key evaluation and LED control are carried out via a film cable connector on the controller board. Like the control of the two LEDs, control is performed in a special microprocessor on the controller board by means of a matrix technique. This microprocessor permits the status of the STANDBY/ON key to be stored when switch-off is performed with the power switch.

Front module controller

The front module controller contains all the necessary components on a board such as processor, memory chips (SIMM modules), I/O devices, lithium battery, IEC/IEEE-bus controller, two serial interfaces (COM1/2), a parallel interface (LPT), LCD graphics controller, external VGA monitor graphics interface (monitor) and an external keyboard connection (USB keyboard).
In addition, a floppy controller for an external floppy disk drive and an IDE hard disk controller are integrated on the controller board.
The LAN interface is also integrated on the controller board of the FMR.

Hard disk

The hard disk is screwed to the rear panel of the front module controller and connected to the printed circuit board via SATA cable.

Power Supply Module

The power supply module provides all currents necessary for operating the FSPFSMR. It can be switched off by means of the power switch on the rear panel.
The power supply module is a primary-clocked switching power supply with power factor correction (PFC) and standby circuit (+12 V standby).

On the secondary side, it generates DC voltages (+3.3 V; +5.2 V; +6 V; +8 V; +12 V; +12 VFAN; +12 V standby; +28 V; -12 V).

The control signal STANDBY/ON controlled by the front module controller (depending on the operating key STANDBY/ON on the front of the instrument frame) activates the power supply. In standby operation, it only supplies the 12 V standby voltage for the crystal oscillator and the LED STANDBY on the front panel.

The secondary voltages are open-circuit-proof and short-circuit-proof with respect to ground and each other.
An over-temperature protective circuit is additionally installed to prevent overheating. The status is taken to the front module controller via a status signal (*OT*).

Fuses

Two fuses are also installed in the power supply as a means of fire protection.

Note: *These fuses are not accessible to the user from outside and are blown only in the case of a serious fault in the power supply (servicing required!).*

Motherboard

The motherboard generates the -6 V supply for the analog boards with an integrated DC/DC converter.
The noise source output (28 V noise source) is also generated on this board.
All external supplies (probe, keyboard, etc) are short-circuit-protected by polyswitches (current-dependent, self-opening and closing fuses).

On the motherboard, a circuit for temperature-dependent instrument fan control is also implemented.

Probe
The probe PCB is located at the front of the instrument frame and accommodates the external interface PROBE POWER connector. For connection with the motherboard, a ribbon cable is used.

Volume / Phones
The volume/phones board is located on the front mounting plate and accommodates the external interfaces PHONES (headphones connector) and the volume control (rotary encoder) for the AF demodulator.
For connection with the motherboard, a ribbon cable is used.

USB Interface

The USB interface is located on the front mounting plate and accommodates the connector for two USB devices. For connection with the front module controller, a cable is used.

Power Sensor Interface

The power sensor interface is located on the front mounting plate and accommodates the connector for the R&S power sensors. For connection with the front module controller, a cable is used.

Tracking Generator (Option FSU-B9)

In normal operation (no frequency offset), the tracking generator generates a signal exactly at the input frequency of the R&S FSU in the frequency range up to 3.6 GHz.

To support frequency-converting measurements, a constant frequency offset of ±200 MHz between the input frequency of the R&S FSMR and the output signal of the tracking generator can be set. In addition, I/Q modulation or AM or FM of the output signal can be performed using two analog input signals.

The output level is controlled and can be adjusted between -30 dBm and 0 dBm in 0.1 dB steps (between -100 dBm and + 5 dBm with the option R&S FSU-B12).

External Generator Control

The external generator control option permits a number of commercially available generators to be operated as tracking generators on the R&S FSMR. The generator is controlled via the second IEC bus interface of the R&S FSMR (= IEC2); with some Rohde & Schwarz generators, it can also be controlled via the TTL synchronization interface included in the AUX interface of the R&S FSMR.

Preamplifier 26.5 GHz (Option R&S FSMR-B23, FSMR-B223)

A connnectible preamplifier can be used to improve the noise figure of the R&S FSMR 26 above 3.6 GHz. The preamplifier is integrated in the microconverter module and is thus only available directly from the factory.

Preamplifier 50 GHz (Option R&S FSU-B24)

A connnectible preamplifier can be used to improve the noise figure of the R&S FSMR 26 / 50.

Module Replacement

This section describes in detail the replacement of modules. Chapter 5 provides information on how to order spare parts; it contains the list of mechanical parts with order numbers and the illustrations for board replacement.

Note: *The numbers indicated in brackets refer to the item position in the list of mechanical parts in chapter 5.*

1166.3311 (R&S FSMR Basic Model, items 1-455),
1166.1677 (Dig. Basic Unit, items 500-776),
1093.4708 (Display Unit, items 800-950),
1144.9017 (option R&S FSU-B4, items 1100-1130).
1162.9921 (option R&S FSP-B28, items 1360-1380)
1144.9300 (option R&S FSU-B25, items 1400-1460)
1142.9090 (option R&S FSU-B9, items 1800-1960)
1130.3240 (≥26.5 GHz MW Converter , items 2100-2165)
1157.0907 (option R&S FSMR-B23, items 2106)
1142.9361.00 (option R&S FSU-B12, items 2400-2445)
1157.2116.00 (option R&S FSU-B24, items 4500-4615)

Note: *The words "left" and "right" in the manual always refer to the front view of the instrument.*

Performing a Cold Start

A cold start has to be performed as described below each time a module containing an EEPROM has been replaced.

- Connect the power cable and press the power switch.
- While the ON key is pressed, the decimal point key must be pressed and held down until the computer responds with a beep.

After this, Windows XP starts the device firmware.

Overview of the Modules

Table 3-1 Overview - module replacement

Module	Required tests and adjustments after replacement		
	Function tests and system error correction	**Adjustment**	**Other**
Front module controller	SYSTEM MESSAGES/ SELFTEST / CAL		DOS/BIOS update
Lithium battery	SYSTEM MESSAGES/ SELFTEST / CAL		Cold boot
Hard disk	SYSTEM MESSAGES/ SELFTEST / CAL	I/Q frequency response (if the file is lost)	Cold boot / FW update
LCD / DC/AC-converter			
Keyboard membrane or mat			
Front cover			
Floppy disk drive	Check of directories		
Power supply	SYSTEM MESSAGES/ SELFTEST / CAL		
Fan			
RF input connector	SELFTEST / CAL	Frequency response	
Motherboard	SYSTEM MESSAGES/ SELFTEST / CAL		Cold boot EEPROM entry
RF attenuator	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response with B72 additional I/Q frequency response	Cold boot
Key probe and vol./phone	Voltage / keyboard / volume		
RF Converter	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response with B72 additional I/Q frequency response	Cold boot
Detector	SYSTEM MESSAGES/ SELFTEST / CAL		Cold boot
IF filter	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency accuracy/ cal. source	Cold boot
MW Converter	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency accuracy/ frequency response	Cold boot
Baseband/Cal. Gen	SYSTEM MESSAGES/ SELFTEST / CAL	Power Reference	Cold boot
OCXO B4	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency accuracy	Cold boot
External Generator Control	SYSTEM MESSAGES/ SELFTEST / CAL		
LAN interface B16			
Removable HD B18			
Electr. Attenuator -B25	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response	Cold boot
Tracking Generator -B9	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response	Cold boot
Attenuator for Generator -B12	SYSTEM MESSAGES/ SELFTEST / CAL		
Preamplifier 26.5 GHz -B23	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response	
Preamplifier 50 GHz -B24	SYSTEM MESSAGES/ SELFTEST / CAL	Frequency response	
Trigger Port B28	SYSTEM MESSAGES/ SELFTEST / CAL		

Replacing Front Module Controller A90

(see chapter 5, spare parts list, item 573 and illustrations 1166.3311 and 1166.1677)
The front module controller is mounted behind the front panel.

Opening Instrument and Removing Front Panel

- Switch off the instrument and pull the mains plug.
- Undo the 4 screws (430) on the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Undo 2 countersunk screws (610) in the front frame, at the top and at the bottom.
- Remove the front panel with keyboard and display (600, 621, 631, 641, 650, 660) towards the front and turn it toward the top of the instrument.

Note that the connecting cables are still connected to the controller.

- Disconnect the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane, spinwheel, SATA data, SATA power and network connector.

  Note: *When removing the connecting cables, be careful with the cable connecting the keyboard. It is a film cable that can only be disconnected after sliding up the lock of the film cable plug.*

Removing Front Module Controller

- Undo the 10 screws with washers (590) of the front module controller board and take out the front module controller as follows (see also Fig. 3-9):

  Note: *The front module controller is tightly inserted on the motherboard.*
  It can be pulled off towards the front using the slots at the bottom of the mounting plate.
  Carefully push the board towards the front step by step using a flat, blunt tool.

Do not insert the tool too far into the slots and press only against the PC board !
To pull out the board, carefully it pry off at all slots alternately.
The board must not be bent!

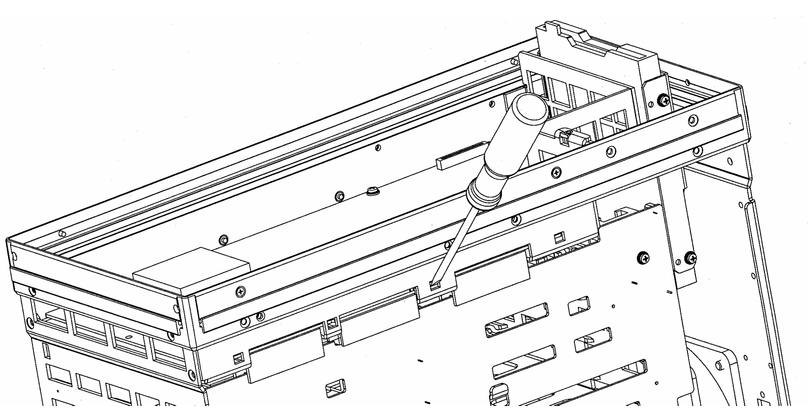


Fig. 3-10 Removing the front module controller

Installing New Front Module Controller and Completing Instrument

- Carefully plug the new front module controller to the motherboard and fasten it in place using the 10 screws with washers (590).
- Carefully plug the cable connectors to the controller board, taking care not to reverse the polarities.

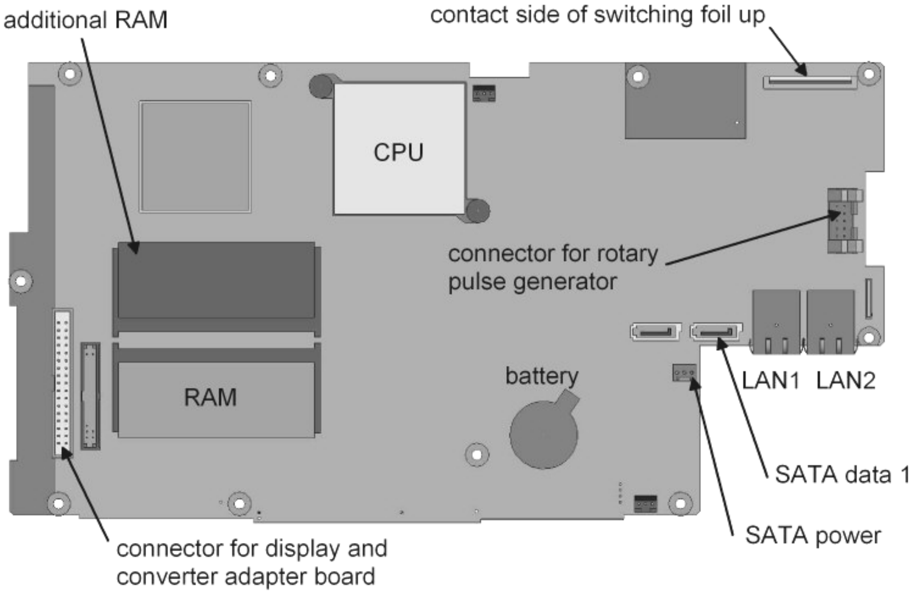


Fig. 3-11 Position of connectors on front module controller

- Rotate the front panel into the R&S FSMR and fasten in place using 4 countersunk screws (610) in the front frame.

The cables to the front module controller are still connected

- Install the front cover (270).
- Mount the 2 front handles (420) on the instrument using the 4 screws (430).

Putting Instrument into Operation

- Connect the instrument to AC supply and switch on the power switch. The instrument is now in stand-by mode.
- Insert a floppy disk with DOS and BIOS update into the floppy disk drive.
- Switch on the R&S FSMR and wait until the first beep. Press the FILE key. The BIOS update starts.
- When programming the flash EEPROM, the FSMR must not be switched off.
- Follow the message indicated in the display, then switch the FSMR off and on.
- After starting the instrument, check the log file for system messages:
  - [**SETUP** : SYSTEM INFO : SYSTEM MESSAGES]
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST] , then [SELFTEST RESULT]
- Start total calibration and check the results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]

Replacing Lithium Battery on Front Module Controller

(see chapter 5, spare parts list, item 776 and illustrations 1166.3311 and 1166.1677)

The lithium battery is accommodated on the front module controller board behind the front panel.

⚠ CAUTION

Danger of fire or intoxication

Lithium batteries must not be exposed to high temperatures or fire.

Keep away from children to avoid intoxication.

If the battery is replaced improperly, there is danger of explosion. Only replace the battery with R&S type *(See Chapter 5, Spare Parts List, Item 776 for type FMR6).*

Lithium batteries are hazardous waste and must be disposed of in dedicated containers. Observe local regulations regarding waste disposal.

Do not short-circuit the battery!

Opening Instrument and Removing Front Panel

- Switch off the instrument and pull the mains plug.
- Undo the 4 screws (430) on the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Undo 2 countersunk screws (610) in the front frame at the top and at the bottom.
- Remove the front panel with keyboard and display (601, 621, 631, 641, 650, 660) towards the front and rotate it to the top of the instrument.

NOTICE

Risk of instrument damage

Be careful when removing the front panel of the instrument because the connecting cables are still connected to the controller to avoid damage to the instrument.

- Disconnect the cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel and, if required, network connector from the front module controller.

  Note: *When removing the connecting cables, be careful with the cable to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug.*

Removing Lithium Battery

- Carefully lift and remove the battery.
  Note: *3.4 V lithium battery (∅ 20 mm * 3 mm) R&S Order No. 0858.2049.00*

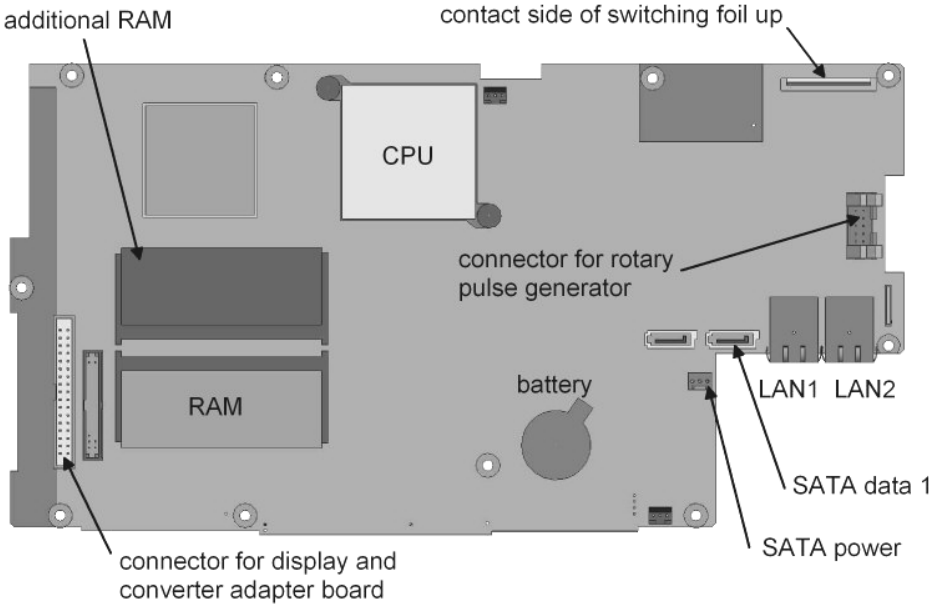


Fig. 3-12 Position of lithium battery on front module controller

Installing New Battery and Completing Instrument

Risk of discharge

Do not short-curcuit the battery.

- Insert battery into holder below the spring.
  Note: *The positive pole (+) of the battery points up.*
- Rotate the front panel back into the R&S FSMR and fasten in place using 4 countersunk screws (610) in the front frame.

NOTICE

Risk of instrument damage

Be careful when replacing the cables. Connect the cables to the proper connectors to avoid damage to the instrument.

- Install the front cover (270).
- Mount the 2 front handles (420) again using the 4 screws (430).

Putting Instrument into Operation

- Connect the instrument to the AC supply and switch on the power switch. The instrument is now in the stand-by mode.
- After battery replacement, a cold boot is required. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check the result:
  - [**CAL** : CAL TOTAL], then [CAL RESULTS]

Replacing Hard Disk A60

(see chapter 5, spare parts list, item 710 and illustrations 1166.3311 and 1166.1677)

The SATA hard disk is located between the front module and the boards.
The spare part contains the complete software.

Opening Instrument and Replacing Hard Disk

- Switch off the instrument, disconnect the AC supply plug, unscrew the 4 rear-panel feet (450) and pull off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Disconnect the SATA data cable (721) and the SATA power cable (722) at the hard disk.
- Undo the 2 countersunk screws (740) on the hard disk mounting plate (730).
- Take the hard disk (710) with the mounting plate (730) out of the R&S FSMR.
- Undo the 4 countersunk screws (750), remove the hard disk and mount a new hard disk to the mounting plate (730).

Installing New Hard Disk and Putting Instrument into Operation

- Mount the hard disk with the mounting plate into the instrument using 2 screws (740).
  Note: *Be careful with the lower cover plate locking in the provided opening.*
- Connect the SATA data cable (721) and the SATA power cable (722) to the hard disk.
  Note: *Connect cable according to illustration 1166.1677 in chapter 5 .*
- Place the top cover (240) onto the instrument and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and fasten the 4 rear-panel feet (450) using screws.
- Connect the instrument to the AC supply and switch on the power switch. The instrument is now in the stand-by mode.
- After replacement of the hard disk, a cold boot is required. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:

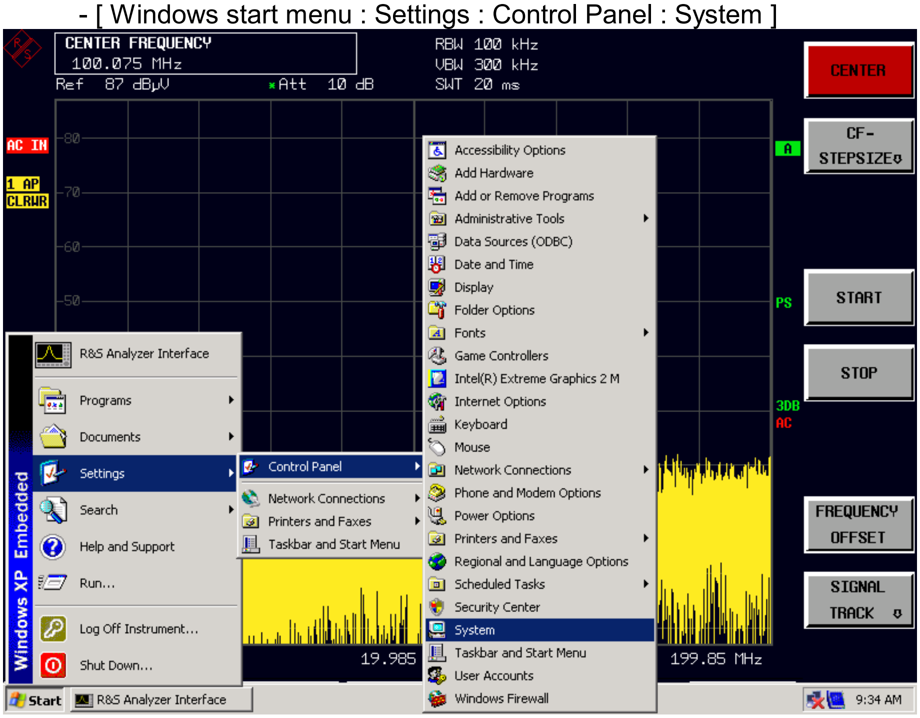
- [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**

➢ Perform a firmware update to actual version if necessary. See section "Software Update/Installing Options".

➢ Start the selftest and check results:
- [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]

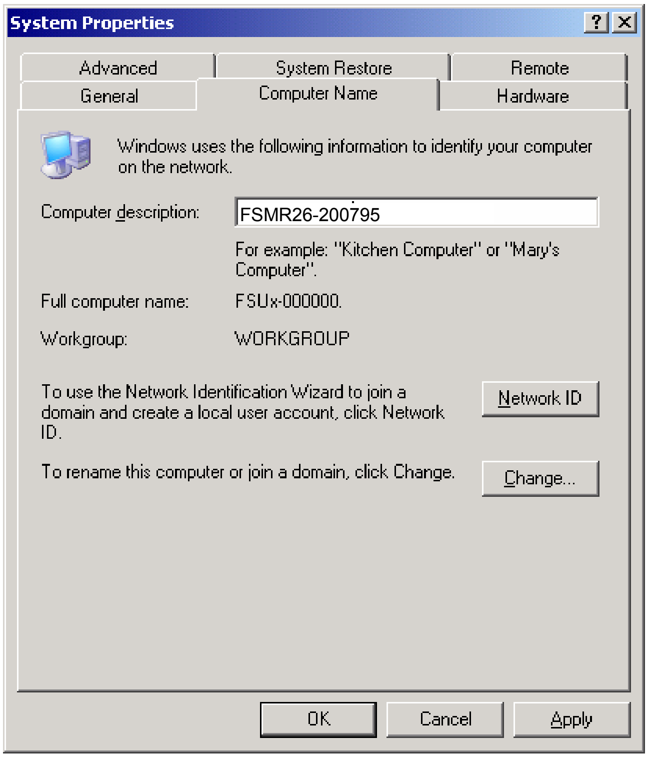
➢ Start total calibration and check the results:
- [**CAL** : CAL TOTAL] , then [CAL RESULTS]

➢ Enter the computer name, using the Windows Control Panel:
- [Windows start menu : Settings : Control Panel : System]



➢ Switch to tab Computer Name

➢ Enter the Computer Name (e.g. FSMR26 with serial number 200795).



- Perform a firmware update if necessary.
- Install the firmware options, if present.

Replacing LCD and DC/AC Converter in Front Module

(see chapter 5, spare parts list, items 601, 921 and 871, and illustrations 1166.3311, 1166.1677, 1093.4708)

The LCD is accommodated on the mounting plate together with the associated DC/AC converter. It is connected to the front module controller via cables, which can also be replaced individually. For replacement, proceed as follows:

Opening Instrument and Removing Front Module

- Switch off the instrument and pull the mains plug.
- Undo the 4 screws (430) of the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Undo 2 countersunk screws (610) in the front frame at the top and at the bottom.
- Pull out the front module with keyboard and display (601, 621, 631, 641, 650, 660) towards the front as far at it goes.

NOTICE

Note that the connecting cables are still connected to the controller.

- Disconnect the cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel and, if required, network connector on the front module controller.

  Note: *When removing the connecting cables, be careful with the cable connecting the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug.*

- Place the front module with the keys onto a clean surface.

Removing DC/AC Converter

- Pull off the connecting cable from the display (921) to the DC/AC converter (871).
- Disconnect cable (905) to DC/AC converter (871).
- Remove the DC/AC converter (871) after undoing the 2 screws (892).

Removing LCD

- Undo the 2 screws (950) and remove the display connector (949).
- Disconnect cable (948) from the display (921).
- Undo the 4 screws with washers (930) and remove the display (921).

Installing New LCD and/or DC/AC Converter and Putting into Operation

- To insert the new LCD and/or DC/AC converter, proceed in the reverse order, connect all cables in the correct position and tighten all screws (drawing 1093.4708).
- When replacing the display (921) or display cable (945), affix a new adhesive label (946) for cable safety.
- Place the front panel with the keys on top of the instrument so that the cables can be connected to the front module controller.
- Carefully plug the cable connectors to the controller board without reversing the polarities.

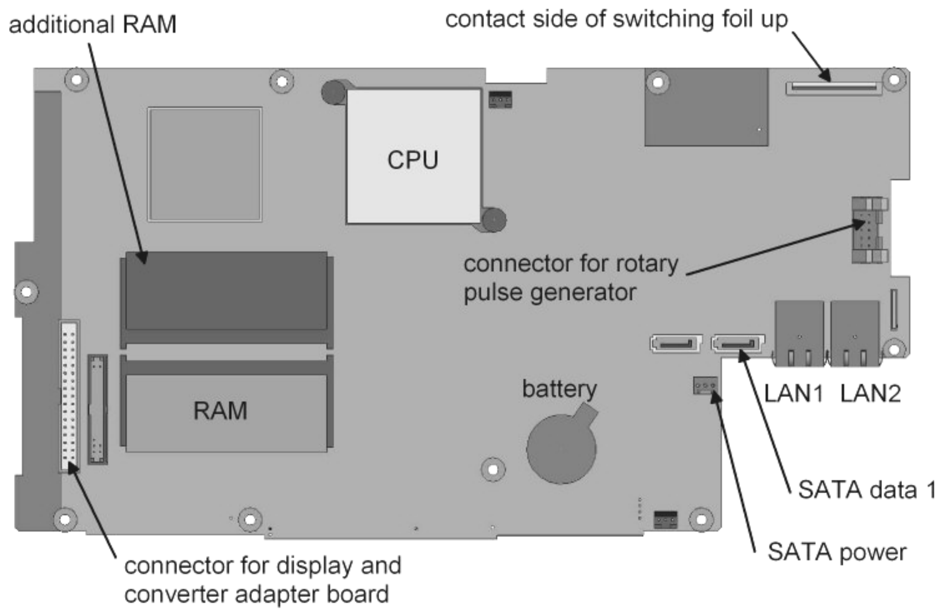


Fig. 3-13 Position of connectors on front module controller

- Rotate the front panel back into the instrument and fasten it in place using 4 countersunk screws (610) in the front frame.

NOTICE

Make sure to route the cables properly.

- Install the front cover (270).
- Mount the 2 front handles (420) again using the 4 screws (430).
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.

Replacing Keyboard Membrane or Mat on Front Module

(see chapter 5, spare parts list items 631 and 641, and illustrations 1166.3311, 1166.1677)

The keyboard membrane is the contact film for the rubber keys (mat) behind the front cover and the keyboard frame.

Opening Instrument and Removing Front Panel

- Switch off the instrument and pull the mains plug.
- Undo the 4 screws (430) on the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Undo 2 countersunk screws (610) in the front frame at the top and at the bottom.
- Pull out the front module with keyboard and display (601, 621, 631, 641, 650, 660) towards the front and put it on top of the instrument with the keys facing the instrument.

NOTICE

The cables are still connected to the controller .

- Disconnect the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel and, if required, the network connector.

  Note: *When removing the cables, be careful with the cable connecting the keyboard. It is a film cable that can only be disconnected after sliding up the lock of the film cable plug.*

Removing Membrane

- Place the front panel onto a clean surface with the keys pointing upwards.
- Pull off the knob (650) of the spinwheel.
- Undo the 10 countersunk screws (660) and remove the keyboard frame (621).
- The keyboard membrane (641) as well as the mat (631) can now be replaced.

Installing New Membrane and Completing Instrument

- Insert the new mat (631) into the keyboard frame (621) from the back.

  Note: *The pins of the mat must be inserted into the holes at the keyboard frame.*

- Position the new keyboard membrane (641) on the back of the mat (631).

  Note: *Push the foil cable of the membrane through the slot in the mounting panel. The membrane must be positioned so that the pins of the mat are inserted into the holes in the membrane.*

- Position the mounting plate with the display on the membrane (641).

  Note: *The display must be positioned so that the pins of the mat are inserted in the holes in the mounting plate (805).*

- Press the front panel together, turn the keys to the top and fasten in the keyboard frame using 10 countersunk screws (660).
- Place the front panel with the keys on the top of the instrument so that the cables can be connected to the front module controller.
- Carefully plug the cable connectors to the controller board without reversing the polarities.

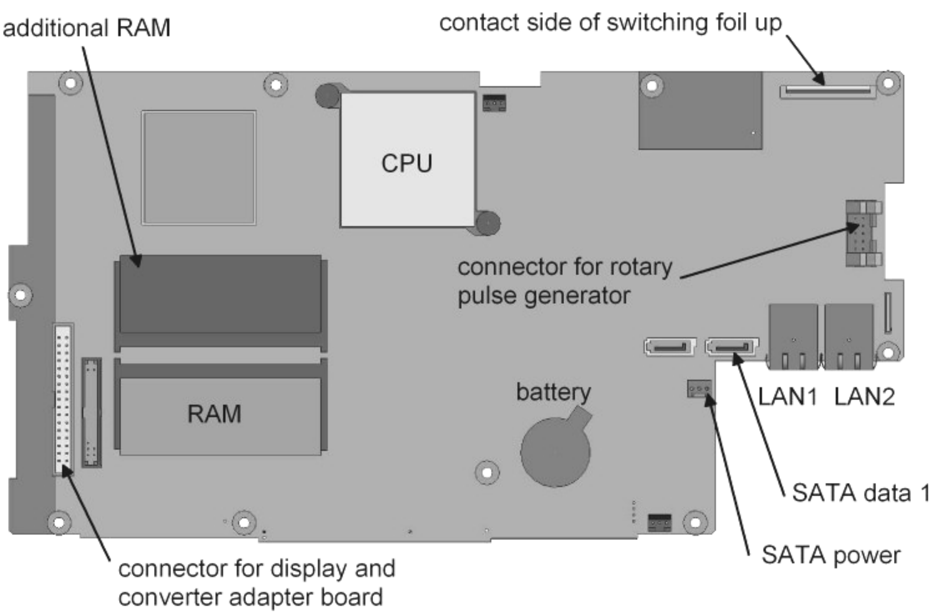


Fig. 3-14 Position of connectors on front module controller

- Rotate the front panel back into the R&S FSMR and fasten it in the front frame using 4 countersunk screws (610).

NOTICE

Make sure to route the cables properly.

Replacing Front Cover on Front Module

(see chapter 5, spare parts list, items 270/280/290, and illustration 1166.3311)

The front cover is the outer front panel that carries the labels. Each model has its own front cover.

- Switch off the instrument and pull the mains plug.
- Undo the 4 screws (430) on the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Install the new front cover and reassemble the instrument in the reverse order.
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.

Replacing Floppy Disk Drive A30

(see chapter 5, spare parts list, item 670, and illustrations 1166.3311, 1166.1677)

Opening Instrument and Removing Floppy Disk Drive

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Remove 3 screws (700) at the fan side of the R&S FSMR and carefully pull out the floppy disk drive (670) with the floppy mounting plate (680) pointing towards the top.

  Note: *The cable is still connected to the motherboard.*
- Disconnect the cable at the floppy disk drive.

Installing New Floppy Disk Drive and Completing Instrument

- Undo the 3 screws with washers (700) and remove the floppy disk from the mounting plate (680) and mount a new disk drive (670) to the floppy mounting plate (680).
- Connect the cable (690) to the disk drive (note the contact side of the cable).
- Insert the floppy mounting plate (680) and fasten it to the fan side using 2 screws with washers (700).

  Note: *Please mount the floppy disk drive in the middle of the front-panel breakout.*
- Replace the instrument cover (240) on the top and fasten it in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Push the enclosure (410) onto the instrument and mount the 4 rear-panel feet (450).
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.

Function Test

- The instrument boots and the firmware starts.
- Insert a 3 ½" disk with any files.
- Press the FILE key, then the FILE MANAGER and EDIT PATH softkeys.
- Enter "a" and ":" and confirm with the Enter key.
- The directory structure of the inserted disk must be displayed on the screen.

Replacing Power Supply A20

(see chapter 5, spare parts list, item 550, and illustration *1166.1677*)

The power supply is installed at the rear of the instrument frame.

Removing Power Supply

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the rear.
- Undo the 10 screws (560) at the rear of the power supply.
- Pull out the power supply approx. 20 mm towards the rear, slightly tilt it towards the bottom and then pull it out completely.

Installing New Power Supply

- Place the instrument onto the front handles and install the new power supply in the reverse order.

  Note: *Make sure that the 96-contact connector to the MOTHERBOARD locks in place correctly.*
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the AC supply and switch it on.
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check resultw:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]

Replacing Fan

(see chapter 5, spare parts list, item 15, and illustration 1166.3311)

The fan is installed at the right side of the frame.

Opening Instrument and Removing Fan

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Remove the fan (15) by loosening the 4 screws.
- Disconnect the fan cable at the motherboard connector X35 (FAN) .

Installing New Fan and Completing Instrument

- Connect the fan cable to the motherboard connector X35 (FAN)
- Mount the new fan using 4 screws.

  Note: *Please note the direction of the airflow printed on the fan. The fan must blow the cold air into the instrument.*

  Make sure to route the cable so that it cannot get into the fan.

- Replace the instrument cover (240) on the top and fasten it in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.

Replacing RF Input Connector (Cable W1) R&S FSMR 3

(see chapter 5, spare parts list, item 295, and illustration 1166.3311)

The RF input connector is installed at the bottom right side of the front panel.
Depending on the frequency range, different cables W1 are available.

Opening Instrument and Removing Cable W1

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 4 screws (430) on the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Remove 3 countersunk screws (70) at the frame and 1 countersunk screw (70) at the connector mounting plate (61).
- Unscrew the cable W1 (295) to 7 GHz or W1 (315) to 30 GHz at the RF attenuator (20) or (30).
- Remove the connector mounting plate (61) together with W1 and the probe/key module (50) towards the front.
  Note: *The probe/key module (50) is connected by a ribbon cable to the motherboard X80.*
- Undo the 4 countersunk screws (350) and remove cable W1 together with mounting plate (330) or (340).

Installing New Cable and Completing Instrument

- Put the mounting plate (330) or (340) onto the new cable W1 and fasten it in place using 4 countersunk screws (350), insert the mounting plate (61) into the instrument and screw it to attenuator (20) or (30).
- Fix 3 countersunk screws (70) in the instrument frame and 1 countersunk screw (70) in the mounting plate (61).
- Install the front cover (270).
- Mount the 2 front handles (420) again using the 4 screws (430).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency response according to chapter 1 and correct, if necessary.

Replacing RF INPUT Connector (Testport Adapter) R&S FSMR 26

(see chapter 5, spare parts list, item 315, and illustration 1166.3311)
The input connector is at the bottom right of the front panel. Different connectors are used depending on the frequency range of the instrument.

Opening Instrument and Removing Testport Adapter

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Remove the 4 screws at the left and right front handles (430) and take off front handles.
- Pull off front cover (290) towards the front.
- Remove 3 countersunk screws (70) from frame and 1 countersunk screw (70) from mounting plate (61).
- Unscrew input cable W1 (316) from attenuator (25).
- Pull out mounting plate (61) together with cable W1 and the probe/key (50) and vol./phone board (43) modules towards the front.

  ***Note**: The probe/key (50) and vol./phone board (43) modules are connected to X80, X81 on the motherboard by means of a flat cable.*

- Remove cable W1 together with mounting plate (340) after undoing 4 countersunk screws (350).
- Unscrew testport adapter (315) from cable W1 (316).

Installing Testport Adapter and Completing Instrument

- Screw new testport adapter (315) to cable W1 (316).
- Connect mounting plate (340) to cable W1, fasten it with 4 countersunk screws (350), fit it into the instrument together with mounting plate (61) and screw it to the attenuator (21).
- Fasten mounting plate (61) to instrument frame with 3 countersunk screws (70) and to mounting plate (61) with 1 countersunk screw (70).
- Remount the 2 front handles (420) by means of 4 screws.
- Slide on enclosure (410) and screw on the 4 rear-panel feet (450).
- Connect the AC supply cable, switch on power switch and press the ON key.
- Start selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency response as described in Chapter 1 and correct it, if required.

Replacing ´RF-INPUT´ (Testport Adapter) R&S FSMR 50

(see chapter 5, spare parts list, item 320, and illustration 1166.3311)

The input is located at the bottom right of the front panel. The input design will vary depending on the frequency range of the instrument.

Opening Instrument and Removing Testport Adapter

- Switch off the instrument, pull the mains plug, unscrew the 4 rear panel feet (450) and remove the enclosure (410) by pulling it toward the rear.
- Unscrew the 4 screws located on the left and right sides of the front handle (430) and remove the front handle.
- Pull off the front cover (292) toward the front.
- Unscrew the 3 countersunk screws (70) on the instrument frame and the 4 countersunk screws (70) on the subassembly plate (61).
- Unscrew the input cable W1 (322) on the attenuator (22).
- Pull out the subassembly plate (61) toward the front together with W1 and the Probe/Key board (50) and the Vol./Phone board (43).

  ***Note**: The Probe/Key board (50) and* Vol./Phone board (43) *are plugged into the motherboard X80, X81 via a flat cable.*

- Remove cable W1 after undoing 4 countersunk screws (350) with mounting plate (340).
- Unscrew housing adapter (320) from cable W1 (322).

Installing Testport Adapter and Completing Instrument

- Screw the new testport adapter (320) onto cable W1 (322).
- Feed mounting plate (340) to cable W1, fasten into place with 4 countersunk screws (350), insert back into instrument together with subassembly plate (61) and screw back onto attenuator (25).
- Fasten subassembly plate (61) via 3 countersunk screws (70) on the device frame and 4 countersunk screws (70) on the subassembly plate (61).
- Put the front cover (292) back on.
- Reassemble 2 front handles (420) using 4 screws.
- Slide enclosure (410) back on and screw on 4 rear panel feet (450).
- Connect power cable, switch on power switch and press ON key.
- Start selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency response as described in chapter 1 and correct if necessary.

Replacing Motherboard A10

(see chapter 5, spare parts list, item 510 and illustrations 1166.3311, 1166.1677))
The motherboard is located at the bottom.

Before removing the motherboard, you must save the EEPROM entry of the motherboard for the serial number and specification version:

- Save the following files to floppy disk
- D:\R_S\Instr\eeprom\motherb.bin

Opening Instrument and Removing Motherboard

➢ Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.

➢ Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.

➢ Place the instrument on the side frame and remove all cables to the boards.

➢ Pull out all boards towards the top of the instrument.

Note: *The boards can be disconnected from the motherboard by carefully pressing from the bottom through the motherboard slots.*

➢ Remove the power supply (550).
- Undo the 10 screws (560) at the rear of the power supply.
- Pull out the power supply approx. 20 mm towards the rear, slightly tilt it towards the bottom and then pull it out completely.

➢ Undo the 4 screws (430) on the front handles on both sides and take off the front handles.

➢ Pull off the front cover (270) towards the front.

➢ Undo 2 countersunk screws (610) in the front frame at the top and at the bottom.

Remove the front panel with keyboard and display (601, 621, 631, 641, 650, 660) towards the front.

Note that the cables are still connected to the controller.

➢ Disconnect the cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel and, if required, the network connector on the front module controller.

Note: *When removing the cables, be careful with the cable connecting the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug.*

➢ Remove the front module controller (see section "Replacing the Front Module Controller A90")

➢ Remove the screws of all motherboard connectors at the rear panel. Unscrew the bolts (530) at the COM and LPT ports and (540) at the Monitor port. Unscrew the nuts at the Noise Source and Ext. Trig connectors and the bolts at the IEC port.

Note: *Do not change the bolts of the Monitor and the LPT or COM ports !*

➢ Disconnect the cables at the motherboard (RF attenuator, fan, floppy, probe/key, rear panel, etc).

➢ Undo seven screws with washers (520) at the lower side of the motherboard (510 or 511).

➢ Carefully pull the motherboard (510 or 511) towards the front panel (approx. 15 mm) and take it out of the instrument by swiveling down.

Installing New Motherboard and Completing Instrument

- Reinstall the motherboard in the instrument in the reverse order.

  Note: *Be careful when installing the motherboard in order not to cause damage to any components.*

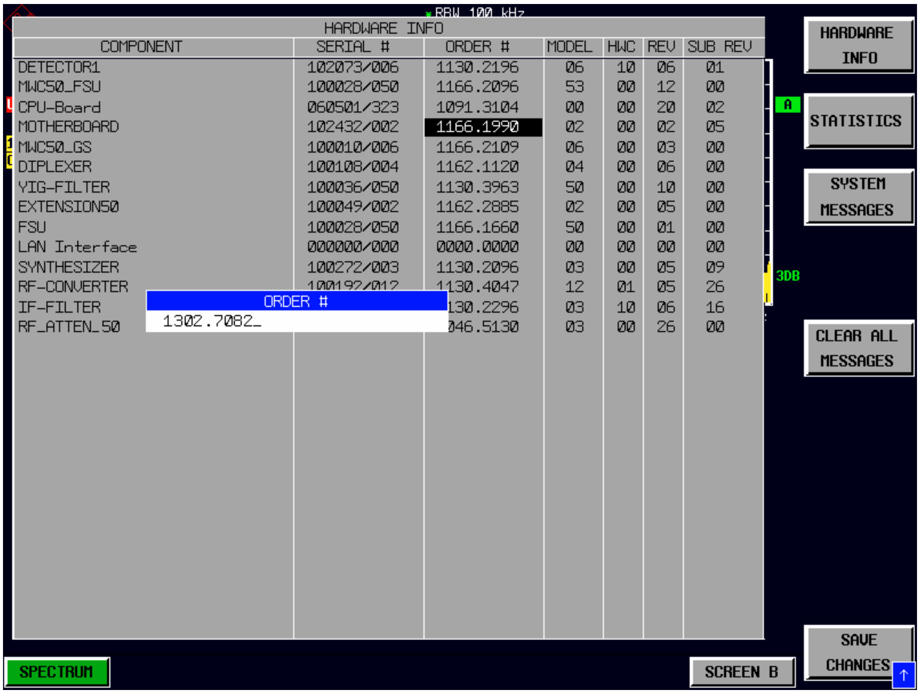
- Make *sure to connect* the *cables according to their labels.*
- Insert the front module controller, front panel, power supply, boards and cables, top cover, enclosure and rear-panel feet in the reverse order.
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- Start the instrument. Do not perform a cold start.
- Check if file D:\R_S\Instr\eeprom\motherb.bin changed. If necessary, copy the file from the floppy back to the harddisk.
- Store the file motherboard.bin to the EEPROM using the following service functions :

  [**SETUP** : SERVICE : ENTER PASSWORT : 30473035]
  [**SETUP** : SERVICE FUNCTION : 3.2.6.1]

- Enter the motherboard data into system info:

  [SETUP : SERVICE : ENTER PASSWORT : 30473035]
  [**SETUP** : SERVICE INFO : HARDWARE INFO]

- Enter the values for ORDER#, MODEL, HWC, REV and SUB REV in the line MOTHERBOARD corresponding to the values on the barcode label of the new motherboard. The serial number cannot be changed!


HARDWARE INFO

COMPONENT	SERIAL #	ORDER #	MODEL	HWC	REV	SUB REV
DETECTOR1	102073/006	1130.2196	06	10	06	01
MWC50_FSU	100028/050	1166.2096	53	00	12	00
CPU-Board	060501/323	1091.3104	00	00	20	02
MOTHERBOARD	102432/002	1166.1990	02	00	02	05
MWC50_GS	100010/006	1166.2109	06	00	03	00
DIPLEXER	100108/004	1162.1120	04	00	06	00
YIG-FILTER	100036/050	1130.3963	50	00	10	00
EXTENSION50	100049/002	1162.2885	02	00	05	00
FSU	100028/050	1166.1660	50	00	01	00
LAN Interface	000000/000	0000.0000	00	00	00	00
SYNTHESIZER	100272/003	1130.2096	03	00	05	09
RF-CONVERTER	100192/012	1130.4047	12	01	05	26
IF-FILTER		130.2296	03	10	06	16
RF_ATTEN_50		046.5130	03	00	26	00

- Press the soft key SAVE CHANGES
- Restart the instrument. A cold start is required after replacement (see chapter "Performing a Cold Start").

- Check the serial number of the instrument:
  [**SETUP** : SYSTEM INFO : STATISTICS]
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES]
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL], then [CAL RESULTS]

Replacing RF Attenuator A40

(see chapter 5, spare parts list, items 20 and 25, and illustration 1166.3311)

The RF attenuator is installed at the bottom behind the RF input connector.

Opening Instrument and Removing RF Attenuator

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Place the instrument onto the left side and unscrew the RF cable or the diplexer (150) at the output of the RF attenuator.
- FSMR 3: Undo the 2 screws with washers (40) at the instrument frame.
  Note*: The RF attenuator is then only held via the RF cables at the front.*
- FSMR 26 / 50: Undo the 3 screws with washers (28) at the instrument frame.
  Note*: The RF attenuator is then only held via the RF cables at the front.*
- Hold the attenuator and disconnect RF cable W1 (295) on the R&S FSMR 3,cable W1 (316) or cable W1 (322) on the R&S FSMR 26 from the input of the RF attenuator.
- Carefully take out the RF attenuator and unscrew the flexible RF cable from the input.
- Disconnect ribbon cable from motherboard connector X41 on the R&S FSMR 3 or at X40 on the R&S FSMR 26 / 50.
- Only R&S FSMR 26 / 50: Remove RF attenuator (25) by undoing 4 countersunk screws (27) from insulating plate (26).

Installing New RF Attenuator and Completing Instrument

- Only R&S FSMR 26 / 50: fasten new attenuator (25) to insulating plate (26) with 4 countersunk screws (27).
- Connect ribbon cable to motherboard connector X41 on the R&S FSMR 3 or to X40 on the R&S FSMR 26 / 50.
- Connect the flexible RF cable to the input of new RF attenuator (see label on cable).
- Install the new RF attenuator in the instrument and connect cable W1 to the input.
- R&S FSMR 3: Fasten the attenuator to the instrument frame using the 2 screws with washers (40).
  R&S FSMR 26 / 50: Fasten the attenuator to the instrument frame using the 3 screws with washers (28).
- Fasten the RF cable to the RF output of the RF attenuator.
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains and switch on the power switch. The instrument is now in the standby mode.
- After replacing the attenuator, a cold start is required. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]

- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Execute frequency response correction FSU-FRQ.EXE.
  The software is located on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform the measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Probe Board A80 and Vol./Phone Board A191

(see chapter 5, spare parts list, Pos. 43, 50 and illustration 1166.3311)

The boards are located behind the front-panel connectors Probe, Headphones and the volume control knob.

Opening Instrument and Removing Boards

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take out the enclosure (410) towards the back.
- Undo the 4 screws (430) of the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Remove volume control knob (48).
- Pace the instrument onto the left side so that its bottom side is accessible.
- Remove 3 countersunk screws (70) at the frame and 1 countersunk screw (70) at the connector mounting plate (61).
- Unscrew the input cable W1 (295) or (315) at the RF attenuator (20) or (30).
- Remove the mounting plate (61) completely with W1 and Probe/Key board (50) and optional Vol./Phone board (1040) towards the front.

  ***Note**: The Probe (50) and Vol./Phone (43) boards are connected to X80 and X81 on the motherboard via a ribbon cable.*
- Disconnect the cables of the 2 boards from motherboard connectors X80 and X81.
- Undo the 3 countersunk screws (55) and remove the Probe/Key board (50).
- Undo the 3 countersunk screws (46) and remove the Vol./Phone board (43) from the mounting plate (61).
- Undo the screw with washer (45) and the nut of the volume control at the mounting bracket (44) and remove the Vol./Phone board (43).

Installing New Boards and Completing Instrument

- Fasten the new Probe/Key board (50) to the mounting plate (61) using 4 countersunk screws (55).
- Fasten the new Vol./Phone board (43) to the mounting bracket (44) using the nut of the volume control and 1 screw with washer (45). Mount Vol./Phone board (43) to mounting plate (61) using 2 countersunk screws (46).
- Connect the cables of the 2 boards to motherboard connectors X80 and X81.
- Carefully slide the complete mounting plate (61) back into the instrument.

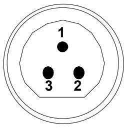
NOTICE

Make sure to route the cables properly.

- Screw RF cable W1 (295) or (315) to the input of the RF attenuator (20) or (30).
- Mount 3 countersunk screws (70) to the instrument frame and 1 countersunk screw (70) to the mounting plate (61).
- Install the front cover (270).
- Mount the volume control knob (48).
- Mount the 2 front handles (420) using the 4 screws (430).
- Mount the enclosure (410) and the 4 rear-panel feet (450).

Function Test

- Connect an appropriate keyboard to the keyboard socket.
- Connect the instrument to the AC supply, switch on the power switch and press the ON key.
- Simultaneously press the CTRL and ESC keys on the keyboard. The Windows XP task bar will appear at the lower edge of the screen.
- Shift the cursor to MAINAPP using the trackball and click. The task bar will disappear.
- Measure the output voltages at the probe connector (see Fig. 3-15).



Pin	Signal
1	GND
2	-12.6 V
3	+15 V

Fig. 3-15 Pin assignments of PROBE POWER connector

- Test the function of headphones connector and volume control. Press the *MKR* key and then the *MARKER DEMOD* softkey. Noise can be heard in the loudspeaker, and the volume can be changed using the *VOLUME* knob at the front panel. Connect headphones to the *AF OUTPUT* at the front panel. The loudspeaker is switched off and the noise can be heard in the headphones.

Replacing USB2.0 Board A310

The boards are located behind the front-panel.

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take out the enclosure (410) towards the back.
- Undo the 4 screws (430) of the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Pace the instrument onto the left side so that its bottom side is accessible.
- Remove 3 countersunk screws (70) at the frame and 4 countersunk screw (70) at the mounting plate (61 or 62).
- Unscrew the input cable W1 at the RF attenuator (20, 22, 23, 24 or 25).
- Remove the mounting plate (61 or 62) completely with W1 and Probe Board (50), Vol./Phone board (43) and USB Board (57) towards the front.

  Note: *The Probe Board (50) and Vol./Phone board (43) are connected to X80 and X81 on the motherboard via a ribbon cable and the USB Board (60) is connected to the front module controller (573).*

- Disconnect the cable W310 (760) on the USB Board (57).
- Undo the 2 countersunk screws (58) and remove the USB Board (57).

Replacing Power Sensor Interface A 72

(see chapter 5, spare parts list, Pos. 65 and illustration 1166.3311*)*

The boards are located behind the front-panel connector Power Sensor.

Opening Instrument and Removing Boards

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take out the enclosure (410) towards the back.
- Undo the 4 screws (430) of the front handles on both sides and take off the front handles.
- Pull off the front cover (270) towards the front.
- Disconnect the cable from frontmodule controller X1.
- Undo the 2 countersunk screws and remove the Power Sense Interface (65).

Installing New Boards and Completing Instrument

- Connect the cable from motherboard to connector X1.
- Carefully slide the Power Sens Interface (65) back into the instrument.

NOTICE

Make sure to route the cables properly.

- Mount 2 countersunk screws to the mounting plate (61).
- Install the front cover (270).
- Mount the 2 front handles (420) using the 4 screws (430).
- Mount the enclosure (410) and the 4 rear-panel feet (450).

Function Test

- Connect the instrument to the AC supply, switch on the power switch and press the ON key.
- Press the hot key Power Meter.
- Connect an appropriate power sensor.
- The measured value will be displayed

Replacing RF Frontend A100

(see chapter 5, spare parts list, item 100, and illustration 1166.3311)
The board is located in the middle of the instrument .

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) on the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side frame and remove all cables connecting the board.
- Pull out board towards the top of the instrument.

  Note: *The board can be disconnected from the motherboard connector by carefully pressing from the bottom through the motherboard slots.*

Installing New Module and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.

  Note: *Please observe the labels on the motherboard.*
- Replace the instrument cover (240) on the top and fasten it in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable, and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency response according to chapter 1 and correct, if necessary, using the correction software.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Synthesizer A110

(see chapter 5, spare parts list,, Pos. 105 and illustration 1166.3311)

The board is located in the middle of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and pull off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) on the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all connecting cables to the board.
- Pull out the board towards the top of the instrument.

  Note: *The board can be disconnected from the motherboard connector by carefully pressing through the motherboard slots from the bottom.*

Installing New Module and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.

  Note: *Please observe the labeling on the motherboard.*
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency response according to chapter 1 and correct, if necessary, using the correction software.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Detector A140

(see chapter 5, spare parts list, item 110, and illustration 1166.3311)

The board is located in the front part of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all RF cables to the board.
- Pull out the board towards the top of the instrument.

  Note: *The module can be disconnected from the motherboard connector by carefully pressing through the motherboard slots from the bottom.*

Installing New Module and Completing Instrument

- Plug the new board into the instrument and reconnect all RF cables.

  Note: *Please observe the labeling on the motherboard.*
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable and switch on the power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing IF Filter A130

(see chapter 5, spare parts list, item 120, and illustration 1166.3311)

The board is located in the middle of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all RF cables to the board at the bottom of the instrument.
- Pull out board towards the top of the instrument.

  Note: *The board can be disconnected from the motherboard connector by carefully pressing from the bottom through the motherboard slots.*

Installing New Board and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.

  Note: Please observe the labeling on the motherboard.
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains, switch on the power switch and press the ON key.
- As of firmware version 1.6x, a cold start is required after replacement of the IF Filter. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency accuracy and the calibration source level according to chapter 1 and readjust according to chapter 2, if necessary.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").
- Write calibration data to the EEPROM (see chapter 2, section "Adjustment of Module Data").

Replacing MW Converter Unit A160; R&S FSMR 26 / 50

(see chapter 5, spare parts list, item 140, 150 and illustration 1166.3311)

The board is located in the middle of the instrument.

Opening Instrument and Removing Module

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the cover (240) of the instrument to left side and take off.
- Place the instrument on its side and remove all RF cables from the module at the bottom of the instrument.
- Pull out the module towards the top of the instrument.

  Note: *The module can be disconnected from the motherboard connector by carefully pushing it upwards from the bottom through the motherboard slots.*

Installing New Module and Completing Instrument

- Plug the new module into the instrument and reconnect all RF cables.
  Note: *Please observe the labeling on the motherboard.*
- Put the top instrument cover (240) back into place and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains, switch on the power switch and press the ON key.
- A cold start is required after replacement of the MW Converter Unit. See section "Performing a Cold Start".
- After starting the instrument, check if the protocol file is correct:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES]
- Start selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Diplexer A161; R&S FSMR 26

(see chapter 5, spare parts list, item 2105 and illustration 1130.3240, sheet 6)
The board is located on the 26.5 GHz MW Converter Unit.

Removing Diplexer

- Remove the 26.5 GHz Converter Unit (140).
  Note: *See description "Replacing 26.5 GHz MW Converter Unit A160"*
- Disconnect all cables from diplexer (2105).
- Undo 4 screws with washers (2110) from the bottom of the PCB.
- Remove diplexer (2105) perpendicularly to the PCB.
  Note*: The diplexer is still connected to the PCB with contact pins.*

Installing Diplexer

- Plug in new diplexer (2105) perpendicularly to the PCB.
  Note: The diplexer is connected to the PCB with contact pins.
- Refasten 4 screws with washers (2110) to the bottom of the PCB.
- Refasten all cables to the diplexer (2105).

Completing Instrument and Frequency Response Correction

- Put the 26.5 GHz MW Converter Unit (140) back into the instrument.
  Note: See description "Replacing 26.5 GHz MW Converter Unit A160"Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:

  \- [SETUP : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  \- [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing 26.5 GHz YIG Unit 162; R&S FSMR 26 (Option B2)

(see chapter 5, spare parts list, item 2108-2119 and illustration 1130.3240)

The board is located on the 26.5 GHz MW Converter Unit.

Note: *Only the YIG units (with YIG filter, cable, sheet metal part) are replaced. The interface is thus always the same when using other YIG filters.*

Removing 26.5 GHz YIG Unit

- Remove the 26.5 GHz MW Converter Unit (140).
  Note: *See description "Replacing 26.5 GHz MW Converter Unit A160 "*
- Disconnect cable W1 from the diplexer (2105) and cable W2 from the relay unit (2170).
- Disconnect cable from YIG filter at X4.
- Undo 3 cover screws holding the YIG unit (2115) from the bottom of the module.
- Undo 2 countersunk screws (2120).
- Remove the complete YIG unit.

Installing 26.5 GHz YIG Unit

- Put the new YIG unit on the PCB.
- Fasten YIG unit with 2 countersunk screws (2120).
- Refasten 3 cover screws holding the YIG unit to the bottom of the module.
- Reconnect cable W1 to the diplexer (2105) and cable W2 to the relay unit (2170).
- Connect cable from the YIG filter to X4.

Completing Instrument and Frequency Response Correction

- Put the ≥26.5 GHz Converter Unit (140) back into the instrument.
  Note: *See description "Replacing 26.5 GHz MW Converter Unit A160 ".*
- Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Extender 26,5 GHz A163; R&S FSMR 26

(see chapter 5, spare parts list, item 2125 and illustration 1130.3240)
The board is located on the 26.5 GHz MW Converter Unit.

Removing Extender 26,5 GHz

- Remove the 26.5 GHz MW Converter Unit (140).
  Note: See description "Replacing the 26.5 GHz MW Converter Unit A160".
- Disconnect all cables from Extender 26 (2125).
- Undo all cover screws from the bottom side of the module and remove cover (2165).
  Note: The cover on the top (2160) thus comes off.
- Undo 7 screws with washers (2130) from the Extender 26 (2125) at the bottom side of the module.
  Caution: The Extender 26 (2125) may drop out.
- Remove the Extender 26 (2125) perpendicularly to the PCB.
  Note: The Extender 26 is still connected to the PCB with contact pins.

Installing 26,5 GHz YIG Unit

- Plug in the new Extender 26 (2125) perpendicularly to the PCB.
  Note: *The Extender 26 is connected to the PCB by means of connector contacts.*
- Refit 7 screws with washers (2130) to the Extender 26 (2125) at the bottom of the module.
- Fit the module cover (2160) onto the top of the 26.5 GHz MW Converter Unit (positioning by means of adjusting pins). Turn the 26.5 GHz MW Converter Unit upside down, fit module cover (2165) to the bottom side and refit all screws.
- Reconnect all cables to the Extender 26 (2125).

Completing Instrument and Frequency Response Correction

- Put 26.5 GHz MW converter (140) back into the instrument.
  Note: See description "Replacing 26.5 GHz MW Converter A160 "
- Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing the Relay on the MW Converter Unit; R&S FSMR 26 (Option B2)

(see chapter 5, spare parts list, item 2300 and illustration 1130.3240, sheet 2, and 1130.3405)
The relay is located on the 26.5 GHz Converter Unit.

Removing the Relay from the MW Converter

- R&S Remove the 26.5 GHz Converter Unit (140).
  Note: See description "Replacing 26.5 GHz MW Converter Unit A160 ".
- Disconnect cables from the relay unit (2170) to the diplexer (2105), YIG unit (2117) and Extension (2125).
- Disconnect the relay supply cable (2305) on module X2 and route the cable through the module slot and connect it to the rear.
  Undo the screw (2195) at the rear of the module to remove the clamp (2190).
- Undo 2 screws (2180) and remove the 2 relays with cables.
- Unscrew all cables from the relay and unsolder the supply lines (2305).

Installing the Relay on the MW Converter

- Solder supply lines (2305) to the relay.
  Note: For pin assignment see sheet 1130.3405.
- Refasten all cables to the relay.
- Refasten the relay unit (2170) to the MW converter using 2 screws (2180) .
- Route relay supply cable (2305) through the module slot from the rear and connect it to module X2.
- Connect the cable (2305) with clamp (2190) and screw (2195) to the rear of the module.
- Refasten cables between the relay unit (2170) and diplexer (2105) and YIG unit (2117) and Extension (2125).

Completing Instrument and Frequency Response Correction

- Place the 26 GHz Converter Unit (140) back into the instrument.
  Note: See description "Replacing 26 GHz Converter Unit A160 ".
- Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Diplexer A161; R&S FSMR 50

(see chapter 5, spare parts list, item 3110 and illustration 1166.2096, sheet 63)
The board is located on the 50 GHz MW Converter Unit.

Removing Diplexer

- Remove the 26.5 GHz Converter Unit (150, 152).
  Note: *See description "Replacing 50 GHz MW Converter Unit A160"*
- Disconnect all cables from diplexer.
- Undo 4 screws with washers from the bottom of the PCB.
- Remove diplexer perpendicularly to the PCB.
  Note*: The diplexer is still connected to the PCB with contact pins.*

- Installing Diplexer
- Plug in new diplexer perpendicularly to the PCB.
  Note: *The diplexer is connected to the PCB with contact pins.*
- Refasten 4 screws with washers to the bottom of the PCB.
- Refasten all cables to the diplexer.

Completing Instrument and Frequency Response Correction

- Put the 50 GHz MW Converter Unit (150, 152) back into the instrument.
  Note: See description "Replacing 50 GHz MW Converter Unit A160"Netzkabel anschließen und Gerät einschalten.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Extender 50 GHz A163; R&S FSMR 50

(see chapter 5, spare parts list, item 3148, 3150 and illustration 1166.2096)
The board is located on the >26.5 GHz MW Converter Unit.

Removing Extender 50 GHz

- Remove the 50 GHz MW Converter Unit (150, 152).
  Note: *See description "Replacing the 50 GHz MW Converter Unit A160; R&S FSPFSMR26".*
- Disconnect all cables from Extender 50 (3148, 3150).
- Undo all cover screws from the bottom side of the module and remove cover (3240).
  Note: *The cover on the top (3250) thus comes off.*
- Undo 6 screws with washers (3160) from the Extender 50 (3148, 3150) at the bottom side of the module.
  Caution: *The Extender 50 (*3148, 3150*) may drop out.*
- Remove the Extender 50 (3148, 3150) perpendicularly to the PCB.
  Note: *The Extender is still connected to the PCB with contact pins.*

Installing > 26,5 GHz Extender

- Plug in the new Extender 50 (3148, 3150) perpendicularly to the PCB.
  Note: *The Extender 50 is connected to the PCB by means of connector contacts.*
- Refit 6 screws with washers (3160) to the Extender 50 at the bottom of the module.
- Fit the module cover (3250) onto the top of the 50 GHz MW Converter Unit (positioning by means of adjusting pins). Turn the 50 GHz MW Converter Unit upside down, fit module cover (3240) to the bottom side and refit all screws.
- Reconnect all cables to the Extender 50 (3148, 3150).

Completing Instrument and Frequency Response Correction

- Put 50 GHz MW converter (150, 152) back into the instrument.
  Note: *See description "Replacing 50 GHz MW Converter A160; R&S FSMR 50"*
- Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Execute frequency response correction software FSU-FRQ.EXE.
  The software is on the Gloris server.
  - Test setup according to menu item "Schematic" (connect external reference).
  - Check IEC/IEEE addresses and configuration of instruments.
  - Press the Autoselect button and perform measurement with Run.
  - The frequency correction of the YIG filter is performed under item YIG.
  - After calibration, the frequency response is corrected over the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Baseband/Cal A300

(see chapter 5, spare parts list, item 125 and illustration 1166.3311)

The board is located in the front of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all RF cables to the board at the bottom of the instrument.
- Pull out board towards the top of the instrument.
  Note: The board can be disconnected from the motherboard connector by carefully pressing from the bottom through the motherboard slots.

Installing New Board and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.
  Note: *Please observe the labeling on the motherboard.*
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains, switch on the power switch and press the ON key.
- A cold start is required after replacement of the Baseband/Cal board. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check power reference level according to chapter 1 and readjust according to chapter 2, if necessary.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Tracking Generator A170 (Option: B9)

(see chapter 5, spare part list, item. 1800, and illustrations 1166.3311 and 1142.9090)
The board is installed in the rear part of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all connecting cables to board at the bottom of the instrument.
- Pull out the board towards the top of the instrument.

  Note: *The board can be disconnected from the motherboard connector by carefully pressing from the bottom through the motherboard slots.*

Installing New Module and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.
  Note: *Please observe the labeling on the motherboard.*
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See chapter „Performing a cold start“.
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check according to chapter 1, option Tracking Generator –B9.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Generator Attenuator A171 (Option: B12)

(see chapter 5, spare part list, item. 2400, and illustrations 1166.3311 and 1142.9361)
The board is installed in the rear part of the instrument (behind the fan).

Opening Instrument and Removing Attenuator

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all connecting cables W41 - X2 and W49 - X1 to tracking attenuator (2400).
- Disconnect flat cable of tracking attenuator (2400) on motherboard connector X270.
- Undo the 3 screws with washers (2420) and remove attenuator with holder.
- Undo the 2 screws M3 (2415) and remove the tracking attenuator (2400).

Installing New Attenuator and Completing Instrument

- Mount Tracking Attenuator (2400) with 2 screws M3 (2415) to attenuator holder (2410).
- Insert Tracking Attenuator with attenuator holder into unit and mount 3 screws with washers (2420).
- Connect flat cable of Tracking Attenuator (2400) to motherboard connector X270.
- Connect cable W41 - X2 and W49 – X1 to Tracking Attenuator.
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See chapter „Performing a cold start".
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check according to chapter 1, option Tracking Generator –B9 and Option Attenuator –B12.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing OCXO A200 (Option: B4)

(see chapter 5, spare parts list, item 1100, and illustrations 1166.3311 and 1144.9017)

The board is installed in the front part of the instrument.

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Place the instrument on its side and remove all connecting cables to board at the rear of the instrument.
- Pull out the board towards the top of the instrument.

Note: *The board can be disconnected from the motherboard connector by carefully pressing from the bottom through the motherboard slots.*

Installing New Module and Completing Instrument

- Plug the new board into the instrument and reconnect the cables.
  Note: Please observe the labeling on the motherboard.
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains, switch on the power switch and press the ON key.
  As of firmware version 1.6x, a cold start is required after replacement of the OCXO. See section "Performing a Cold Start".
- After starting the instrument, check the log file for system messages:
  - [SETUP : SYSTEM INFO : SYSTEM MESSAGES]
- Start the selftest and check results:
  - [SETUP : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start total calibration and check results:
  - [**CAL** : CAL TOTAL] , then [CAL RESULTS]
- Check frequency accuracy according to chapter 1 and readjust according to chapter 2, if necessary.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Combo Drive A381 (Option: B18)

(see chapter 5, spare parts list, item 1500, and illustrations 1166.3311 and 1145.0259)
The board is located on the top right of the front panel.

Opening Instrument and Removing Module

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 10 countersunk screws (260) on the top of the instrument and the 3 screws with washers (250) at the fan side, lift the cover (240) of the instrument to left side and take off.
- Disconnect floppy power (691) and floppy data (1550) cables from combo drive (1500).
- Disconnect 44-contact flat cable from front module processor (570 or 571), remove cable tie and disconnect cable from combo drive (1500).
- Undo 3 screws with washers (700) and carefully take combo drive (1500) out of the instrument towards the top.
- Remove combo drive (1500) from holder (1505) by undoing 3 screws with washers (1506).

Installing New Module and Completing Instrument

- Fit new combo drive (1500) to holder (1505) using 3 screws with washers (1506).
- Carefully insert combo drive (1500) with flat cable into the instrument and fasten it to frame using 3 screws with washers (700).
- Route 44-contact flat cable from combo drive (1500) to front module processor (570 or 571) via cable ties and connect it. Lock cable ties.
- Reinstall floppy power (691) and floppy data (1550) cables to combo drive (1500).
- Place top cover on instrument (240) and fasten it with 10 countersunk screws (260) and 3 screws with washers (250).
- Push enclosure (410) back in place and fasten 4 rear-panel feet (450) by means of screws.
- Connect power cable, switch on power switch and press ON key.
- After starting the instrument, check if the protocol file is correct:
  - [**SETUP** : SYSTEM INFO : SYSTEM MESSAGES]
- Start selftest and check results:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check results:
  - [**CAL** : CAL TOTAL], then [CAL RESULTS]
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Electronic Attenuator A50 (Option: B25)

(see chapter 5, spare parts list, item 1400 and illustrations 1166.3311 and 1144.9300)
The board is located below the fan.

Opening Instrument and Removing Module

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Place instrument on its side and remove RF cables on both sides of the electronic attenuator (1400).
- Undo 4 screws with washers (1460) from the trough.
- Carefully remove electronic attenuator (1400).
- Connect flat cable (1410) to electronic attenuator (1400).

Installing Module and Completing Instrument

- Refit flat cable (1410) to new electronic attenuator (1400).
- Carefully reassemble new electronic attenuator (1400) and screw it to trough using 4 screws with washers (1460).
- Refit RF cables to both sides of electronic attenuator (1400).
- Push enclosure (410) back in place and fix 4 rear-panel feet (450) by means of screws.
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See chapter „Performing a Cold Start“.
- After starting the instrument check if the protocol file is correct:
  - [**SETUP** : SYSTEM INFO : SYSTEM MESSAGES]
- Start selftest and check if the result is correct:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check if the result is correct:
  - [**CAL** : CAL TOTAL], then [CAL RESULTS]
- Check frequency accuracy according to chapter 1 and adjust according to chapter 2, if required.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing External Generator Control A210

(see chapter 5, spare parts list, item 1600, and illustrations 1166.3311 and 1129.7298)

The board is installed in the front part of the instrument .

Opening Instrument and Removing Board

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Undo the 2 countersunk screws (260) on the top of the instrument and the 2 screws with washers (250) at the fan side, lift the instrument cover (240) and remove it by swinging it to the left.
- Pull out the board towards the top of the instrument.

Installing New Module and Completing Instrument

- Plug the new board into the instrument.
- Replace the instrument cover (240) on the top and fasten in place using 10 countersunk screws (260) and 3 screws with washers (250).
- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- As of firmware version 1.6x, a cold start is required after replacement of the RF converter. See chapter „Performing a Cold Start“.
- After starting the instrument, check the log file for system messages:
  - [SETUP : SYSTEM INFO : SYSTEM MESSAGES]

Replacing Diplexer with Preamplifier A161; (Option B23)

(see chapter 5, spare parts list, item 2106 and illustration 1130.3240.01 sheet 5)

The Diplexer is installed on the 26.5 GHz MW Converter Unit.

Removing Diplexer

- Remove the 26.5 GHz MW Converter Unit (140).
  Note: *See description "Replacing* 26.5 GHz *MW Converter Unit A160*
- Undo all cables on the diplexer (2106).
- Unscrew 4 screws with washers (2110) at the bottom of the PCB.
- Remove the diplexer (2106) perpendicularly to the PCB.
  Note: *The diplexer is still connected to the PCB with contact pins.*

Installing Diplexer

- Plug in the new diplexer (2106) perpendicularly to the PCB.
  Note: *The diplexer is connected to the PCB with contact pins.*
- Screw on 4 screws with washers (2110) at the bottom of the PCB.
- Screw on all cables to the diplexer (2106).

Completing Instrument and Correcting Frequency Response

- Plug the ≥26.5 GHz MW converter unit (140) back into instrument.
  Note: *See description "Replacing 26.5 GHz MW Converter Unit A160""*
- Connect the AC supply cable and switch on the instrument.
- Start selftest and check the result to ensure that no errors occurred:
  - [**SETUP** : SERVICE : SELFTEST], subsequently [SELFTEST RESULT]
- Start system error correction and check the result to ensure that no errors occurred:
  - [**CAL** : CAL TOTAL] , subsequently [CAL RESULTS]
- Run the "FSU-FRQ.EXE" frequency response software program.
  The software is located on the GLORIS server.
  - Test setup in accordance with menu item "Schematic" (connect external reference). Check IEC addresses and configurations of the instruments.
  - Press the Autoselect button and perform measurement with Run.
  - Select YIG to perform the frequency correction of the YIG filter.
  - After calibration, the frequency response is corrected for the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing Preamplifier A50 (Option B24)

(see chapter 5, spare parts list, item 4500, and illustrations 1166.3311 and 1157.2116)

Opening Instrument and Removing Module

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) toward the rear.
- Place instrument on its side and remove RF cable W2 (4615) and RF cable W28 (4600) on preamplifier (4500).
- Remove ribbon cable on motherboard X50.
- Undo 2 screws (4612) from the bottom side of the bracket (4611).
- Disconnect the preamplifier (4500) from the attenuator (22 or 23).
- Carefully remove preamplifier (4500).

Installing Module and Completing Instrument

- Carefully reassemble new preamplifier (4500) and connect it to attenuator (22 or 23).
- Screw preamplifier (4500) back on bracket (4611) with two screws (4612).
- Connect ribbon cable to motherboard X50.
- Refit RF cable W2 (4610) and RF cable W28 (4600) back to preamplifier (4500).
- Push enclosure (410) back in place and fix 4 rear-panel feet (450) by means of screws.
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- A cold start is required after replacement (see chapter "Performing a Cold Start").
- After starting the instrument check if the protocol file is correct:
  - [**SETUP** : SYSTEM INFO : SYSTEM MESSAGES]
- Start selftest and check if the result is correct:
  - [**SETUP** : SERVICE : SELFTEST], then [SELFTEST RESULT]
- Start system error correction and check if the result is correct:
  - [**CAL** : CAL TOTAL], then [CAL RESULTS]
- Run the "FSU-FRQ.EXE" frequency response software program.
  The software is located on the GLORIS server.
  - Test setup in accordance with menu item "Schematic" (connect external reference). Check IEC addresses and configurations of the instruments.
  - Press the Autoselect button and perform measurement with Run.
  - Select YIG to perform the frequency correction of the YIG filter.
  - After calibration, the frequency response is corrected for the entire frequency range.
- Create backup of the EEPROM data (see chapter 2, section "Adjustment of Module Data").

Replacing the Electronic Attenuator A50 (Option B25)

(see chapter 5, spare parts list, item 1400, and illustrations 1166.3311 and 1144.9300)
The electronic attenuator is fitted behind the RF attenuator under the fan.

Opening the Instrument and Removing the Electronic Attenuator

- Switch off the instrument, pull the mains plug, unscrew the 4 rear-panel feet (450) and take off the enclosure (410) towards the back.
- Place the instrument on the left side and remove RF cable W28 (1430/1440) at the electronic attenuator output.
- Undo 4 screws with washers (1460) at the instrument frame.
  ***Note**: The electronic attenuator is then only held by the RF cable at the front.*
- Hold the electronic attenuator and unscrew RF cable W29 (1420) at the output of the attenuator.
- Carefully take out the RF attenuator and disconnect the ribbon cable at the electronic attenuator.

Installing the new Electronic Attenuator

- Connect cable (1420) at the new electronic attenuator.
  ***Note:** Label X3 points to the electronic attenuator.*
- Connect the ribbon cable (W50) at the new attenuator.
- Insert the new electronic attenuator into the instrument and reconnect cable W29 (1420) to the output of the attenuator (20).
- Fasten the electronic attenuator to the instrument frame using 4 screws with washers (1460).
- Fasten the RF cable (1420) at the output of the attenuator (20) and at the electronic attenuator using screws.

3.6 GHz Model (1129.9003.03)

- Connect cable W28 (1430) between electronic attenuator and the RF Converter (100) .

7 GHz Model (1129.9003.07)

- Connect cable W28 (1440) between electronic attenuator and the MW-Converter (130).

Completing the Instrument

- Mount the enclosure (410) and the 4 rear-panel feet (450).
- Connect the instrument to the mains, switch on the power switch and press the ON key.
- After starting the instrument check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES **]**

Replacing the Trigger Ports W67 (Option B28)

see chapter 5, spare parts list, item 1360, and illustrations 1166.3311 and 1162.9921).

The cable is at the rear panel.

Opening the Instrument and Removing the Cable

- Switch off the instrument and disconnect it from power supply.
- Unscrew 6 screws (180).
- Move rear panel (170) with cables carefully outside.
- Disconnect cable W67 Trigger Port (1360) on motherboard and move on the rear panel.

Installing the Cable and Completing the Instrument

- Mount supplied cable W67 Trigger Port (1360) spring (1370) and nuts (1375).
- Connect cable W67 onto motherboard X67.
- Fasten rear panel (170) again with 6 screws (180).
- Connect AC supply cable and switch on power switch. The instrument is now in the standby mode.
- After starting the instrument, check the log file for system messages:
  - [**SETUP :** SYSTEM INFO : SYSTEM MESSAGES]

Troubleshooting

Malfunctions may have simple causes but may also be caused by faulty components.

These troubleshooting instructions can be used to locate error causes down to board level and make the instrument ready for use again by means of board replacement. For troubleshooting and diagnostics, a selftest is available that polls diagnostic voltages of the modules and displays limit value violations.

We recommend shipping the instrument to our experts in the service centers (see address list at the beginning of this manual) for module replacement and further error elimination.

NOTICE

Risk of damage to the boards

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

Do not plug or unplug boards prior to disconnecting them from the AC supply.

The following utilities are provided in the R&S FSMR for diagnostic purposes:

- Permanent monitoring of levels and frequencies in the instrument
- Selftest
- System error correction

The first thing to do if you encounter any problems is to check if any connection (cables, edge connectors etc.) are damaged or even incorrectly inserted.

Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S-Order No.	Use
1	DC meter		URE	0350.5315.02	Troubleshooting
2	Spectrum analyzer	Frequency range 0 to 7 GHz	FSEB 20	1066.3010.20	Troubleshooting
3	Adapting cable	1m long SMP-to-SMA connection	-	1129.8259.00	Troubleshooting
4	Adapting cable	0.5m long SMP-to-SMP connection	-	1129.8265.00	Troubleshooting
5	Adapter board	Extension 150 mm high 48-contact, 2 mm spacing	-	1100.3542.02	Troubleshooting

Troubleshooting Switch-on Problems

- **Error: The R&S FSMR cannot be switched on.**

Action	Possible error causes and further steps
Check power-on switch on the rear ⇓	Power switch OFF: Switch on power supply.
Check yellow LED (stand-by). ⇓	LED remains dark: ➢ Measure voltage at X20.D24 (power supply unit) Rated value: +12 V ± 1V Voltage o.k.: Keyboard or controller faulty. No voltage: Remove IF filter or OCXO modules. ➢ Measure voltage at X20.D24 (power supply unit): Rated value: +12 V ± 1V Correct voltage: Removed module faulty No voltage: Power supply faulty or short-circuit at 12V standby.
Switch on instrument. Check green LED ⇓	LED remains dark: Measure PWR-ON signal on the power supply X20.B1: < 1V for ON Voltage > 1V: Keyboard membrane or controller faulty.
Power supply starts, screen remains dark?	Measure voltages on the motherboard, see "Short-circuit of one or more operating voltages".

- **Error: Short-circuit of one or more operating voltages**

Action	Possible error causes and further steps
At the bottom of the motherboard, check which of the voltages is short-circuited: Computer, hard disk, EEPROMs : X20.A7 to A10: rated value: +5 V2 Detector unit: B73: Wideband detector unit: X20.A5 and X20.A6: rated value +3 V3	One voltage is missing or very low: Remove the respective boards from the instrument one by one and repeat the measurement. If the voltage is supplied, the error is probably located on the module removed. ***Note:*** *The power supply switches off all voltages after a short time in the case of a short-circuit. Restart by pressing the Standby/On key.*
Analog boards: X130.A10: rated value +12 V X130.A9: rated value +8 V X130.A8: rated value +6 V X130.A12: rated value –12 V	

- **Error: Fan does not work.**

Action	Possible error causes and further steps
Check voltage at connector: X35 pins 1 + 3 : Rated value 7V	If there is no voltage, the fan is defective: Replace fan. If the voltage is too low, the fan is blocked or the power consumption is too high.

Troubleshooting Problems with Booting

- **Error:The R&S FSMR does not start the measurement application.**

Following switch-on, the R&S FSMR first boots the computer BIOS. After successful initialization of the computer, the Windows XP operating system starts up. Subsequently, the test application is loaded as a start-up program. Simultaneously, selftests are performed at various locations and error messages, if any, are output. The messages are disabled with normal operation, but can be enabled for troubleshooting purposes. When troubleshooting, it is advisable to connect a keyboard to the keyboard socket.

Normal action	Error and error cause
➢ Start the R&S FSMR. After the R&S FSMR is switched on, the following BIOS message is displayed: **Award Modular BIOS v6.00PG, An Energy Star Ally** **Copyright (C) 1984-2000, Award Software, Inc.** **R&S ANALYZER BIOS V2.0-17-2** **02/12/2002-io815E-LPC47B2-6A69REFC2C-00** After the first beep, the computer starts the hardware test and the following message is briefly displayed at the lower edge of the screen: **, ESC to skip Memory test...** The test results are usually not displayed. If errors occur during the boot procedure, these messages may indicate defects. ➢ The messages can be made visible by pressing the "DISP" key following the beep. The keystroke is acknowledged by a second beep. Then, all messages are displayed.	
Award Modular BIOS v6.00PG, An Energy Star Ally **Copyright (C) 1984-2000, Award Software, Inc.** **R&S ANALYZER BIOS V2.0-17-2** **Main Processor : Intel Pentium III 700 MHz (100x7.0)** **Memory Testing: 261120K OK + 1024 Shared Memory** ***(= result of memory test)*** **02/12/2002-io815E-LPC47B2-6A69REFC2C-00** The memory test yields the memory capacity of the front module controller. The FMR6 provides 512 Mbyte. BIOS then starts to check the controller hardware. All PCBs found are displayed.	If no result of the memory test is indicated, the memory is defective.

Normal action	Error and error cause
➢ This procedure may be interrupted using the "PAUSE" key on the connected external keyboard, any other key continues the program execution.	

Award Modular BIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-2000, Award Software, Inc.

R&S ANALYZER BIOS V2.0-17-2

Main Processor : Intel Pentium III 700 MHz (100x7.0)
Memory Testing: 261120K OK + 1024 Shared Memory

Primary Memory Clock is 100 MHz
Primary Master : IBM-DJSA-205 JS100AB0A
(depending on installed hard disk))
Primary Slave : None
Secondary Master : None
Secondary Slave : None

02/12/2002-io815E-LPC47B2-6A69REFC2C-00

If this hard disk entry is missing, the hard disk may be faulty

SETUP is then displayed.

➢ This procedure can also be interrupted using the "PAUSE" key.

The contents partly depend on the hardware provided:

Award Software Inc.
System Configurations

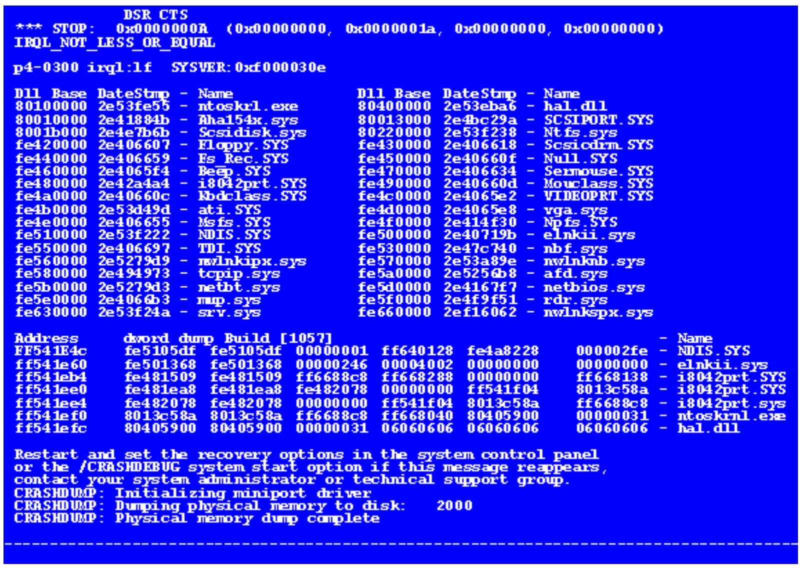
CPU Type	**: Intel Pentium III**	**Base Memory**	**: 640K**
Co-processor	**: Installed**	**Extended Memory**	**: 260096K**
CPU Clock	**: 700 MHz**	**Cache Memory**	**: 256**
Diskette Drive A	**: 1.44M, 3.5 in.**	**Display Type**	**: EGA/VGA**
Diskette Drive B	**: None**	**Serial Port(s)**	**: 3F8**
Hard Disk Drive C	**: LBA ,ATA 66, 5001MB**	**Parallel Port(s)**	**: 378**
Hard Disk Drive D	**: None**	**EDO DRAM at Row(s)**	**: None**
		SDRAM at Row(s)	**: 2 3**
		Display Cache Size	**: None**

PCI device listing.....

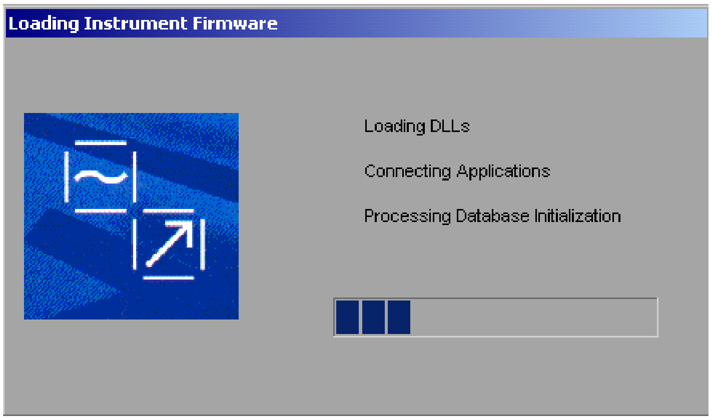
Bus No.	Device No.	Funct No.	Vendor /	Device ID	Class	Device Class	IRQ
0	2	0	8086	1132	0300	Display Cntrlr	10
0	31	1	8086	244B	0101	IDE Cntrlr	14
0	31	2	8086	2442	0C03	Serial Bus Cntrlr	11
0	31	3	8086	2443	0C05	SMBus Cntrlr	NA
0	31	4	8086	2444	0C03	Serial Bus Cntrlr	9
1	8	0	8086	2449	0200	Network Cntrlr	11
1	13	0	162F	1212	FF00	Unknown PCI Device	11

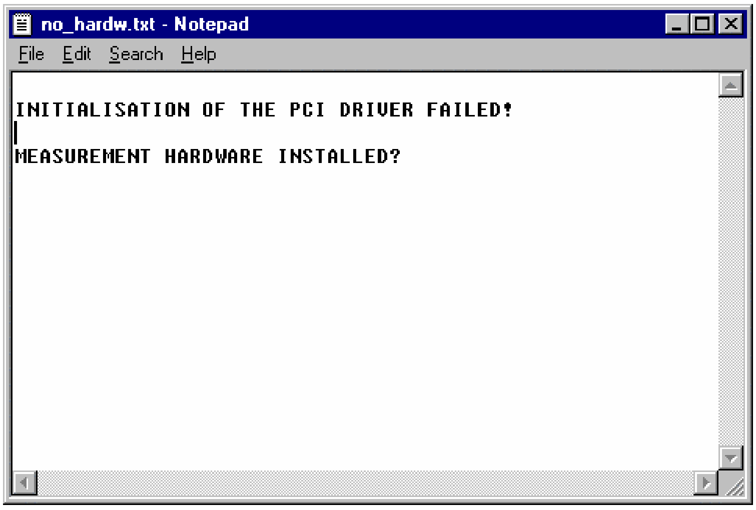
Normal action	Error and error cause
The PCI hardware test is displayed in the lower half of the screen. All modules found during the test are displayed with their names and PCI device IDs. The Device Class column lists the types of PCI devices. The detector board of the instrument is indicated as "Unknown PCI Device".	If the line "Unknown PCI Device" is missing, the detector board has not been identified and the measuring application cannot be started. If the remaining PCI devices have all been identified, the detector board will probably contain the error, which is why the board must then be replaced.
After this test, the BIOS has been loaded and the operating system is started.	The message "No System Disk or Disk error ..." at this point indicates that the contents of the hard disk are not correct. Replace the hard disk.
At successful installation of Windows XP, the following selection menu is displayed: **Please select the operating system to start:** **Analyzer Firmware** **Analyzer Firmware Backup** **Use the up and down arrow keys to move the highlight to your choice.** **Press ENTER to choose.** **Seconds until highlighted choice will be started automatically: 0** **For troubleshooting and advanced startup options for Windows, press F8.** **The Windows XP start screen will appear in a few seconds.**	If the instrument has started correctly so far, there is most probably no fault in the computer; the boot problem presumably results from a defective system file on the hard disk.

Normal action	Error and error cause
	If the operating system on the hard disk has been destroyed and cannot be loaded correctly, Windows XP displays a "bluescreen". This bluescreen contains all essential information about the internal states of the computer which are displayed as follows (by way of example):

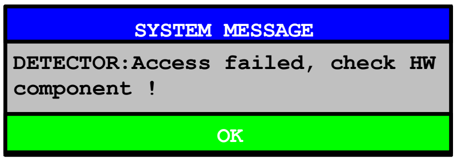


After the operating system is started, the application for the instrument is loaded in a start-up program. The program start is initiated automatically and generates a window that displays information about the start-up procedure.	Windows XP and the instrument firmware must then be updated from the back-up partition (see chapter 4, section "Software Update").

Normal action	Error and error cause
	
	If a "bluescreen" is displayed when loading, a cold start may be necessary. Proceed as follows in this case: Cold start (see section "Performing a Cold Start") Firmware update from the backup partition if cold start is not successful (see chapter 4).
While booting, the detector board is identified again.	If the detector board (wideband detector unit with FSMR-B73) is not identified, the following message is issued:



Normal action	Error and error cause
When the program has been loaded, the measurement hardware is initialized first. A timer which is controlled by a 32 MHz clock signal is set on the detector board. This test reveals proper functioning of the detector board and the clock oscillator in the (RF converter).	If there is an error on the detector board or the clock is missing, the following message is displayed:



After passing the function tests, the analog boards are initialized and the correction data EEPROMs are loaded.	In this case, first check the clock generation in the instrument.
The reference is generated on the synthesizer. This 128 MHz reference is necessary for proper functioning of the detector board.	The following measurements are appropriate to check the reference supply:

Measurement:	**Result:**
Synthesizer A100, X114: rated value 128 MHz, 0 dBm ⇓	No signal: replace synthesizer.
Synthesizer A100, X114: rated value 32 MHz, 0 dBm	No signal:replace synthesizer.

If no error occurs with the clock generation, booting can be continued by acknowledging the error message using "OK"

If no error message or any other information on the error source is issued during booting, the error can only be determined by replacing the detector board (wideband detector unit with FSMR-B73) or the front-module controller.

Troubleshooting - Loading Module EEPROMs

- **Error: Data of modules cannot be read.**

Normal action	Error and error cause
On booting the instrument, all calibration data required must be written to the RAM of the computer. The calibration data of a module is either read from the EEPROM (in the case of a cold start from EEPROM only) or from the associated binary file. The module information is read from the module EEPROMs in the case of a cold start. Otherwise the binary data is read from the hard disk during starting (e.g. motherb.bin).	
If reading at the desired address is not possible, the software assumes that the module is not available.	For modules that must always be available (e.g. IF filter), an error message will be output: Error reading EEPROM of IF Filter
The calibration data are then read from the file pertaining to the module (e.g. motherb.bin).	If the binary data cannot be read out without error, an error message will be output, e.g.: Error reading file of IF Filter
If reading at the address of an optional module is not possible, this module is marked as not available in the module array for storage of the module information. If the file pertaining to the non-available module does exist, it is assumed that upon the last successful booting the module was available but has been removed meanwhile. The file with the calibration data of the module is erased. Moreover, the data collected during the last calibration is invalid and only saved as a backup copy on the hard disk	If reading at the address of a module is possible but the contents of the data block are faulty (e.g. check sum of header block incorrect), the calibration data of the respective module is read from the associated file. The firmware assumes that the module is available. The information read from the file is entered into the array for storage of the module information. Error reading EEPROM of IF Filter

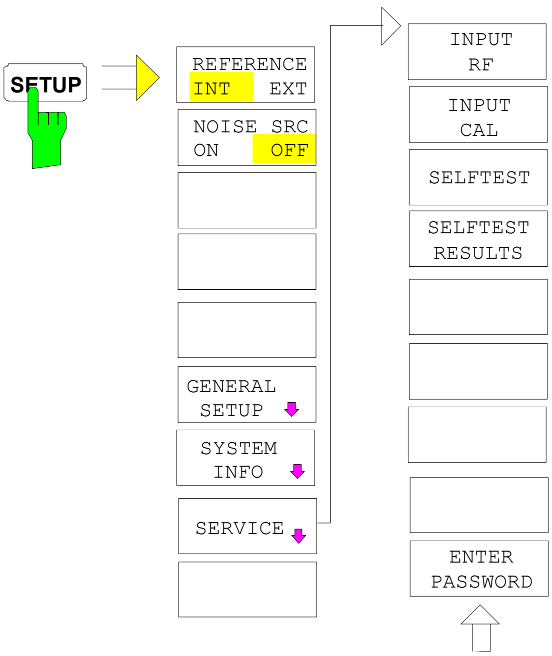
Normal action	Error and error cause
Upon successful reading of the module header from the EEPROM, the contents of the module header is compared with the module header of the associated binary file. If the module header can be read from the file and complies with the header read from the EEPROM, the assumption is made that the contents of the module EEPROM have already been mapped in the binary file. The calibration data can thus be written from the file to the RAM.	If, however, the associated file cannot be found or if the module header of the EEPROM differs from that of the file, the total EEPROM contents must be written to the RAM and then saved in the binary file.
	Error finding file of IF Filter
After loading the calibration data from the EEPROMs, the calibration data are loaded from the calibration data files (e.g. DDC settings for various filters). First the relevant calibration data file is written to the calibration data memory.	If an error occurs upon loading the file into the memory, an error message is output:
	Error reading file of DDC Filter
After loading the calibration data from the EEPROMs and files, the data collected during the last calibration is loaded from the 'rdf_cal.bin' file into the calibration data memory. This process takes place only if valid calibration data (and the 'rdf_cal.bin' file) is available.	If there is no valid calibration data, the status message "UNCAL " is output informing the user that the instrument is uncalibrated.

Troubleshooting via Selftest

The selftest is provided for identification of instrument errors and tolerance violations that cannot be corrected by self-calibration of the instrument.
All signal paths are connected and the signal is traced via test points. The selftest checks all possible hardware settings that are used for the self-calibration with regard to a sufficient setting range including reserves.

Service Level 1 - Test Following the Entry of a Password
When entering the password, the test result is recorded in detail and, in case of a fatal error (such as a failure of the operating voltage), the selftest is *not* aborted.

The selftest can be called in the *SETUP - SERVICE* menu:



- Enter the password 894129 with *ENTER PASSWORD*.
- Initiate the selftest of the instrument modules using the *SELFTEST* softkey.

While the selftest is running, a message box is displayed that shows the current test and test result.

- Pressing ENTER ABORT aborts the test run.

All modules are tested one by one and the test result (selftest PASSED or FAILED) is output in the message box

The *SELFTEST RESULTS* softkey calls a complete list of all test results.
If an error occurs, a brief description of the failed test, the module concerned, the valid range and the measurement value are displayed.

```
Total Selftest Status: ***FAILED***
Date (dd/mm/yyyy): 10/06/1999 Time: 16:34:47
Runtime: 05:59

Supply voltages detector
test description    min       max       result    state
+6V                   5.88      6.42      6.06    PASSED
+8V                   7.84      8.96      8.56    PASSED
+12V                 11.76     12.83     12.42    PASSED
-12V                -11.33    -13.28    -11.85    PASSED
+28V                 26.62     29.39     28.34    PASSED
```

If the result is ***FAILED***, look not only for entries marked with FAILED** but also those marked with SKIPPED. These entries indicate that a test item was not carried out, because the conditions had not been met. In this case, an error is present only if the instrument cannot be calibrated.
The selftest with password returns FAILED as the overall status, because the instrument will no longer be able to be calibrated in the near future due to temperature drift or aging.
The selftest without password returns the overall status of PASSED; in this case as well, however, the skipped test items are marked with SKIPPED as an aid for the service technician.

Running Selftest and Error Messages
Overview

The calibration source on the IF filter module is used as a signal source for testing the signal path.

1. Measurement of the operating voltages

   of the power supply
   regulated operating voltages on the detector and IF filter modules
2. Temperature measurement on the IF filter board
3. Testing the fourfold D/A converter on the detector
4. Synthesizer test
5. Lock test YIG oscillator and LO level test on RF converter
6. Testing of the signal paths on RF converter, IF filter and detector
7. Test of optional modules

All measurements on the analog boards are independent of the gate arrays on the wideband detector unit, since individual A/D converters are provided for them on the analog boards. The interface section in the FPGA of the wideband detector unit must function properly to read these A/D converters. This is always tested when the instrument is switched on.

The signal path via the gate arrays on the wideband detector unit is tested using a known, analog signal at the input of the A/D converter on the wideband detector unit. The analog test signal is provided by the preceding analog tests.

Since the operating voltages are measured first, it is ensured that the selftest can be performed correctly. If an operating voltage not required by the selftest has failed, this is correctly signaled in the error list. If, however, all operating voltages are indicated to be faulty, it may well be assumed that the operating voltage for the selftest has failed or the selftest A/D-converter itself is defective.

Testing Operating Voltages

When an operating voltage fails, the selftest is aborted to avoid subsequent errors.

The test is not aborted after entry of the password. All subsequent errors are then listed in the result record. Errors that have occurred irrespective of the voltage failure can then still be detected.

The error message indicates the error source (power supply, IF filter, wideband detector unit) and the voltage that has failed.

Normal action	Error and error cause
Power Supply The voltages of the power supply and the –6 V regulator (DC/DC converter from –12 V to –6 V on the motherboard) are measured at the board connector by means of the selftest A/D converter on the wideband detector unit.	

Channel	Nominal voltage
1	+6V
2	+8V
3	+12V
4	-12V
5	+28V
7	-6V

FATAL ERROR!

Power supply: DC FAIL +6V.
Selftest aborted.

- ➢ If error messages occur, the voltages on the motherboard should be checked. The tolerances given in the column "Tolerance range power supply / voltage regulator" apply in this case. If the voltages are within the tolerance limits, the error must be located in the selftest:
- ➢ Replace the wideband detector unit.

Regulated voltages on the boards
Wideband detector unit

Channel	Nominal voltage
6	-5V

FATAL ERROR!

Detector: DC FAIL -5V.
Selftest aborted.

- ➢ If no faults have been found in the preceding tests, the wideband detector unit has to be replaced.

Temperature Measurement on IF Filter

Normal action	Error and error cause
The temperature is measured first.	WARNING! IF FILTER: Operating temperature xx °C - out of range If the temperature does not lie within the permissible range of 0° to 70°C, the warning will be output.
Subsequently the operating voltages are measured.	➢ Check the temperature data for plausibility. The fan might be defective or the ventilation slots might be covered. If the indicated temperature data is not plausible, e.g. 120° C when the instrument is cold, the temperature sensor or the selftest may be faulty. If, in the following, the *first* operating voltage (or all operating voltages after entering the password) is measured incorrectly, the selftest will obviously be defective.

Channel	Nominal voltage	Expression displayed in the error message
74	- 5 V	UREF-5
77	+2.5 V	UREF+2.5
76	+3.3 V	+3.3 V
73	+5 V	+5 V
72	+10.6 V	+10 V
71	-5 V	-5 V
70	-10,6 V	-10 V
75	+5 V	+5 VR

➢ The IF filter board must always be replaced if an error message occurs that refers to these operating voltages or the temperature (if not plausible).
The voltage of the temperature sensor is used for temperature compensation of the filters. Thus, a faulty temperature sensor may detune the filters such that subsequent errors are likely to occur.

Checking 4-fold D/A Converter on Detector Board / Wideband Detector Unit

Normal action	Error and error cause
Pretune-DAC Test The 4-fold D/A-converter on the detector unit is checked. One D/A converter controls the frequency-dependant IF gain on the IF filter for frequency response correction. The other ones are provided for options (microwave converter, tracking generator). The first output voltage of the 4-fold D/A converter is measured, thus checking the basic function of the control interface (in DCON gate array), also.	
	FATAL ERROR! Detector: Pretune DAC FAIL - check DCON and pretune DAC Selftest aborted.
	➢ Replace the wideband detector unit

Channel	Nominal voltage
8	666 mV

Testing Synthesizer

Normal Action	Error and error cause

Channel	Voltage nominal	Expression displayed in the error message
11	- 5 V	-5 V
01	+5 V	+5 V
21	+7 V	+7 V
60	+12 V	+12 V
41	+28 V	+28 V

➢ If there is an error message referring to these operating voltages, the synthesizer is always to be replaced.

Temperature measurement:
The synthesizer accommodates a temperature sensor for the module temperature and one monitoring the heater of the 128 MHz reference oscillator.

Test channel 71

WARNING!
Synthesizer: Temperature out of range

Test channel 51

WARNING!
Synthesizer: Temperature 128 MHz reference range

➢ In the case of an impermissible temperature, tuning the 128 MHz oscillator to the correct frequency may not be possible since the SC cut crystal used is specified for a temperature of 70 °C.

Reference signals on the synthesizer
The control loops on the synthesizer are checked for the locking status and the set control voltage.

10 MHz OCXO level:
Level detector channel 00.

FATAL ERROR!
10 MHz OCXO defective !

➢ Replace the synthesizer in case of error.

128 / 384 MHz oscillators:
Testing the 128 MHz crystal oscillator and the third LO.

ERROR!
Reference 128 MHz / 3rd LO unlocked !
Reference 128 MHz / 3rd LO out of tuning range !

The instrument may still work properly, but the tuning voltages are almost at the limit or the frequency accuracy is out of tolerance.

➢ Replace/adjust the synthesizer.

Normal action	Error and error cause
Sweep synthesizer:	
Testing the tuning voltage at the sweep VCO 600 (595) - 620 MHz	ERROR! Sweep synthesizer unlocked ! Sweep synthesizer out of tuning range ! If the sweep VCO fails, the YIG oscillator does not lock or it locks at an incorrect frequency and also signals unlock. ➢ Replace synthesizer.
Second local oscillator Testing the tuning voltage at the 4224 MHz oscillator	FATAL ERROR! 2nd LO tuning voltage out of range ! If the second local oscillator fails, it is possible that the YIG oscillator does not lock or it locks at an incorrect frequency and also signals unlock. ➢ Replace synthesizer
Calibration signal control voltage: Checking the detector voltage in the level control of the Cal signal	ERROR! Calibration signal error If the control voltage is out of tolerance, the level control loop unlocks and the level becomes inaccurate. In the case of a small level error, the selftest of the signal path is possible. However, the level measuring accuracy will be out of tolerance after instrument calibration. ➢ Replace synthesizer.

Testing RF Converter

Normal action	Error and error cause

Channel	Voltage nominal	Expression displayed in the error message
60	+5 V	+5 V
61	2.5 V	DAC Reference
62	+7 V	+7 V
63	+11 V	+11 V
64	+28 V	+28 V

- The RF converter is always to be replaced if there is an error message referring to these operating voltages.

Temperature measurement:
The RF Converter accommodates a temperature sensor for the module temperature.
Test channel 67

WARNING!
RF Converter: Temperature out of range

- Check air supply and fan for proper functioning.

Test LO level

The level detectors of the second and third LO are read:

Channel	Oscillator	Expression displayed in the error message
3	LO 3	Level 3rd Local
2	LO 2	Level 2nd Local

- In the the voltage is too low, also check the level at the module input in the selftest poll! Setting Center, Zero Span
- + 10 dBm / 384 MHz at X 101
- + 7 dBm / 4224 MHz at X105

If the levels are correct, replace the RF converter. If the levels are not okay (deviation > 3 dB), measure the signals at the synthesizer again and replace the synthesizer, if necessary!

YIG oscillator test:

The YIG oscillator is tuned throughout the entire frequency band. The pretuning (with upper and lower limit) is also tuned with a small offset from the actual frequency. If the current flowing through the YIG coil and set by the PLL reaches one of these limits, the unlock detector will respond. This is a test both for the pretuning values and for functioning of the PLL.

FATAL ERROR!
YIG Oscillator unlocked !

- Replace the RF converter in the case of error.

Test input mixer

The mixer diodes both rectify part of the LO power. The two voltages can be polled via the selftest channels 0 and 1.

If the two voltages are missing or too low, the LO level is presumably missing, which is why an error message appears:

FATAL ERROR!
1st LO level low or 1st mixer defective !

If the two voltages differ (>20 %), the mixer is asymmetric, i.e. one of the two diodes is damaged.

FATAL ERROR!
1st Mixer symmetry out of tolerance !

In both cases:

Replace RF converter

Testing Signal Path via Attenuator

The internal source for the test signal (CAL signal) has already been tested when testing the reference signals. The first and second mixer feature sufficient LO power, i.e. the conversion from the RF to the second IF should therefore work properly.

Normal action	Error and error cause

Signal path via RF attenuator
The measurement is made at the second IF using a logarithmic detector on the RF converter. The 0 dBm test signal is measured with the following attenuator settings:

RF-Att	Coupling	Test
0	DC	Reference measurement
0	AC	AC/DC switch +-5 dB
5	DC	5-dB attenuator +- 5 dB
10	DC	10-dB attenuator +- 5 dB
20	DC	20-dB attenuator +- 5 dB
40	DC	40-dB attenuator +- 10 dB

- If there is **no** measured value within the tolerance range, the error is likely to be located in the subsequent signal path. It is not likely that all attenuator stages and the 0-dB position are faulty; therefore, the following error message appears.

FATAL ERROR!
Input level RF converter out of tolerance !

- Before replacing the RF converter, measure the input level at X108 in any case. For this purpose, the input is connected to the Cal source with 0 dBm and 0 dB attenuator DC coupling. The level should lie at 128 MHz and 0 dBm. Otherwise, check level at X125.
- If the level is okay, replace the RF converter.
- If the signal is not applied at the synthesizer either, replace the synthesizer.
- If only individual measurements are out of tolerance, the RF attenuator is defective.

FATAL ERROR!.

RF Attenuator xx dB pad failed !

Caution: Since a faulty RF attenuator causes many subsequent errors to occur with the IF filter test, proper functioning of the attenuator is a must.

Signal Paths on IF Filter Board

Normal action	Error and error cause
Input level of IF filter / calibration amplifier (CAL-Amps 1 + 2)	FATAL ERROR! IF board: IF input level / CALAMP Selftest aborted
	Possible error causes: • Signal path interrupted in the RF converter. • Erroneous EEPROM data in the RF converter leading to incorrect setting of CAL_Amp1. • CAL_Amp1 or 2 faulty. Troubleshooting ➢ Check the level applied at X132 with 0 dBm mixer level: Nominal –3 dBm, production tolerance ± 3 dB, max. permissible ± 4.5 dB; ➢ Replace the RF converter if the deviation exceeds this value. If the level lies within the tolerance, a defective CAL_Amp may have caused the error. The setting ranges of the CAL_Amps are later tested during the selftest. The selftest is not interrupted after entry of a password. ➢ Note whether the result file contains any error messages concerning the CAL_Amps. If there is no CAL_Amp error, the CAL_Amps will be set incorrectly. The EEPROM data in the RF converter are obviously incorrect.
LC filter I and XTAL filter The level measurement is performed with wide and narrow bandwidths of the LC filter. Subsequently, an additional measurement is performed via the crystal filter. If the LC filter does not work properly, the measurement of the crystal filter is not performed.	
	ERROR! IF board: LC Filter-1/2 wide XTAL Filter not tested
	ERROR! IF board: LC Filter-1/2 narrow XTAL Filter not tested
	ERROR! IF board: XTAL Filter
	➢ The IF filter board must be replaced in all cases.

Normal action	Error and error cause
StepGain (IF amplifier) The 10 dB Step Gain (Step Gain Coarse) and the 0.1 dB Step Gain (Step Gain Fine) are tested. The input level is attenuated in steps of 10 dB by the RF attenuator and simultaneously amplified by means of the StepGain by the same amount. The level detector C checks to ±6 dB (user) or ±4 dB (service level 1).	
	FATAL ERROR! IF board: Step Gain Fine Selftest aborted
	➢ Test with Step Gain Coarse bypassed (0 dB) and Step Gain Fine set to 0 dB. If an error occurs, Step Gain Fine does not work correctly or the signal path is interrupted. ➢ Replace the IF filter board.
	ERROR! IF board: Step Gain Coarse
	➢ Testing the amplifier stages.
	ERROR! IF board: Step Gain Fine
	➢ Testing the amplifier stages. ***Attention:*** *If the RF attenuator test has already caused an error message, Step Gain cannot be tested and an error message must be ignored!* ➢ If the RF attenuator test passed without any error, Step Gain is defective. ➢ Replace the IF filter board. However, the selftest can be continued since it does not require the IF gain.

Signal Paths on Detector Board / Wideband Detector Unit

Normal action	Error and error cause
Various settings of the detector unit are checked via the normal display function, i.e. FFT mode, digital filters and analog filters. Possible error messages:	
	ERROR! Detector Board: FFT Detector Board: FIR Detector Board: Video

Testing Baseband/Cal Gen board

Normal action	Error and error cause
Various settings of the baseband section are tested i.e. range 0.4 V/ 4 V.	ERROR! ➢ Replace the Baseband/Cal Gen board.
Power reference control voltage: Checking the detector voltage in the level control of the Power Reference signal	ERROR! If the control voltage is out of tolerance, the level control loop unlocks and the level becomes inaccurate. ➢ Replace Baseband Cal Gen.

Troubleshooting RF Converter 1

Depending on the kind of error, a few measurements should be performed on the RF converter before the module is replaced:

- IP3 too high
- Signal level too low
- LO feedthrough too high
- Spurious signals

These errors may be caused by a defective input mixer. Since this mixer is directly connected to the input connector, it may be easily destroyed by the user.

A defective mixer can be recognized from a very high display of > -10 dBm at the frequency 0 Hz with 0 dB input attenuation.

Action	Error and error cause
Measure with diode tester at X101: rated value: approx. 0.6 V voltage in the forward and reverse directions with a current of 1 mA.	Different values in both directions, high-impedance or very low-impedance: mixer defective : replace RF converter

- **Signal missing or displayed with incorrect frequency**

If the signal is missing or the instrument signals "LOUNL", the conditioning of the 1st LO is probably not correct. The function of this oscillator requires both the EEPROM data and the reference frequency of the second module.

Action	Error cause/remedy
Measure function of the 1st LO in zero span. check signal at X107: rated value: 4628.4.4 MHz above the current input frequency (between 0 Hz and 3.6 GHz) and the signal level is approx. –5 dBm.	The frequency is considerably higher or lower or the signal is not stable replace RF converter

Troubleshooting MW Converters

The most common error on MW converters is that the displayed signal level on the signal analyzer > 3.6 GHz is too low or missing altogether.

Level ratios on MW converter

Action	Error cause/remedy
Apply a high-frequency signal (f > 3.6 GHz) at the MW converter input with a level of -20 dBm and measure the IF level at the output connector with a spectrum analyzer. The center frequency of the FSMR must be set to the frequency of the signal generator, and the span must be set to 0 Hz. If the instrument is operated on an adapter, the LO (connector X102 RF converter) and -- with the models >26 -- the 2nd LO (connector X114 synthesizer) must be taken out to the MW converter (connector X167 /X1611). FSMR 26/50: - Diplexer input connector: X168 - Output connector: X162 Output level at 404.4 MHz: > -20 dBm	If the level is missing or too low, a module is defective on the MW converter. Check levels of the modules on the MW converter unit (see following items). If the measured level is within tolerances, the attenuator or a subsequent module in the signal path is defective.

Level ratios on diplexer

Action	Error cause/remedy
Apply a high-frequency signal (f > 3.6 GHz) at the diplexer input with a level of -20 dBm and measure the level at the output connector. FSMR 26: - Diplexer input connector: X168 - Diplexer output connector: X5 FSMR 50: - Diplexer input connector: X168 - Diplexer output connector: X7 Output level: >-27 dBm	If the level is missing or too low, replace the diplexer (see "Replacing the Diplexer Module"). If the measured level is within tolerances, one of the subsequent modules on the MW converter is defective.

Level ratios on YIG filter unit (Option FSMR-B2)

Action	Error cause/remedy
Apply a high-frequency signal (f > 3.6 GHz) at the YIG filter input with a level of -25 dBm and measure at the output connector. Set the FSMR to the center frequency of the signal generator and a span of 0 Hz. - Input connector: J1 - Output connector: J2 Output level: >-33 dBm	If the level is missing or too low, replace the diplexer (see "Replacing the YIG Filter Unit Module"). If the measured level is within tolerances, one of the subsequent modules on the MW converter is defective.

Level ratios on RF extension

Action	Error cause/remedy
Apply a high-frequency signal (f > 3.6 GHz) at the RF extension input with a level of -10 dBm and measure at the output connector. Set the FSMR to the center frequency of the signal generator and a span of 0 Hz. If the instrument is operated on an adapter, the LO (connector X102 RF converter) must be taken out to the MW converter (connector X167). FSMR 26: - Input connector: X1 - Output connector <26.5 GHz: X3 <u>Output level at 404.4 MHz:</u> f = 3.6 GHz to 26.5 GHz: >-26 dBm FSMR 50: - Input connector: X1 - Output connector: X4 Output level at 404.4 MHz: f = 3.6 GHz to 26.5 GHz: >-26dBm - Input connector: X1 - Output connector: X5 Output level at 404.4 MHz: f = 29.6 GHz to 42.3 GHz: >-30 dBm Output level at 4.6284 GHz: f = 27 GHz: >-30 dBm f = 45 GHz: >-35 dBm	If the level is missing or too low, replace the diplexer (see "Replacing the RF Extension Module").

Troubleshooting - Wideband Detector Unit (Option FSMR-B73)

The extensive selftest will detect most of the faults that may occur on the wideband detector unit.

Selftests performed

- complete signal path for analog filters, digital filters and FFT
- detectors
- PCI interface, data transfer from and to main processor
- signal processing chain (resampler, wideband DDC, RAM, DSP)
- clock synthesizer
- Pretune DAC
- frequency and time sweep
- supply voltages

Any "failed" in the test results of the detector board indicates a fault in this unit, provided the tests of the preceding boards (RF converter, synthesizer, IF filter) have all been passed. For example, the tests of the detector board signal path rely on a correct IF or video input signal.

Part of the signal path is tested only functionally. Performance testing is restricted from the analog input (IF/Video) via the A/D converter to the correction RAM. For example, a blocked bit (except one of the most significant ones) cannot be detected, as there is no test pattern available from ADC.

If the selftest has been passed but the instrument shows unexpected response in the spectrum display such as spikes, strong noise, pumping noise floor, spurious, stepped curves and so on, some additional tests should be performed to prove that the fault is actually in the detector unit.

To ensure that the detector board receives an error-free signal, a signal generator must be used to substitute the IF/video signal.

Test Setup

Connect signal generator (50 Ω output impedance) to X149 of the detector board.

Video Path, Differential Linearity Test

This is a sensitive test for blocked bits.

Signal generator settings
Frequency 1 kHz
Level -1.7 dBm

R&S FSMR settings
Preset
Zero Span
Sweep time 300 µs
AMPT Range Linear
CAL Cal Corr Off
Trigger Video

Expected display

Continuous sinewave-like trace without significant steps
(very small steps are due to noise and pixel resolution)

Why use a linear display? The instrument expects a logarithmic signal at the ADC input. In case of a linear display, the signal is therefore log/lin converted. In the test case, a linear signal is used instead at the ADC input. The log/lin conversion then considerably magnifies differential errors at high levels, yet the whole level range is displayed.

Fig. 3-16 shows the trace of an error-free unit.
In the trace shown in Fig. 3-17, there is an error at the seventh highest bit (differential error = 1/128 of range). Due to the log/lin conversion the effect is extremely magnified at higher levels.

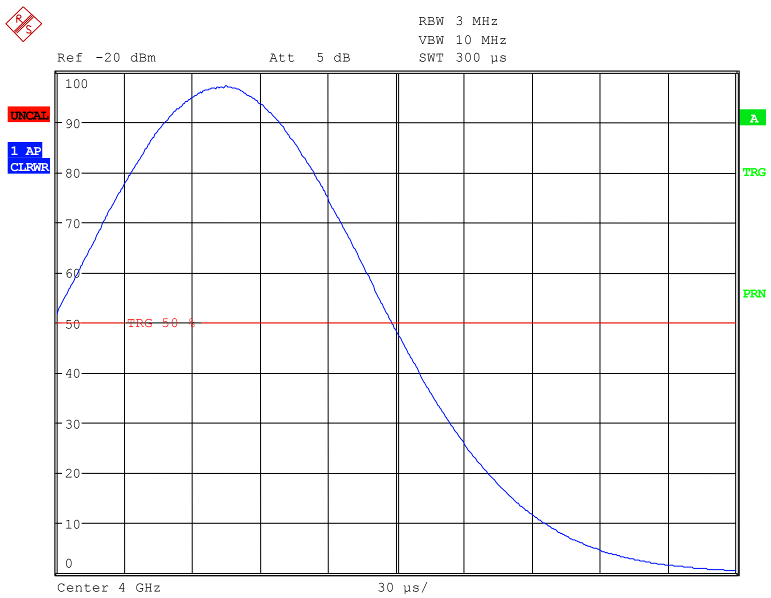


Fig. 3-16 Video path differential linearity test, error-free unit

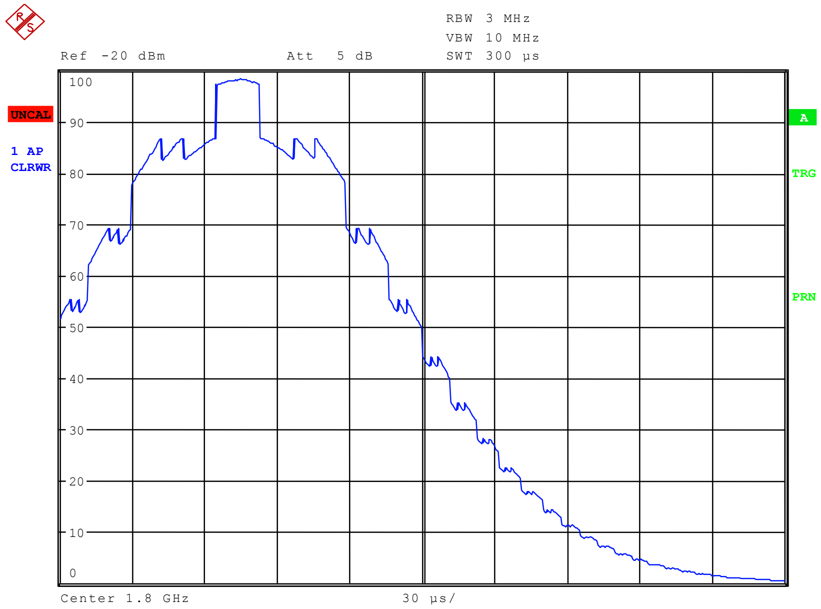


Fig. 3-17 Video path differential linearity test, faulty unit (blocked bit).

FFT Path Performance Test

FSMR settings
Preset
Span 50 kHz
RBW 100 Hz
Filter Type FFT
AMPT: Log Range Manual 120 dB
CAL: Cal Corr Off

Noise floor

Signal generator setting
Level OFF (50 Ω termination alternatively)

Expected display

Noise at the bottom line of the display (see Fig. 3-18).

Possible errors:
Higher noise (more than 10 dB compared to Fig. 3-18)
Higher noise in single sweeps (needs some observation time)

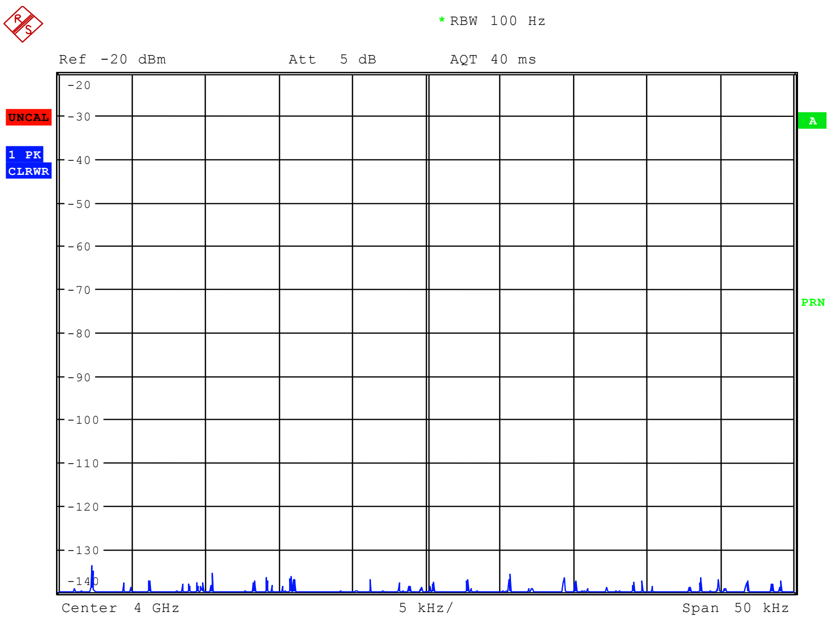


Fig. 3-18 FFT test, noise floor, error-free unit

Full Scale Test

Signal generator settings
Frequency 20.4 MHz
Level -2.9 dBm

FSMR setting
Marker to peak

Expected display

Spectrum of clean CW signal at center frequency (see Fig. 3-19) , level -20 dBm ±2 dB (marker readout)

Possible errors:
level out of tolerance
distorted spectrum
spurious
extreme noise

Note: *The signal generator sets the limits for spurious and phase noise!*

Fig. 3-19 is derived from a high-quality signal generator (R&S SMHU).

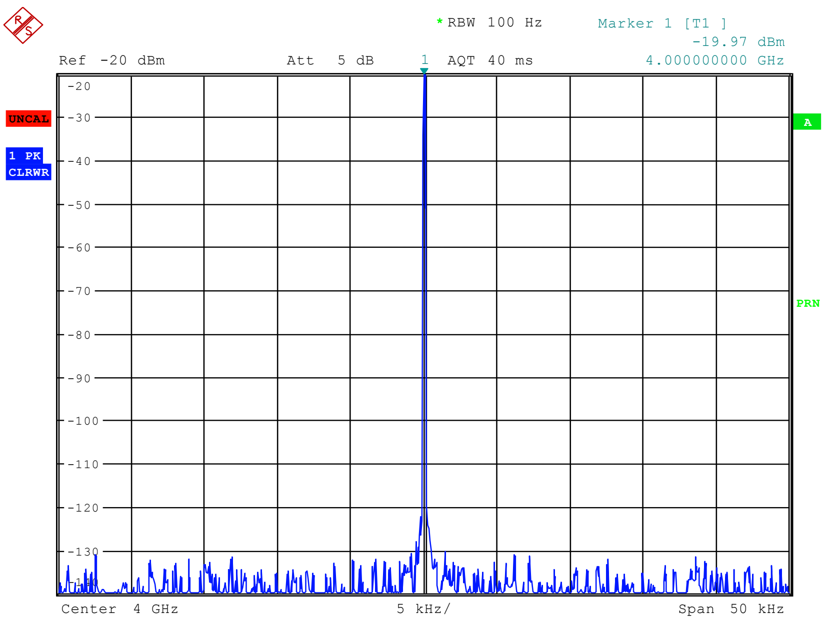


Fig. 3-19 Full-scale test, error-free unit

Linearity test

Signal generator settings
Frequency 20.4 MHz
Level -2.9 dBm

FSMR settings
Marker to peak, reference fixed

Signal generator settings
Frequency 20.4 MHz
Level -12.9 dBm to –52.9 dBm in 10 dB steps

Delta marker readout

Signal generator	-12.9 dBm	-22.9 dBm	-32.9 dBm	-42.9 dBm	-52.9 dBm
Delta marker	-10 ±0.5 dB	-20 ±0.5 dB	-30 ±0.5 dB	-40 ±0.5 dB	-50 ±1 dB

Note: *Use step attenuator if the signal generator's level linearity is worse than 0.2 dB.*

Phase noise test

Signal generator setting
Frequency 20.4 MHz
Level -42.9 dBm

Expected display

Spectrum of clean CW signal at center frequency, level approx. -60 dBm.
The noise level must not be higher than the noise level measured in the noise floor test (see Fig. 3-20)

Presumption: Signal generator phase noise ≤-100 dBc / Hz at >1 kHz offset

Possible errors:
phase noise higher than thermal noise floor (example: Fig. 3-20)
Distorted spectrum
Spurious

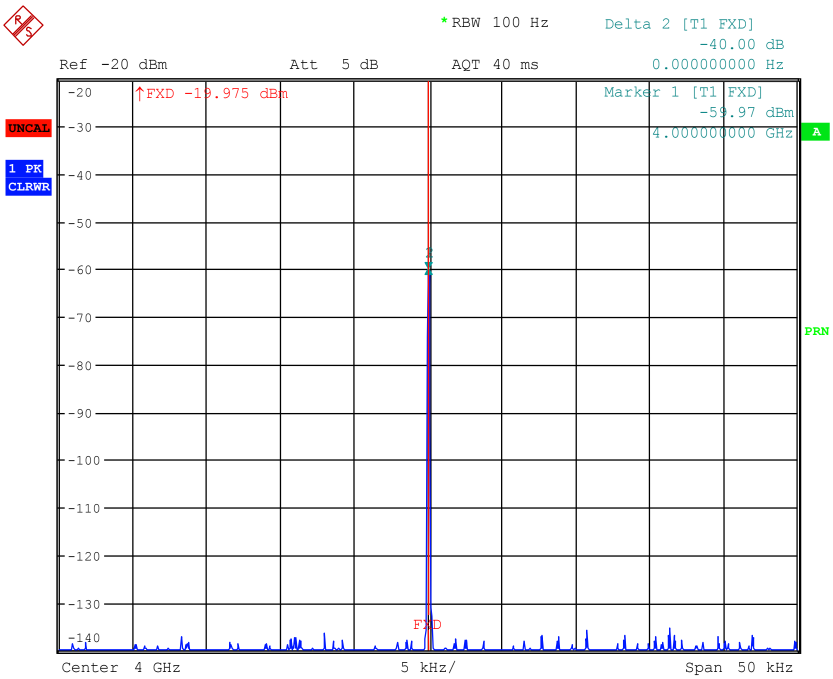


Fig. 3-20 Phase noise test, error-free unit

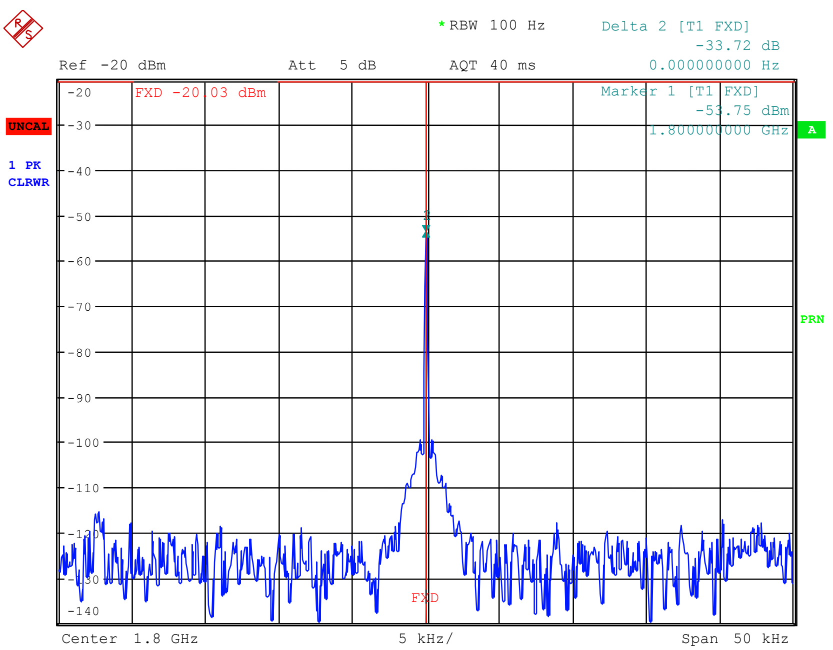


Fig. 3-21 Phase noise test, faulty unit (high phase noise)

Contents - Chapter 4 "Software Update/Installing Options"

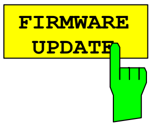
4 Software Update / Installing Options

This chapter contains information on software updates, restoring the operating system installation and installing options on the R&SFSU. Additional manuals obtained together with a software/firmware update or with subsequently acquired options can be filed here.

Installation of New R&S FSMR Software

A new firmware version can be installed using the built-in diskette drive. The firmware update kit contains several diskettes.
The installation program is called up in the *SETUP* menu.

SETUP sidemenu:

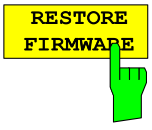


The *FIRMWARE UPDATE* softkey starts the installation program and leads the user through the remaining steps of the update

IE/IEEE-bus command: --

Performing the update:

Insert diskette 1 into the drive.
Call *SETUP* side menu *[**SETUP**][**NEXT**]*
Start update *[FIRMWARE UPDATE]*



The *RESTORE FIRMWARE* softkey restores the previous firmware version

IEC/IEEE-bus command: --

Restoring Operating System Installation

If the operating system can no longer be started, it is possible to start the analyzer in the boot menu from the backup partition and to restore the operating system installation.

Please select the operating system to start:

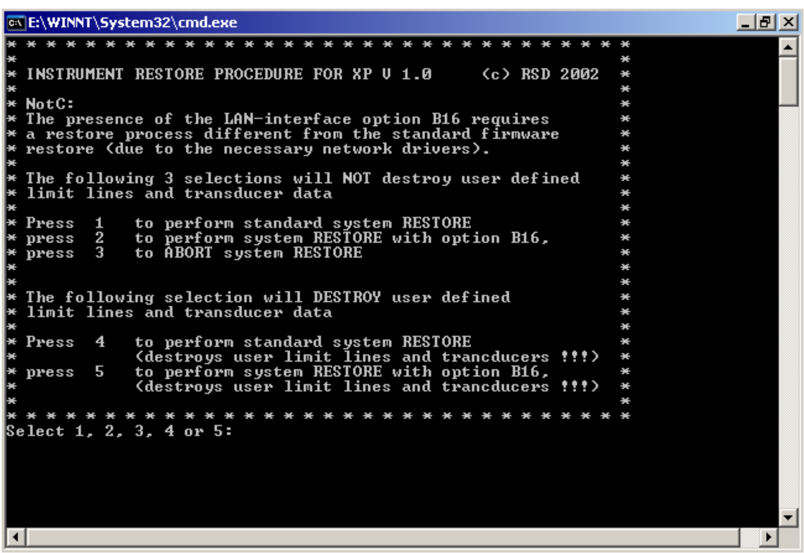
Analyzer Firmware
Analyzer Firmware Backup

Use the up and down arrow keys to move the highlight to your choice.
Press ENTER to choose.

Seconds until highlighted choice will be started automatically: 5

For troubleshooting and advanced startup options for Windows, press F8.

Use the cursor keys to select the operating system to start within the boot menu (*Analyzer Firmware Backup*) from the backup partition and confirm with ENTER.



After the operating system has been started from the backup partition, a window with various restore functions appears.

The desired function can be started by entering the corresponding number. The operating system files will now be copied from the backup partition to the analyzer partition.

After all files have been copied, the instrument boots and the firmware is installed. A cold start is then performed automatically to detect the analyzer hardware.

Installing Options

The following options are available with the R&S FSMR:

OCXO	R&S FSU-B4	1144.9000.02
Tracking Generator	R&S FSU-B9	1142.8994.02
Attenuator for Tracking Generator	R&S FSU-B12	1142.8994.02
Removeable Hard Disk	R&S FSU-B18	1303.0400.04
RF Preamplifier 3.6 GHz to 26 GHz	R&S FSMR-B23	1157.0907.05
YIG Preselection 3.6 GHz to 26.5 GHz with 20 dB Preamplifier 3.6 GHz to 26.5 GHz	R&S FSMR-B223	1157.1955.26
Electronic Attenuator	R&S FSU-B25	1144.9298.02
Trigger Port	R&S FSP-B28	1162.9915.02
Option Preselector for R&S FSMR 26	R&S FSMR-B2	1157.1903.26
Option Preselector for R&S FSMR 43	R&S FSMR-B2	1157.1903.43
Option Preselector for R&S FSMR 50	R&S FSMR-B2	1157.1903.50
Option Preamplifier 100 kHz to 50 GHz for R&S FSMR 26 / 50	R&S FSU-B24	1157.2100.50
Option Vector Signal Analysis	R&S FSMR-B73	1169.5696.02

For retrofitting, please note the mounting instructions enclosed with the options.
These mounting instructions can be inserted at this location in the service manual and will thus be available when needed.

NOTICE

Risk of Electrostatic Discharge

Disconnect the instrument from the mains before opening the casing. Also note the safety instructions at the beginning of this manual.

The components used in the instrument are sensitive to electrostatic discharges which is why they are to be dealt with according to the ESD regulations.

When installing hardware options, note the following:

➢ Switch off the instrument and pull the mains plug.
➢ Unscrew the 4 rear-panel feet (450) and push the tube (410) backwards and take off.
➢ After installing the option, replace the tube and screw the rear panel feet back on.

NOTICE

Risk of cable damage

When replacing the tube, be sure not to damage or pull off cables.

➢ Switch on the R&S FSMR (cold start).
➢ Install additional software, if supplied, according to the instructions enclosed with the option.
➢ If an adjustment is required for this option, refer to the installation instructions for the option.

Contents - Chapter 5 "Documents"

Tables

5 Documents

This chapter contains the spare parts list and the documents for the complete R&S FSMR unit. For general information about spare parts for our products please refer to the sheet "Procedure in Case of Service and Ordering of Spare Parts" at the beginning of this manual

Spare Parts

The stock numbers necessary for ordering replacement parts and modules can be found in the component lists further down.

Important Note

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 anti-statical protection.

Available Power Cables

Table 5-1 List of power cables available

Stock No.	**Earthed-contact connector**	**Preferably used in**
DS 006.7013	BS1363: 1967' complying with IEC 83: 1975 standard B2	Great Britain
DS 006.7020	Type 12 complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 006.7036	Type 498/13 complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 006.7107	Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365 DS 0099.1456	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight	Europe (except Switzerland)

ROHDE & SCHWARZ

Spare Part List

Mechanical Drawings

List of R&S FSMR parts including spare parts

The R&S FSMR is constructed in accordance with R&S design 2000.

Overall dimension: W x H x L, 426,7 x 176,5 x 517

Rackmount: 4E 1/1 T450

Accessories: 19"-Adapter ZZA-411, Stock no. 1096.3283.00

The recommended spare parts are marked with an x in the like column.

Table 5-2 List of all R&S FSMR part and spare parts

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
Document 1166.3311.01 (FSMR-instrument)					
10	Basic Unit	1166.1677.07	1 S		
15	Fan	1130. 0070.00	1 S	E1	x
17	Speaker	1129.9332.00	1 S	B1	x
20	Attenuator R&S FSU3/8	1137.0599.02	1 S	A40	x
23	Attenuator R&S FSU50	1170.0059.03	1 S	A40	x
25	Attenuator R&S FSU26	1046.5130.02	1 S	A40	x
26	Insolating plate	1129.9690.00	1 S		
27	DIN965-M2,5X6-A4-PA	1148.3288.00	4 S		
28	DIN6900-M2,5X6 -A2	1148.3059.00	3 S		
30	Ribbon cable W40	1130.2515.00	1 S	W40	
40	DIN6900-M2,5X6 -A2	1148.3059.00	2 S		
43	VOL/PHONES BOARD	1093.7094.02	1 S	A191	x
44	HOLDING BRACKET AF-OUT	1129.9326.00	1 S		
45	DIN6900-M2,5X6 -A2	1148.3059.00	1 S		
46	DIN965-M2,5X6-A4-PA	148.3288.00	2 S		
48	Rotary knob 13 ACHS-RD4T-GR	0852.1211.00	1 S		
49	Ring for rotary knob	0852.1228.00	1 S		
50	PROBE BOARD	1302.7101.02	1S	A80	x
55	DIN965-M2,5X6-A4-PA	1148.3288.00	4 S		

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
57	USB 2.0 ADAPTOR	1302.7253.02		A310	x
61	Subassembly plate II	1309.3324.00	1 S		
65	Power Sense Interface	1166.3270.00	1 S		x
67	Cable 4x2 with shield	5500.0213.00	1	1 S	
70	DIN965-M2,5X6-A4-PA	1148.3288.00	4 S		
72	3,5 MM GROUND SPRING	1142.8242.00	1 S		
91	Cover RD15,9	0009.9200.00	2 S		
100	RF CONVERTER	1130.4647.02	1 S	A100	x
105	SYNTHESIZER	1166.3170.02	1 S	A110	x
111	DETECTOR BOARD 1	1130.2196.06	1 S	A140	x
120	IF-FILTER	1130.2296.03	1 S	A130	x
125	Baseband / Cal Gen	1130.4401.02	1 S	A210	x
130	IEC-BUC CONTR.	1164.5200.02	1 S	A210	x
131	IEC-BUS Cable W21	1129.7252.00	1 S	W21	x
132	DIN125-A3,2-A4	0082.4670.00	2 S		
134	Aux control cable W22	1129.7269.00	1 S	W22	x
135	Locking bolt M3	0009.6501.00	2 S		
136	DIN137-A3-A2	0005.0296.00	2 S		
137	DIN934-M3-A4	0016.4398.00	2 S		
136	DIN965-M2,5X6-A4-PA	1148.3288.00	2 S		
140	MW-CONVERTER UNIT 26,5 GHz	1166.2338.21	1 S	A160	x
145	MW-CONVERTER UNIT 50 GHz	1166.2096.44	1 S	A160	
152	MW-CONVERTER UNIT 50 GHz	1166.2096.51	1 S	A160	x
160	Air cover	1129.9355.00	2 S		
161	Air cover	1129.9355.00	1 S		
170	Rear panel	1163.0092.00	1 S		
180	DIN6900-M2,5X6 -A2	1148.3059.00	6 S		
182	Cover I/Q DATA	1130.0006.00	1 S		
183	DIN7985-M2.5x6-A4-PA	1143.5630.00	2 S		

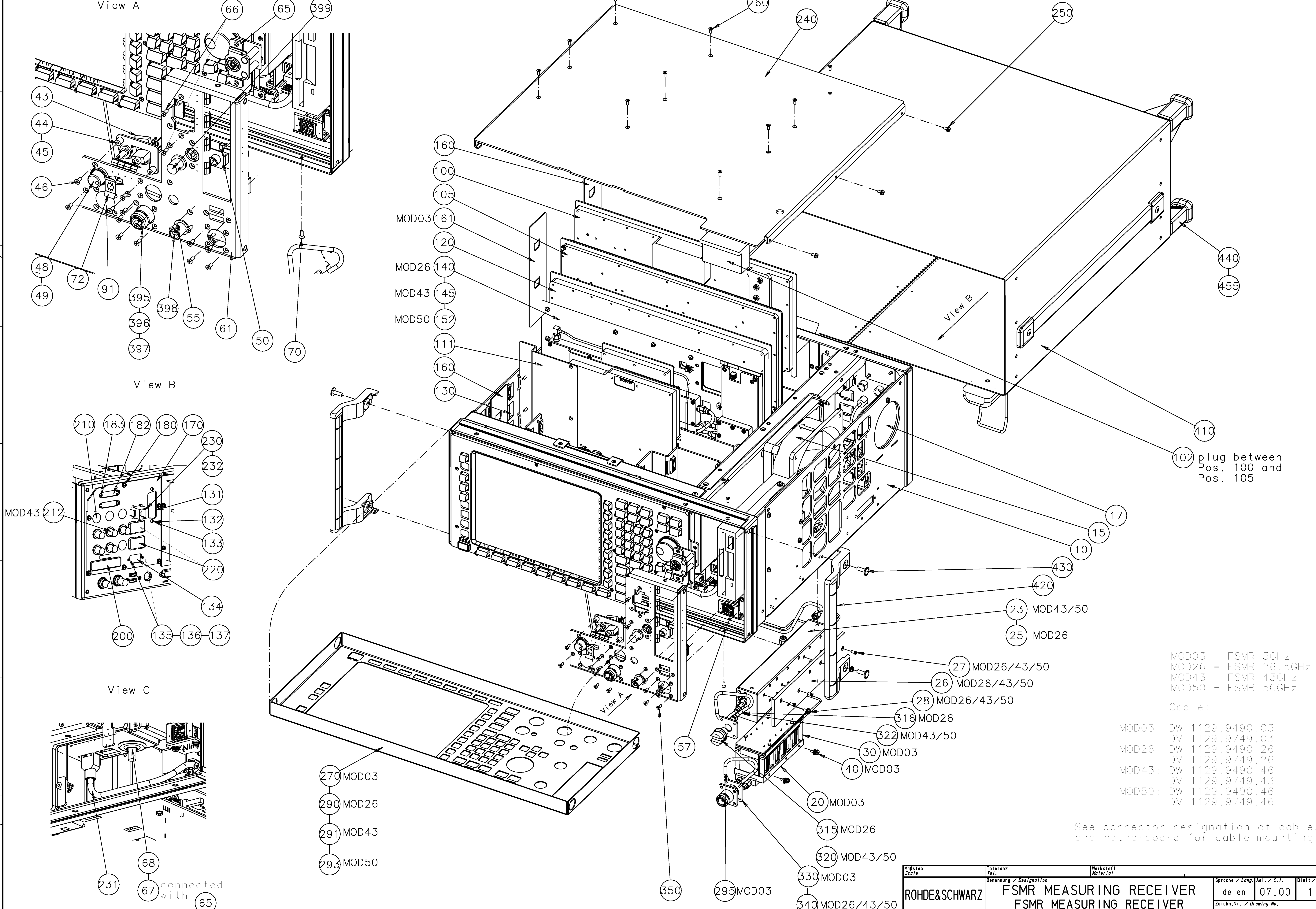
Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
190	Cover 9-pin SUB-D	1093.8990.00	1 S		
200	Cover 25-pin SUB-D	1093.9000.00	2 S		
210	Cover RD11,1/9,9	0009.9217.00	5 S		
Document 1093.4708.01 Sheet 4 (Display Unit)					
805	Assembly tray	1129.9426.00	1 S		
810	Shielded filter plate	1091.2014.00	1 S		
820	RF spring (177)	1069.3011.00	2 S		
830	RF spring (137)	1069.3105.00	2 S		
Document 1144.9017.00 (Option R&S FSU-B4 1144.9000.02)					
1100	OCXO	1093.7871.03	1 S	A200	x
1120	RF-cable W21	1129.9926.00	1 S	W21	
Document 1162.9921.00 (Option R&S FSP-B28 1162.9915.02)					
1360	USER-PORT CABLE W67	1142.8094.00	1 S	W67	x
1365	Locking bolt M3	0009.6501.00	2 S		
1370	DIN137-A3-A2	0005.0296.00	2 S		
1375	DIN934-M3-A4	0016.4398.00	2 S		
1380	Adhesive shield	1162.9938.00	1 S		
Document 1144.9300.00 (Option R&S FSU-B25 1144.9298.02)					
1400	ATTENUATOR (PARTLY ELECTRICAL)	1137.0724.02	1 S	A50	x
1410	Ribbon cable 10 POL	1129.7823.00	1 S		
1420	RF-CABLE W 27	1144.9330.00	1 S		
1425	RF-CABLE W27 (26,5 GHz)	1144.9323.00	1 S		

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
1430	RF-CABLE W28 (RF-CON)	1144.9346.00	1 S		
1440	RF-CABLE W28 (MW-CON)	1144.9352.00	1 S		
1460	DIN6900-M2,5X8 -A2	0071.5705.00	4 S		
Document 1130.1825.00 (Option FSMR-B18 1303.0400.04)					
1502	COMBI DRIVE SATA	1130.1819.00	1 S	A381	x
1505	DIN6900-M2.5X6 -A2	1148.3059.00	4 S		
1510	FLASHDISK MIT SOFTWARE FSUMR	1303.0417.04	1 S	A380	x
1550	SATA DATA CABLE 420	1091.3456.00	1 S	W30	
1560	SATA POWER CABLE 440	1091.3433.00	1 S	W29	
Document 1142.9090.00 (Option R&S FSU-B9 Tracking Generator 1142.8994.02)					
1800	Tracking Generator	1130.3605.02	1 S	A170	x
1810	RF-CABLE W41	1142.9003.00	1 S	W41	
1820	RF-CABLE W42 (RF-Con)	1142.9010.00	1 S	W42	
1830	RF-CABLE W42 (8GHz)	1142.9026.00	1 S	W42	
1840	RF-CABLE W43	1142.9032.00	1 S	W43	
1850	RF-CABLE W44	1142.9049.00	1 S	W44	
1860	RF-CABLE W45	1142.9055.00	1 S	W45	
1870	RF-CABLE W46	1142.9061.00	1 S	W46	
1880	RF-CABLE W47	1142.9078.00	1 S	W47	
1890	RF-CABLE W48	1142.9084.00	1 S	W48	
1895	ADAPTOR	0343.0257.00	1 S	X2	x
1900	MOUNTING PLATE	1093.4750.00	1 S		
1910	DIN965-M2,5X6-A4-PA	1148.3288.00	4 S		
1920	LABEL FSU-B9 FRONT	1142.9132.00	1 S		
1930	LABEL FSU-B9 REAR	1142.9126.00	1 S		

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
Document 1130.3240.01 page 6 (MW-Converter Unit 26.5 GHz)					
Document 1130.3240.01 page 2 (OPTION FSMR-B2 PRESELECTOR 1157.1903.26)					
Document 1130.3240.01 page 5 (OPTION FSMR-B23 PREAMP 26.5 GHz 1157.0907.05)					
Document 1130.3240.01 page 4 (OPTION FSMR-B2 PRESELECTOR & FSMR-B23 Preamp 26.5 GHz)					
2100	26 GHz CONVERTER	1130.3257.02	1 S	A160	x
2105	DIPLEXER26	1151.3010.02	1 S	A161	x
2106	DIPLEXER 26 (OPTION B23)	1151.5520.23	1 S	A161	x
2108	YIG UNIT (MICRO LAMBDA)	1130.3311.23	1 S	A162	x
2110	DIN6900-M2,5X6 –A2	1148.3059.00	4 S		
2120	DIN965-M2,5X6-A4-PA	1148.3288.00	2 S		
2121	PLATE	1166.3492.00	1 S		
2125	EXTENDER 26	1132.8504.02	1 S	A163	x
2130	DIN6900-M2,5X6 –A2	1148.3059.00	7 S		
2135	RF-CABLE W3	1130.3340.00	1 S		
2140	RF-CABLE W4	1130.3357.00	1 S		
2142	RF-CABLE W4	1157.0971.00	1 S		
2145	RF-CABLE W5	1130.3363.00	1 S		
2150	HOLDER LO CABLE	1130.3292.00	1 S		
2155	DIN6900-M2,5X6 –A2	1148.3059.00	2 S		
2160	Cover B side	1130.3270.00	1 S		
2225	ABSCHLUSSKAPPE SMA	1066.2095.00	1 S		
2230	RF CABLE W2	1166.3440.00	1 S		
2240	RF CABLE W2	1166.3463.00	1 S		
Document 1130.3405.01 (RELAY UNIT 26,5 GHz)					
2300	RELAY SMA 12V	1137.4788.00	2 S	K1 / K2	x
2305	RELAY CABLE	1130.2838.00	1 S		
2310	RELAY HOLDER	1130.3392.00	1 S		
2315	DIN7985-M2,5x30-A4	0455.5966.00	2 S		

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
2320	RELAY SHIELDING	1130.3470.00	1 S		
2325	RF CABLE W1	1130.3428.00	1 S		
2330	RF CABLE W2	1130.3434.00	1 S		
2335	RF CABLE W6	1130.3440.00	1 S		
2340	RF CABLE W7	1130.3457.00	1 S		
2345	RF CABLE W8	1130.3463.00	1 S		
Document 1142.9361.00 (Option R&S FSU-B12 Tracking Attenuator 1142.9349.02)					
2400	STEP ATTENUATOR (R&S FSU-B12)	1067.8380.04	1 S	A171	x
2400	ATTENUATOR HOLDER	1129.9455.00	1 S		
2415	DIN6900-M3x8-A2	0071.6853.00	2 S		
2420	DIN6900-M2,5x6-A2	1148.3059.00	3 S		
2430	RF CABLE W41	1142.9378.00	1 S	W41	
2440	RF CABLE W49	1142.9384.00	1 S	W49	
2445	ADAPTER CABLE	1142.9390.00	1 S		
Document 1166.2096.01 page 1 (MW-Converter Unit 43/46/50 GHz)					
3106	50 GHz Converter	1166.2109.06	1 S	A160	X
3110	Diplexer	1162.1120.04	1 S	A161	X
3120	DIN6900/ISR-M2,5X6-A2	1148.3059.00	4 S		
3140	DIN965-M2,5X8-A4-PA	1148.3294.00	2 S		
3150	EXTENDER 50	1162.2885.02	1 S	A163	X
3160	DIN6900/ISR-M2,5X6-A2	1148.3059.00	6 S		
3170	CLAMP LO-KABEL	1130.3292.00	1 S		
3180	DIN6900-M2,5X6 –A2	1148.3059.00	2 S		

Position	Designation	Stock No.	Number	Electrical designation	Recommended Spare Parts
3190	RF-CABLE W3	1130.3892.00	1 S		
3200	RF-CABLE W4	1130.3905.00	1 S		
3210	RF-CABLE W5	1130.3911.00	1 S		
3220	RF-CABLE W6	1130.3928.00	1 S		
3230	SMA	1066.2095.00	1 S		
3240	B-SIDE-COVER	1130.3870.00	1 S		
3250	A-SIDE-COVER	1166.2167.00	1 S		
3295	LABEL MW-CONVERTER	1130.3940.00	1 S		
Option R&S FSMR-B73 1169.5696.03					
5100	WIDEBAND DETECTOR UNIT	1130.3086.09	1 S	A140	X
Document 1157.2116.00 (Option R&S FSU-B24 1157.2100.50)					
4500	PREAMP 50GHZ UNIT	1157.2080.50	1 S		x
4600	RF CABLE W28 (FSU-B24)	1169.5115.00	1 S	W28	
4610	RF CABLE W2	1129.9626.00	1 S	W2	
4611	BRACKET FSU-B24	1157.2097.00	1 S		
4612	DIN7985/ISR-M2.5X6-A4-PA	1143.5630.00	4 S		
4614	RF CABLE W52	1305.8944.00	1 S	W52	
4615	RF CABLE W2	1302.7353.00	1 S	W2	



MOD03 = FSMR 3GHz
MOD26 = FSMR 26,5GHz
MOD43 = FSMR 43GHz
MOD50 = FSMR 50GHz

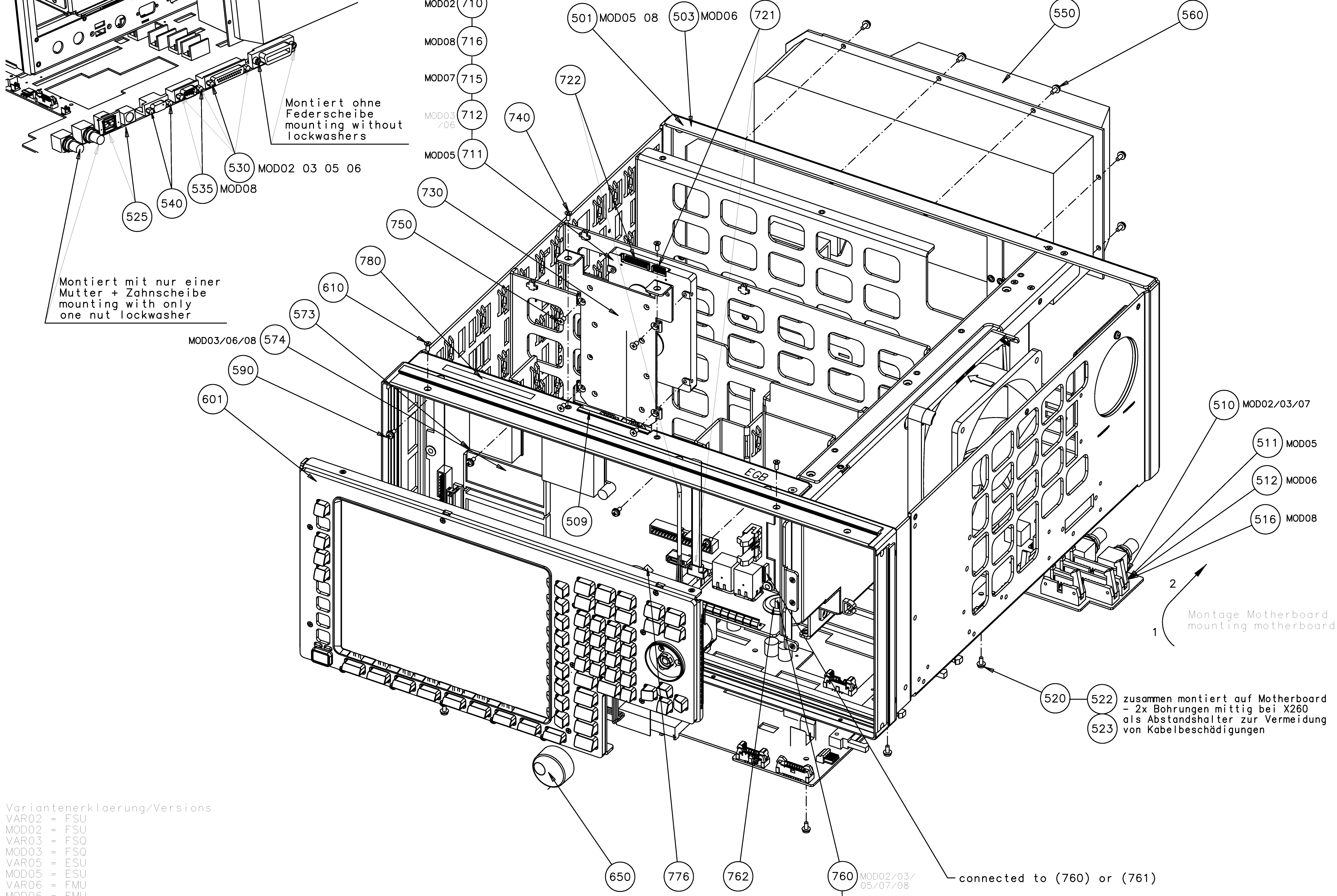
Cable:

MOD03: DW 1129.9490.03
DV 1129.9749.03
MOD26: DW 1129.9490.26
DV 1129.9749.26
MOD43: DW 1129.9490.46
DV 1129.9749.43
MOD50: DW 1129.9490.46
DV 1129.9749.46

See connector designation of cables and motherboard for cable mounting.

Maßstab / Scale	Toleranz / Tol.		Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER			Sprache / Lang.: de en	Änd. / C.I.: 07.00	Blatt / Sh.: 1
FSU	Datum / Date: 2007-10-26	Abteilung / Dept.: 1ESK	Name / Name: Wn/PA	Zeichn.Nr. / Drawing No.: 1166.3311.01 D	

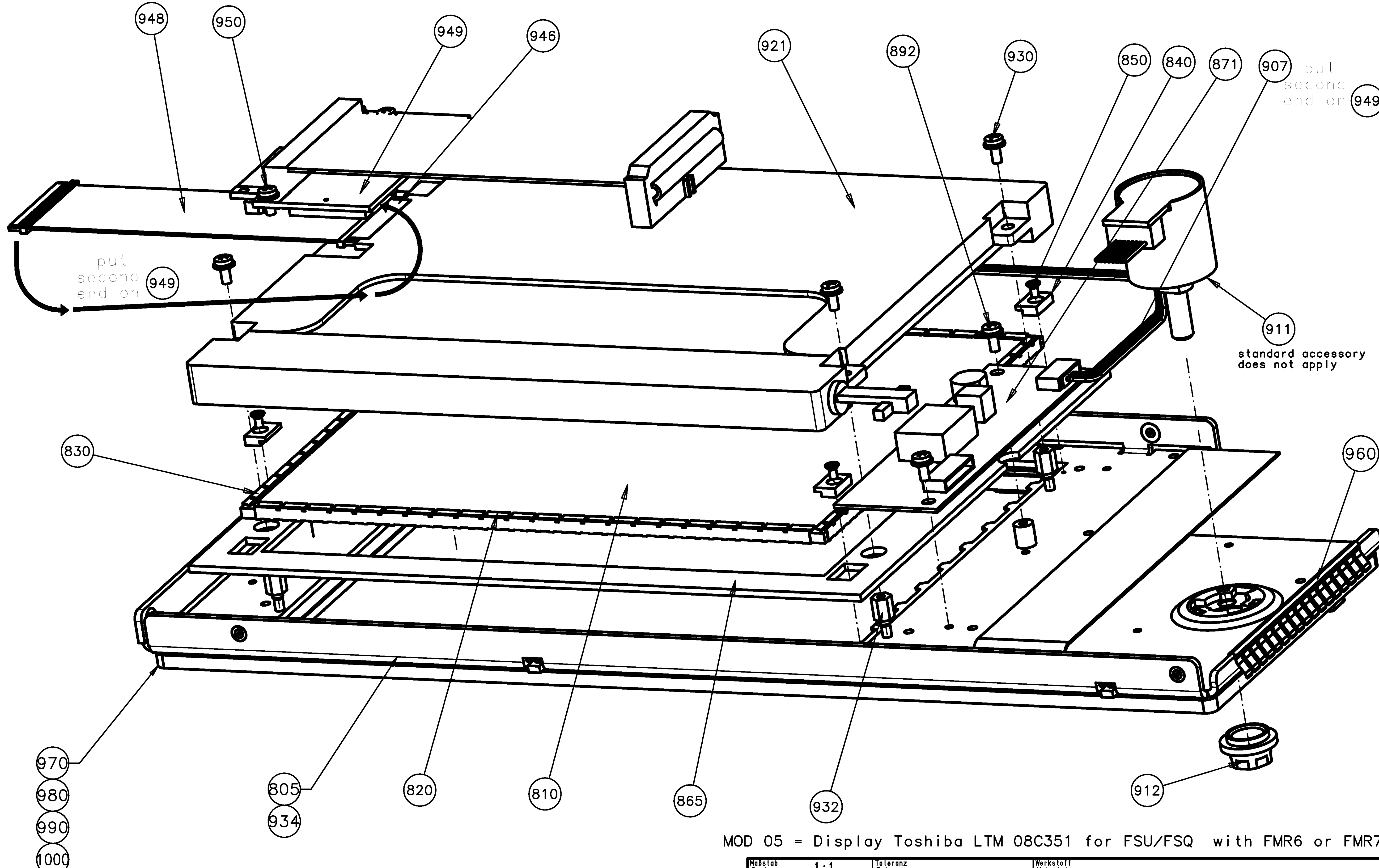
Projektionsmethode / Projection Method



Variantenerklaerung/Versions
VAR02 = FSU
MOD02 = FSU
VAR03 = FSQ
MOD03 = FSQ
VAR05 = ESU
MOD05 = ESU
VAR06 = FMU
MOD06 = FMU
VAR07 = FSMR
MOD07 = FSMR
VAR08 = FSG
MOD08 = FSG

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material	Sprache / Lang.: de en; Änd. / C.I.: 09.00; Blatt / Sh.: 2
ROHDE&SCHWARZ	Benennung / Designation: GRUNDEINHEIT Basic Unit		
Typ / Type: FSU			Zeichn.Nr. / Drawing No.: 1166.1677.01 D
T.Z. / used in	Datum / Date: 2008-07-24	Abteilung / Dept.: MEEK	Name: kl

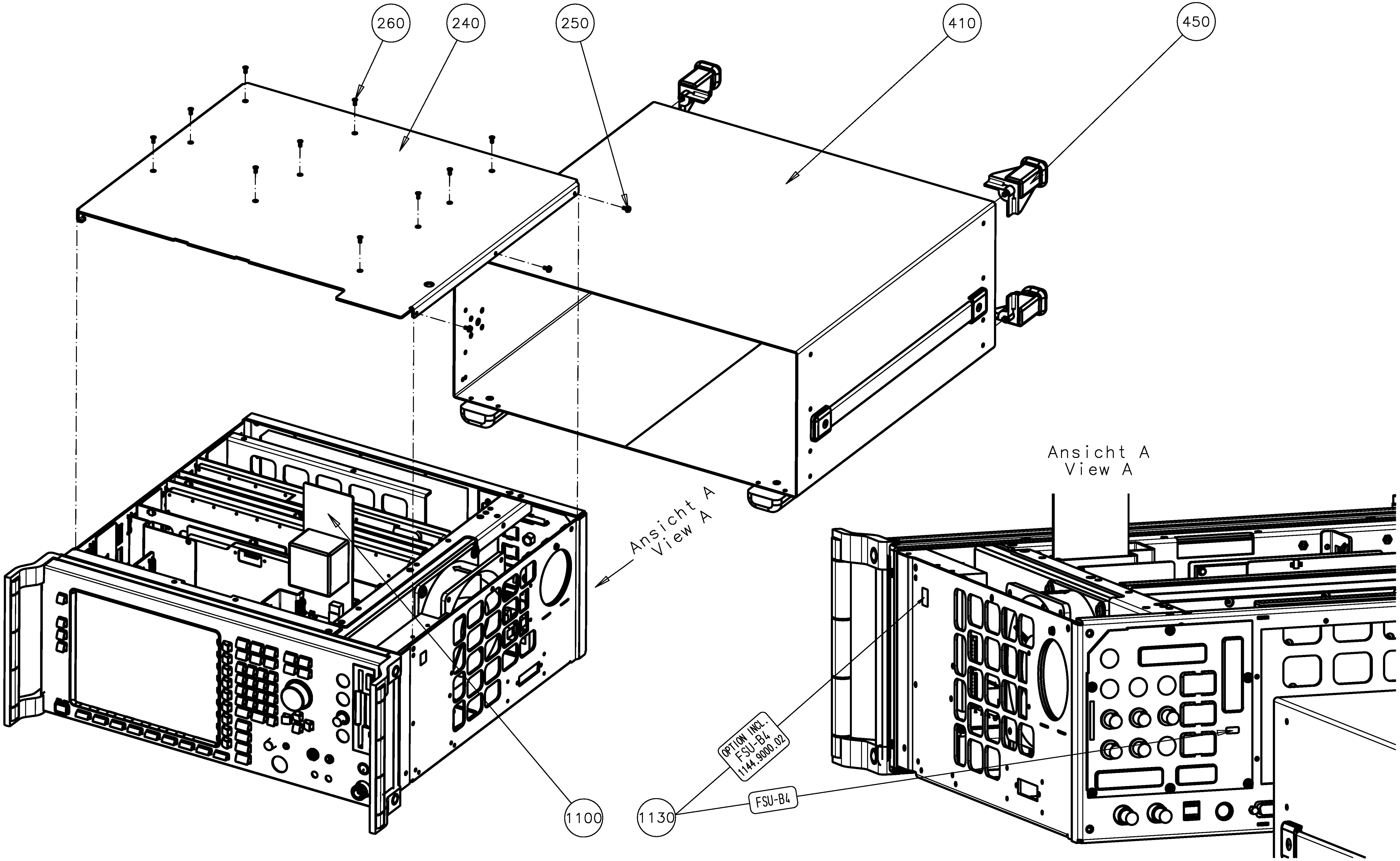
Projektionsmethode / Projection Method



MOD 05 = Display Toshiba LTM 08C351 for FSU/FSQ with FMR6 or FMR7

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material		
1:1				
ROHDE&SCHWARZ	Benennung / Designation: DISPLAYEINHEIT DISPLAY UNIT	Sprache / Lang.: de en	Aei. / C.I.: 12.00	Blatt / Sh.: 4
Typ / Type		Zeichn.Nr. / Drawing No.: 1093.4708.01 D		
I.Z. / used in: 1129.9090.01	Datum / Date: 2007-01-29	Abteilung / Dept.: MEZ1	Name / Name: kl	

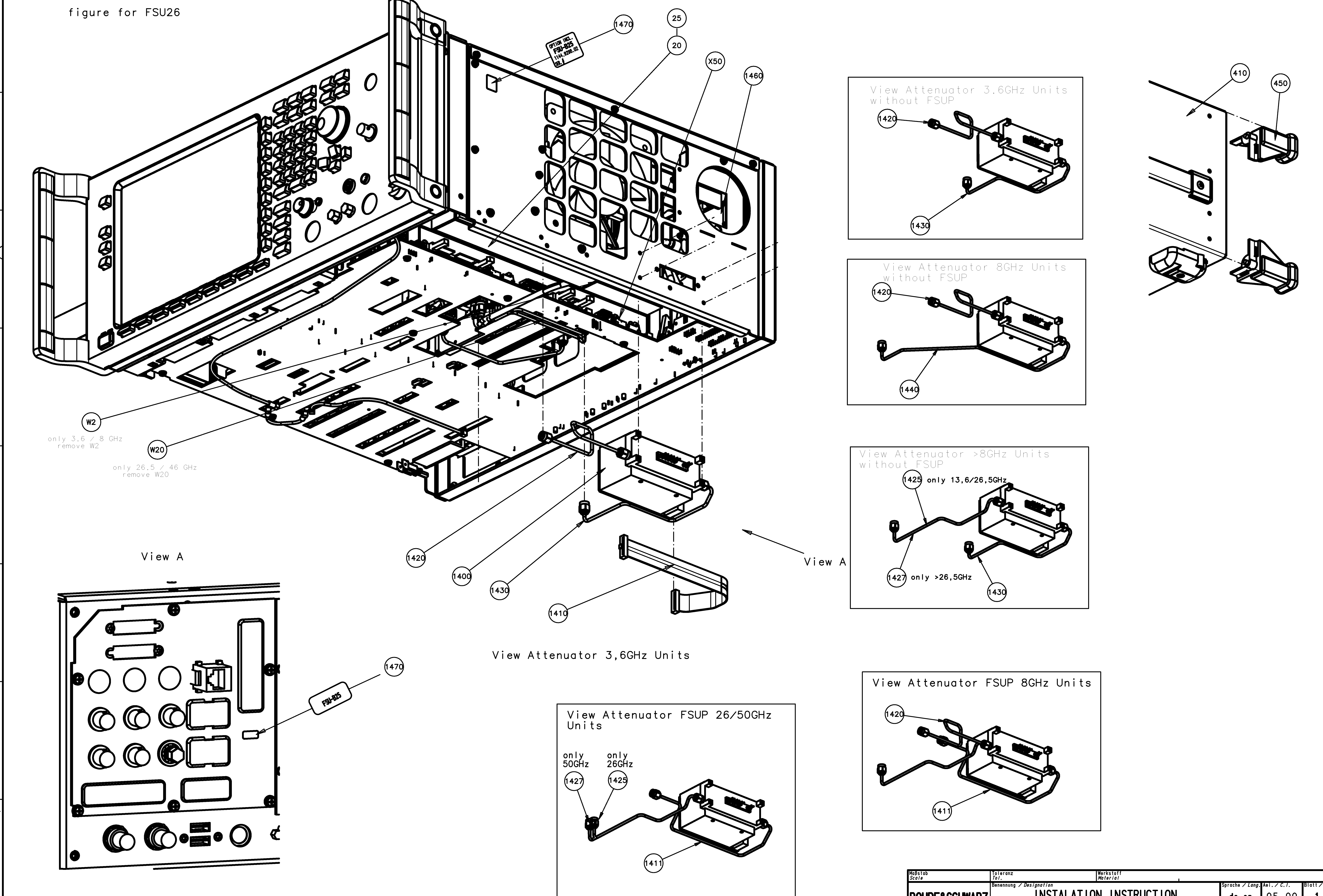
Projektionsmethode / Projection Method



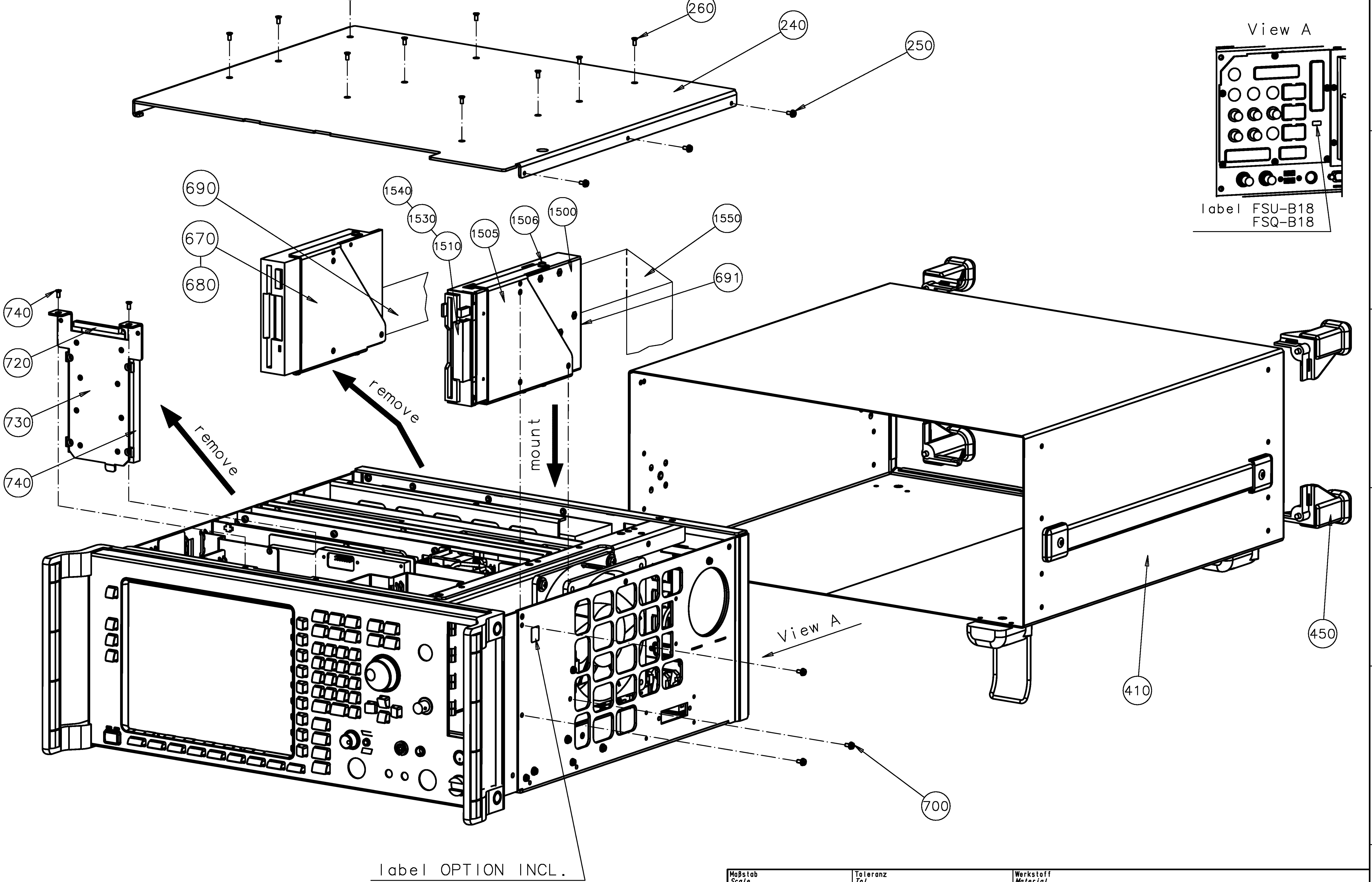
Projektionsmethode
Projection Method

Kabel nach Beschriftung montieren.
See connector designation of cables
and motherboard for cable mounting.

Maßstab / Scale		Toleranz / Tol.		Werkstoff / Material			
ROHDE&SCHWARZ		Benennung / Designation: Einbauanweisung FSU-B4 Installation Instruction				Sprache / Lang.: de en	Aei. / C.I.: 02.00	Blatt / Sh.: 1
Typ / Type	FSU-B4					Zeichn.Nr. / Drawing No.	
I.Z. / used in	1144.9000.01	Datum / Date: 24.11.2000	Abteilung / Dept.: 1ESK	Name / Name: TF		1144.9017.00	D

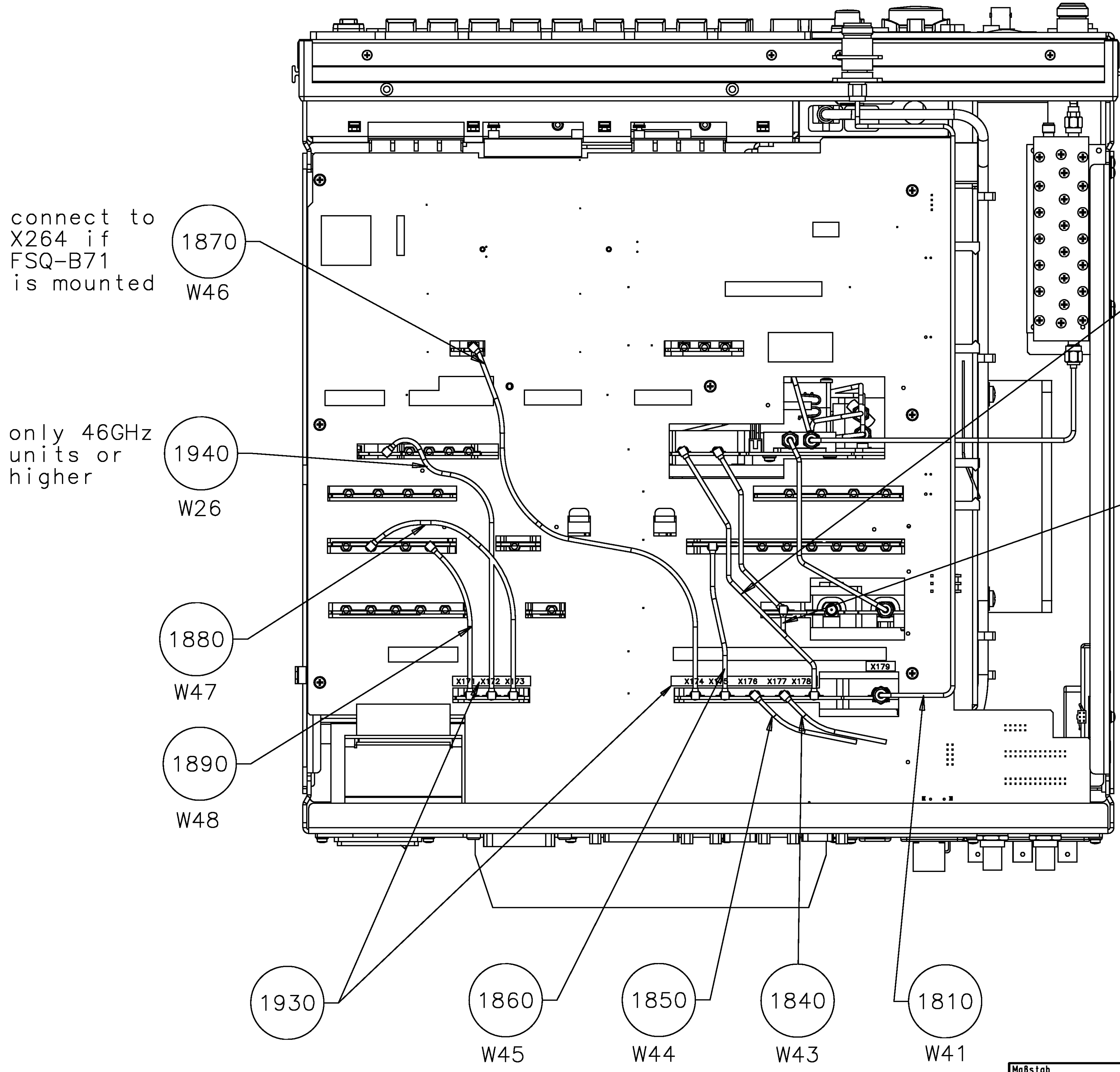


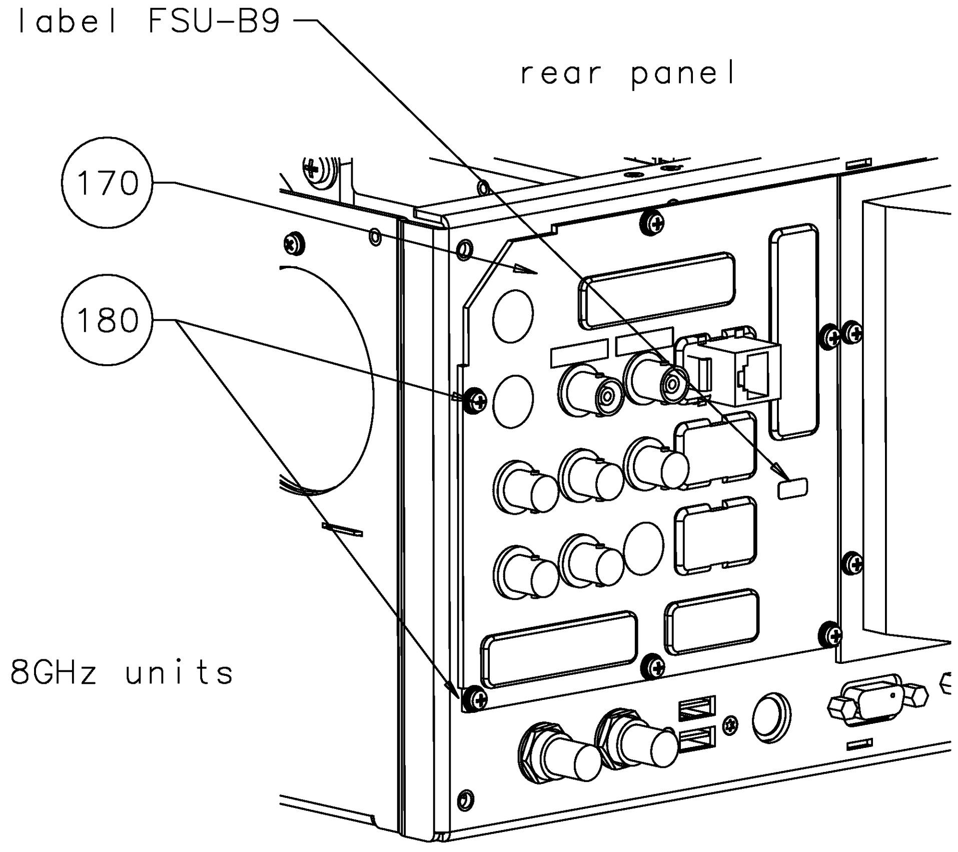
Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: INSTALATION INSTRUCTION	Sprache / Lang.: de en	Änd. / C.I.: 05.00 · Blatt / Sh.: 1
FSU-B25	Datum / Date: 2008-03-12 · Abteilung / Dept.: 1ESK · Name: MI/PA	Zeichn.Nr. / Drawing No.: 1144.9300.00 D	

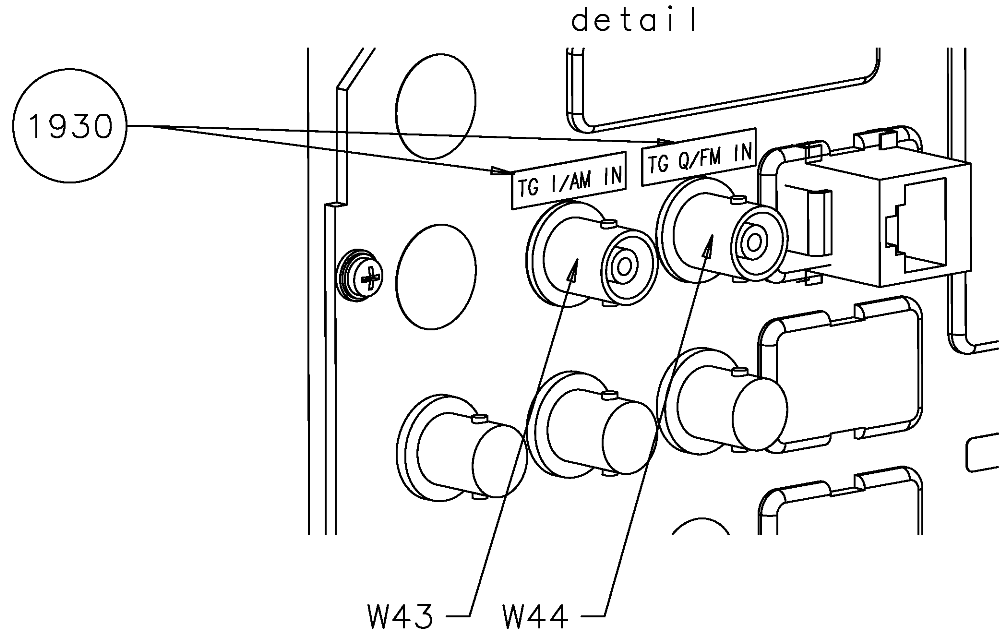


Projektionsmethode
Projection Method

Maßstab Scale	Toleranz Tol.	Werkstoff Material		
ROHDE&SCHWARZ	Benennung / Designation: Assembly Instruction / Assembly Instruction		Sprache / Lang.: de en	Aei. / C.I.: 02.00 — Blatt / Sh.: 1
FSU-B18	Datum Date: 16.10.2003	Abteilung Dept.: 1ESK — Name Name: Wn	Zeichn.Nr. / Drawing No.: 1145.0259.00	D



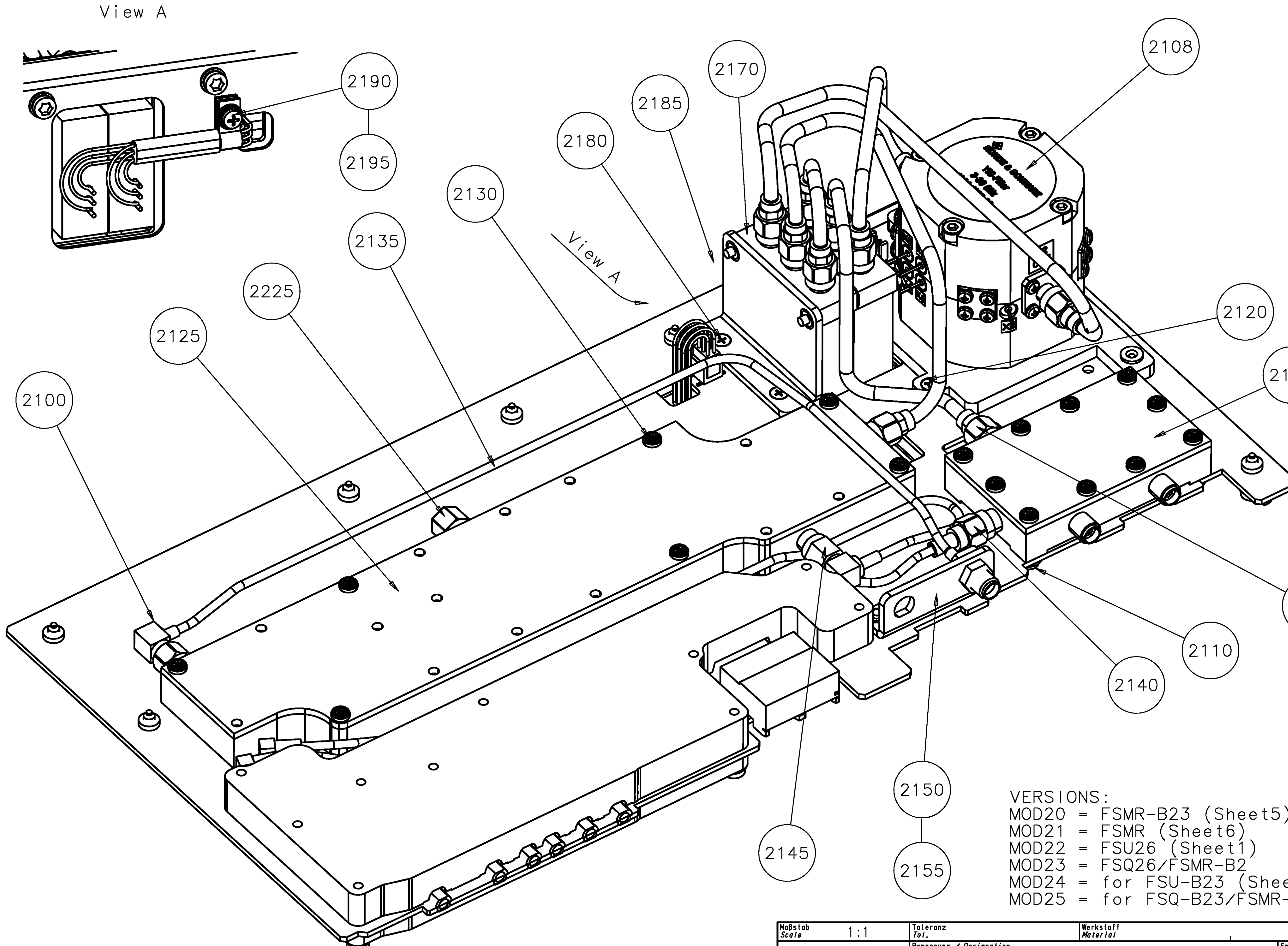




see connector designation of cables
and motherboard for cable mounting

Projektions-methode / Projection Method

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSU-B9 Assembly Instruction		Sprache / Lang.: de en; Aei. / C.I.: 02.00; Blatt / Sh.: 2
Typ / Type: FSU-B9			Zeichn.Nr. / Drawing No.: 1142.9090.00 D
I.Z. / used in: 1142.8994.01	Datum / Date: 26.05.2003	Abteilung / Dept.: 1ESK; Name / Name: Wn	

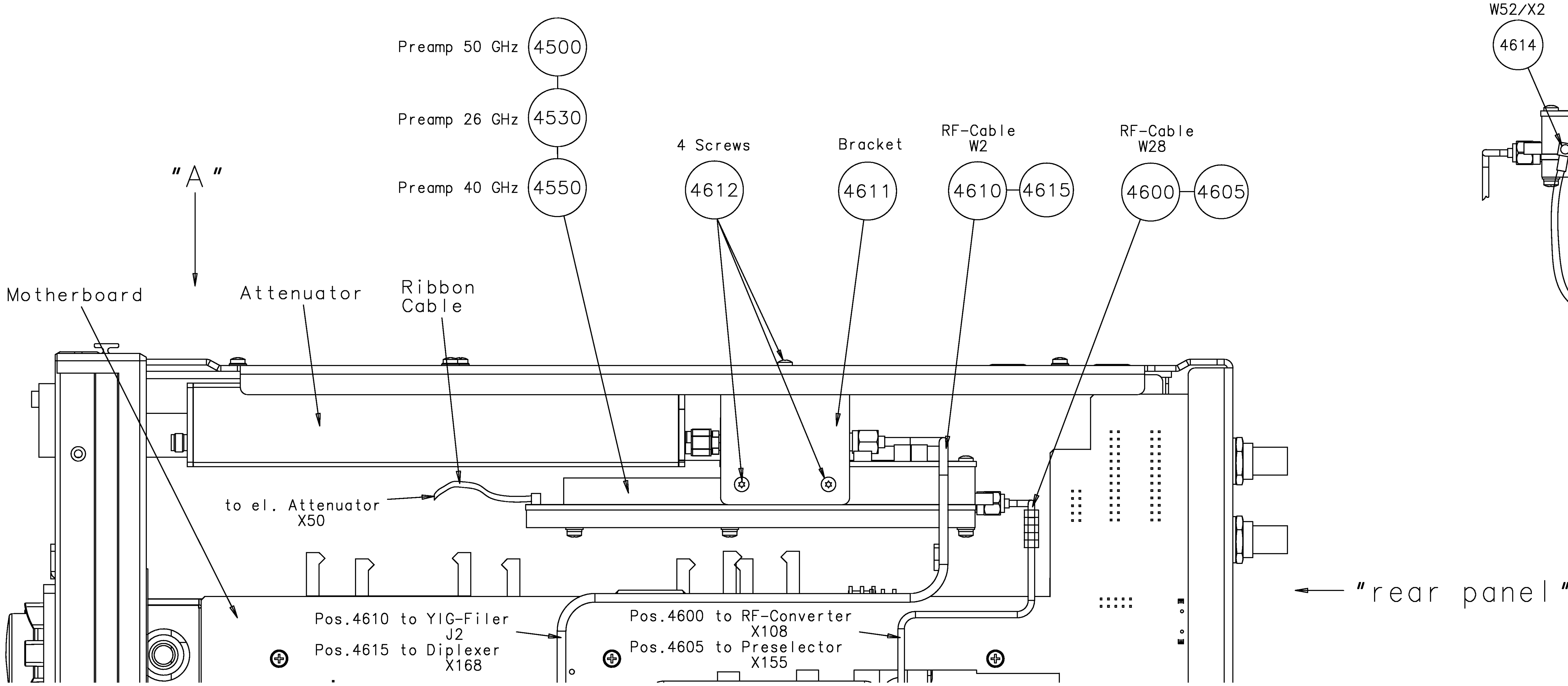


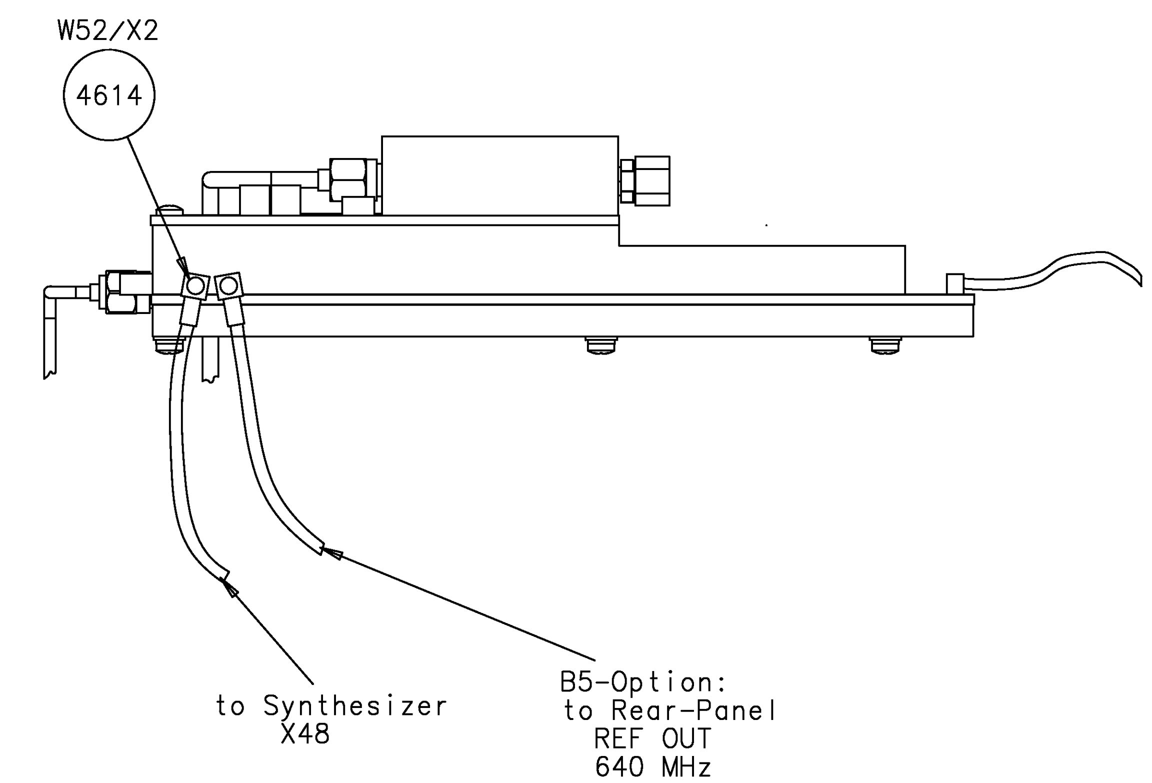
VERSIONS:
MOD20 = FSMR-B23 (Sheet5)
MOD21 = FSMR (Sheet6)
MOD22 = FSU26 (Sheet1)
MOD23 = FSQ26/FSMR-B2
MOD24 = for FSU-B23 (Sheet3)
MOD25 = for FSQ-B23/FSMR-B223 (Sheet4)

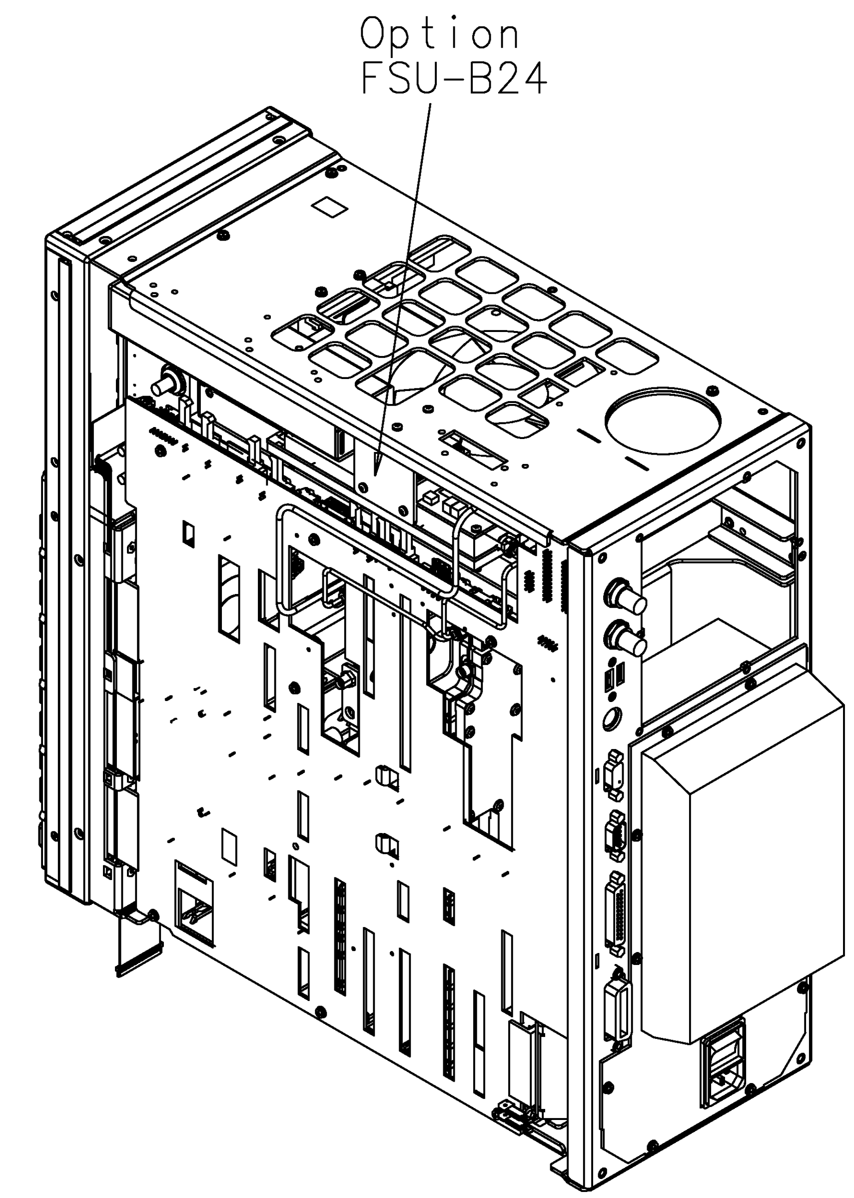
Projektions-methode / Projection Method

Maßstab / Scale	1:1	Toleranz / Tol.		Werkstoff / Material		
ROHDE&SCHWARZ		Benennung / Designation: MW-Converter Unit 26 / MW-Converter Unit 26			Sprache / Lang.: de en	Aei. / C.I.: 10.00 — Blatt / Sh.: 2
Typ / Type	FSU26				Zeichn.Nr. / Drawing No.	1130.3240.01 D
I.Z. / used in	1130.9003.01	Datum / Date: 2005-11-14	Abteilung / Dept.: 1ESK	Name: Wn		

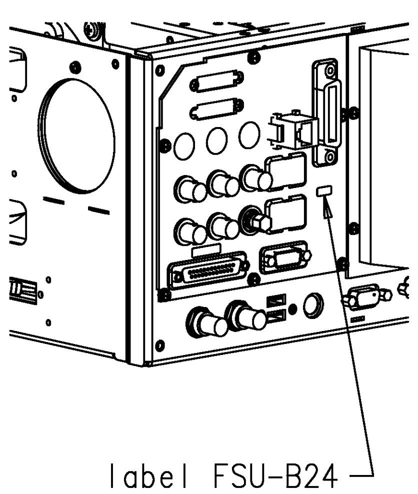
Back View - Option FSU-B24



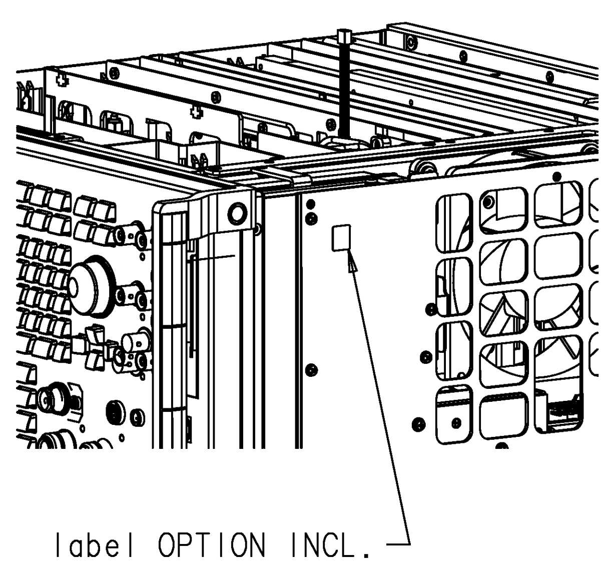




view rear panel



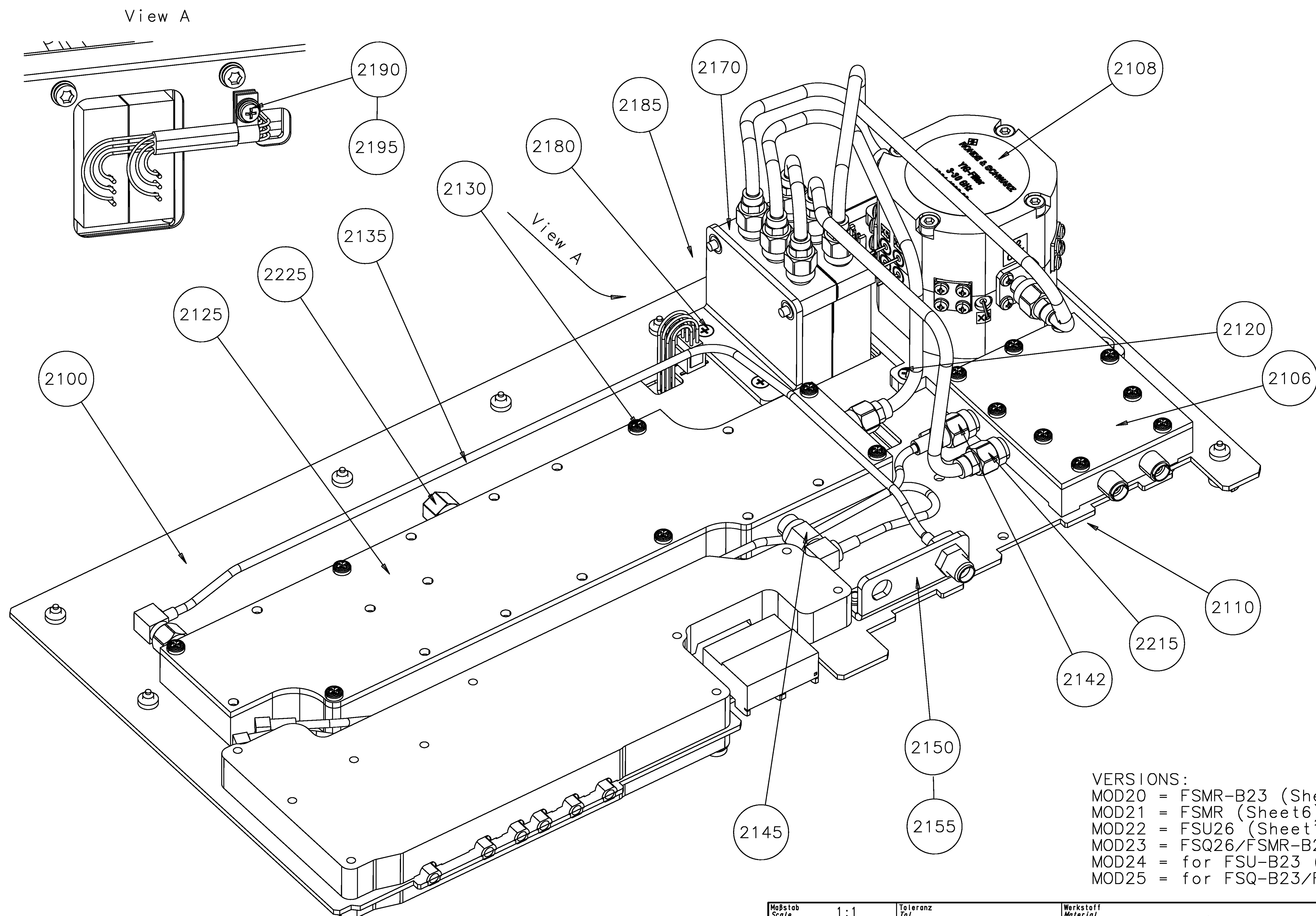
view A



Versions:
MOD26 = Preamplifier 26 GHz
MOD40 = Preamplifier 40 GHz
MOD50 = Preamplifier 50 GHz

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: INSTALL. INSTRUCTION INSTALL. INSTRUCTION	Sprache / Lang.: de en; Ånd. / C.I.: 05.00; Blatt / Sh.: 1	
ESU-B24	Datum / Date: 2007-06-13; Abteilung / Dept.: 1ESK; Name: Wn	Zeichn.Nr. / Drawing No.: 1157.2116.00 D	

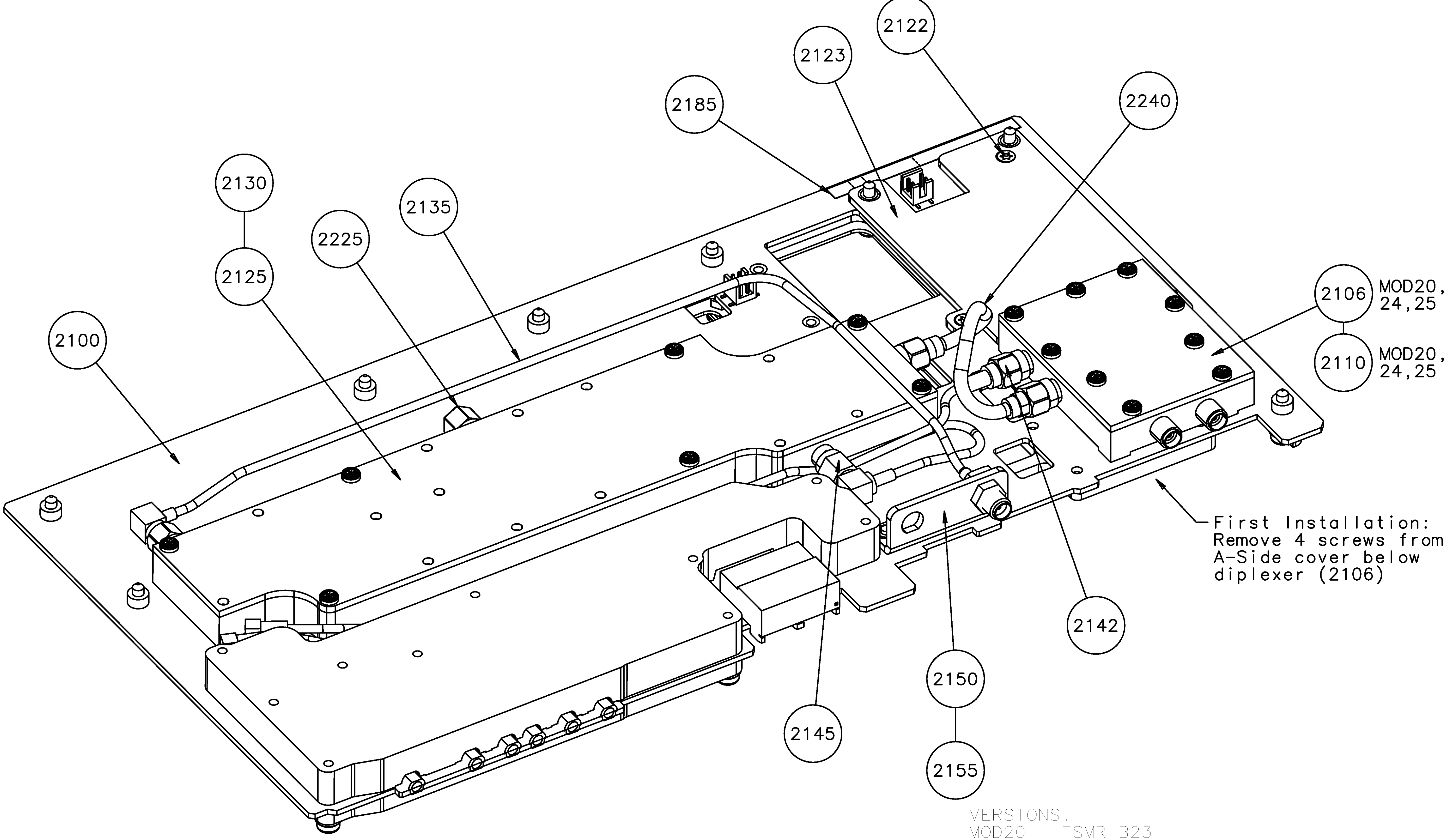
Projektionsmethode / Projection Method



VERSIONS:
MOD20 = FSMR-B23 (Sheet5)
MOD21 = FSMR (Sheet6)
MOD22 = FSU26 (Sheet1)
MOD23 = FSQ26/FSMR-B2 (Sheet2)
MOD24 = for FSU-B23 (Sheet3)
MOD25 = for FSQ-B23/FSMR-B223

Maßstab / Scale 1:1	Toleranz / Tol.		Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: MW-Converter Unit 26 / MW-Converter Unit 26			Sprache / Lang.: de en	Aei. / C.I.: 04.00 · Blatt / Sh.: 4
Typ / Type: FSU26				Zeichn.Nr. / Drawing No.: 1130.3240.01 D	
I.Z. used in: 1130.9003.01	Datum / Date: 2005-11-14	Abteilung / Dept.: 1ESK	Name / Name: Wn		

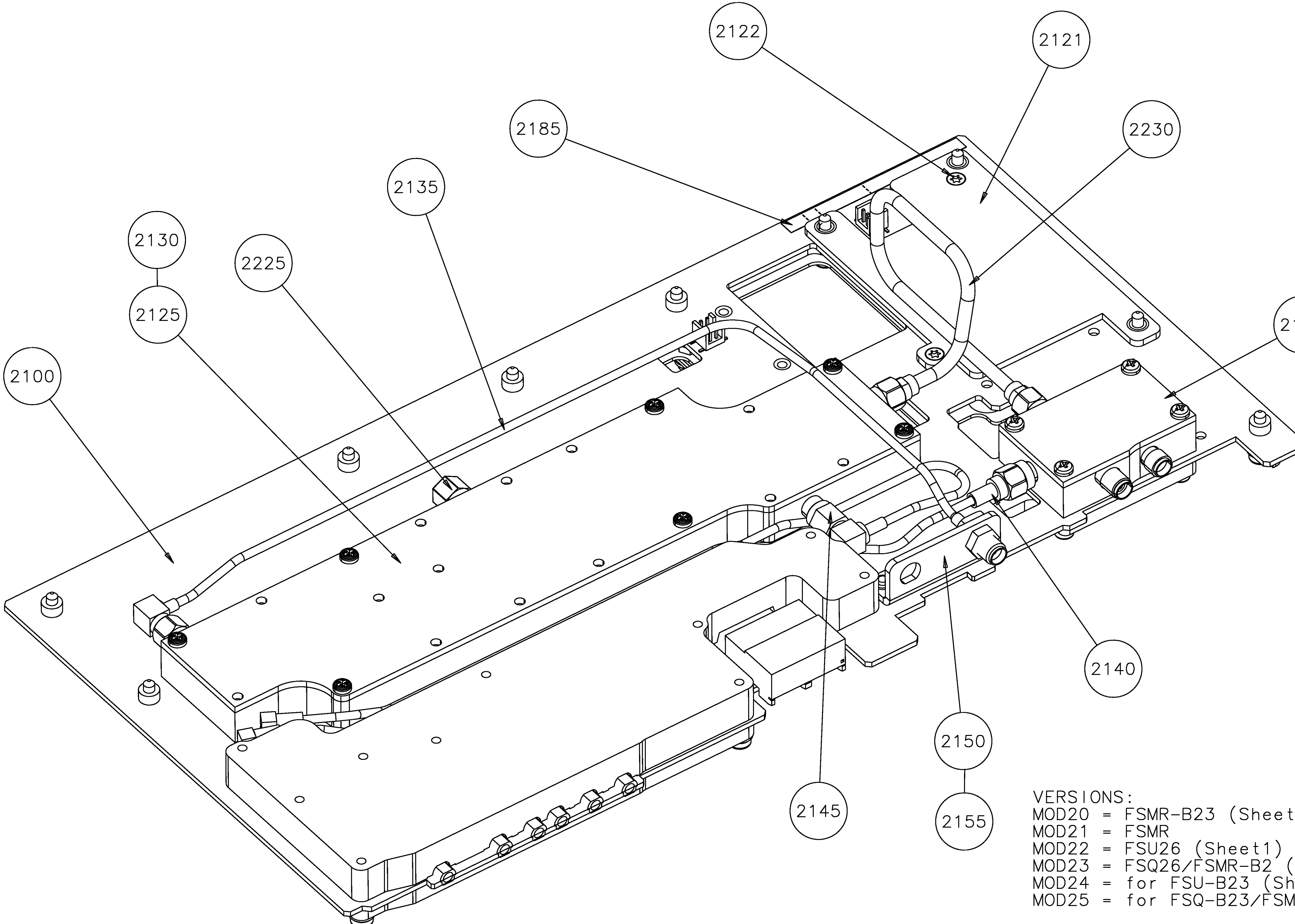
Projektions-methode / Projection Method



VERSIONS:
MOD20 = FSMR-B23
MOD21 = FSMR (Sheet6)
MOD22 = FSU26 (Sheet1)
MOD23 = FSQ26/FSMR-B2 (Sheet2)
MOD24 = for FSU-B23 (Sheet3)
MOD25 = for FSQ-B23/FSMR-B223 (Sheet4)

Projektionsmethode / Projection Method

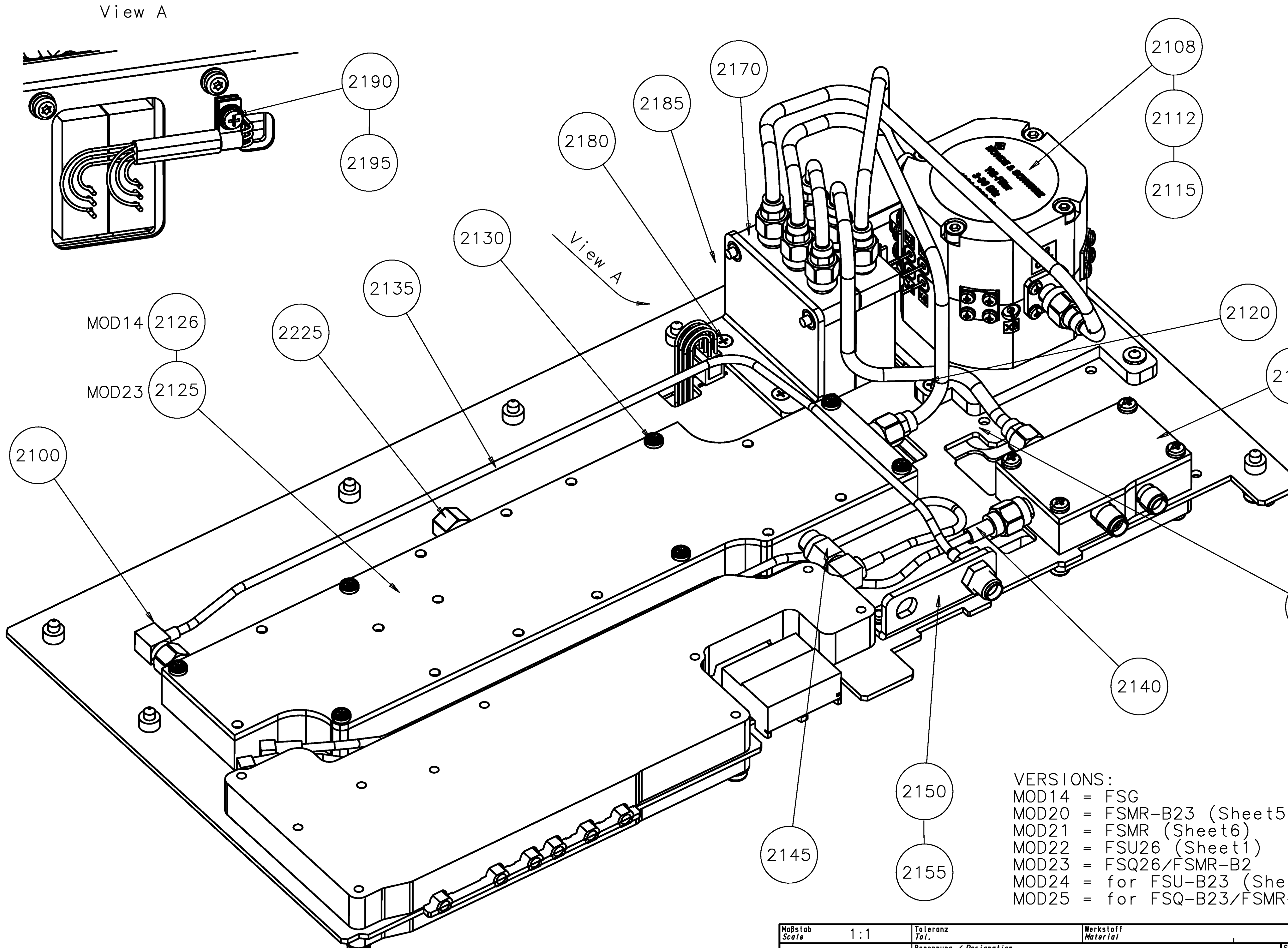
Maßstab / Scale 1:1	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER UNIT 26.5 GHZ / MW CONVERTER UNIT 26.5 GHZ		Sprache / Lang.: de en	Aei. / C.I.: 02.00	Blatt / Sh.: 5
	Datum / Date: 2006-06-30	Abteilung / Dept.: 1ESK	Name: Wn	Zeichn.Nr. / Drawing No.: 1166.2338.01 D	



VERSIONS:
MOD20 = FSMR-B23 (Sheet5)
MOD21 = FSMR
MOD22 = FSU26 (Sheet1)
MOD23 = FSQ26/FSMR-B2 (Sheet2)
MOD24 = for FSU-B23 (Sheet3)
MOD25 = for FSQ-B23/FSMR-B223 (Sheet4)

Projektions-methode
Projection Method

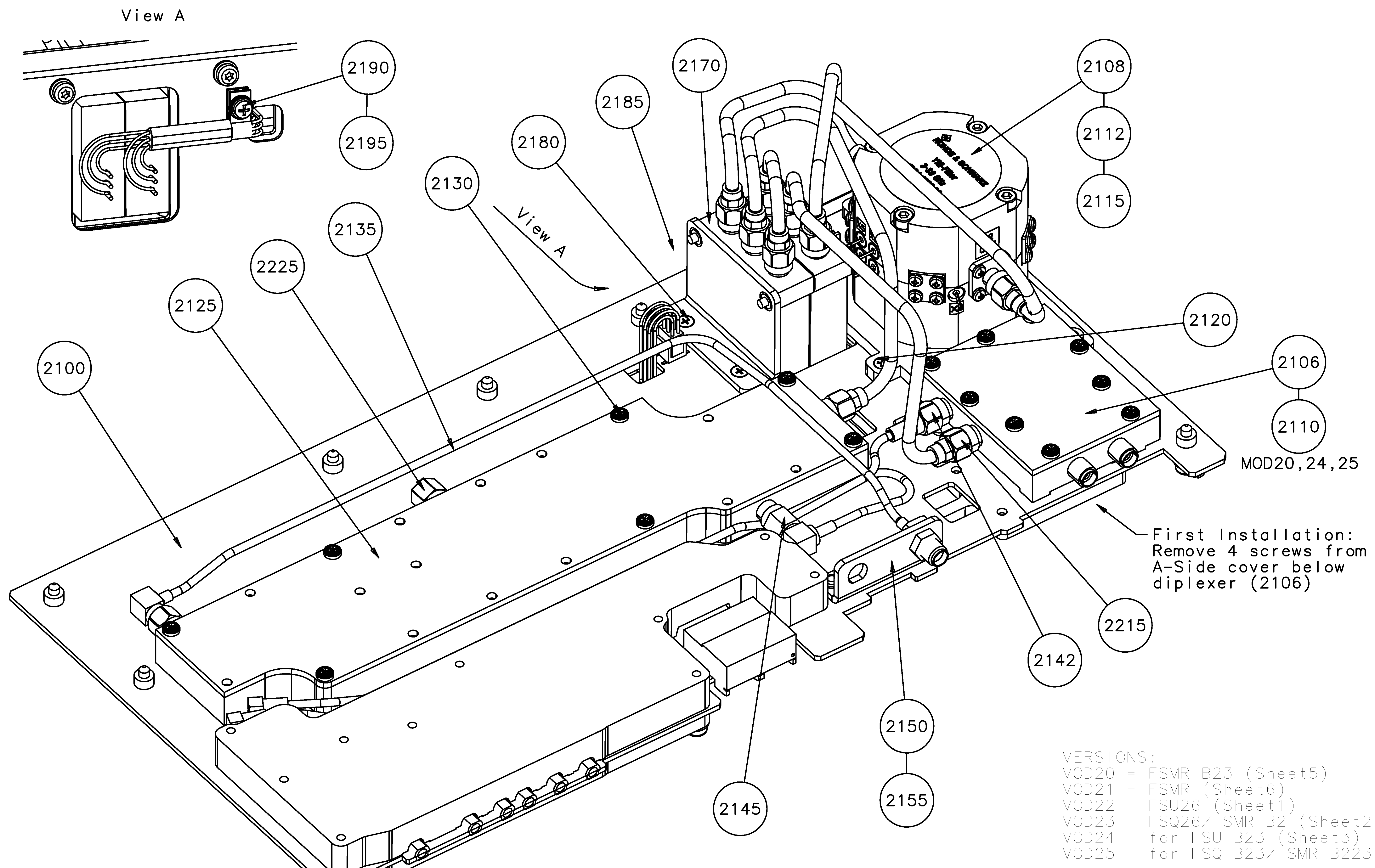
Maßstab / Scale: 1:1	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER UNIT 26.5 GHZ / MW CONVERTER UNIT 26.5 GHZ	Sprache / Lang.: de en	Aei. / C.I.: 01.00 — Blatt / Sh.: 6
Typ / Type: FSU		Zeichn.Nr. / Drawing No.: 1166.2338.01 D	
i.Z. / used in	Datum / Date: 2006-06-30 — Abteilung / Dept.: 1ESK — Name: Wn		



VERSIONS:
MOD14 = FSG
MOD20 = FSMR-B23 (Sheet5)
MOD21 = FSMR (Sheet6)
MOD22 = FSU26 (Sheet1)
MOD23 = FSQ26/FSMR-B2
MOD24 = for FSU-B23 (Sheet3)
MOD25 = for FSQ-B23/FSMR-B223 (Sheet4)

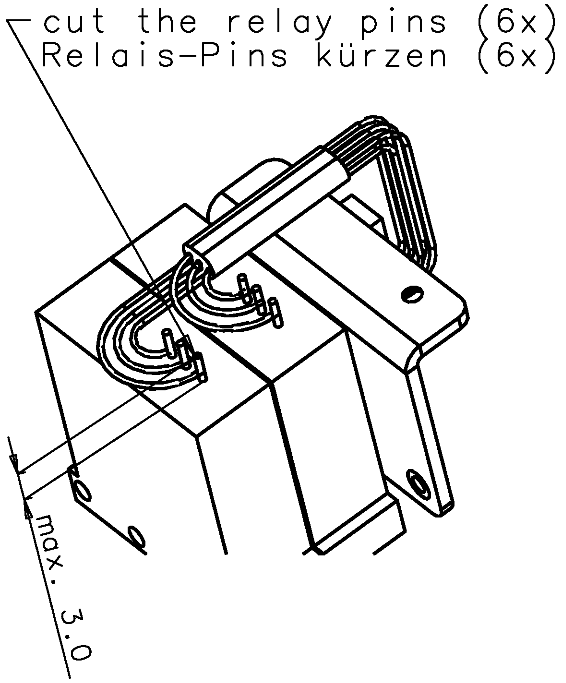
Maßstab / Scale: 1:1	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER UNIT 26.5 GHZ MW CONVERTER UNIT 26.5 GHZ	Sprache / Lang.: de en	Aei. / C.I.: 03.00 — Blatt / Sh.: 2
Typ / Type: FSU		Zeichn.Nr. / Drawing No.: 1166.2338.01 D	
I.Z. / used in	Datum / Date: 2007-06-13 — Abteilung / Dept.: 1ESK — Name / Name: Wn		

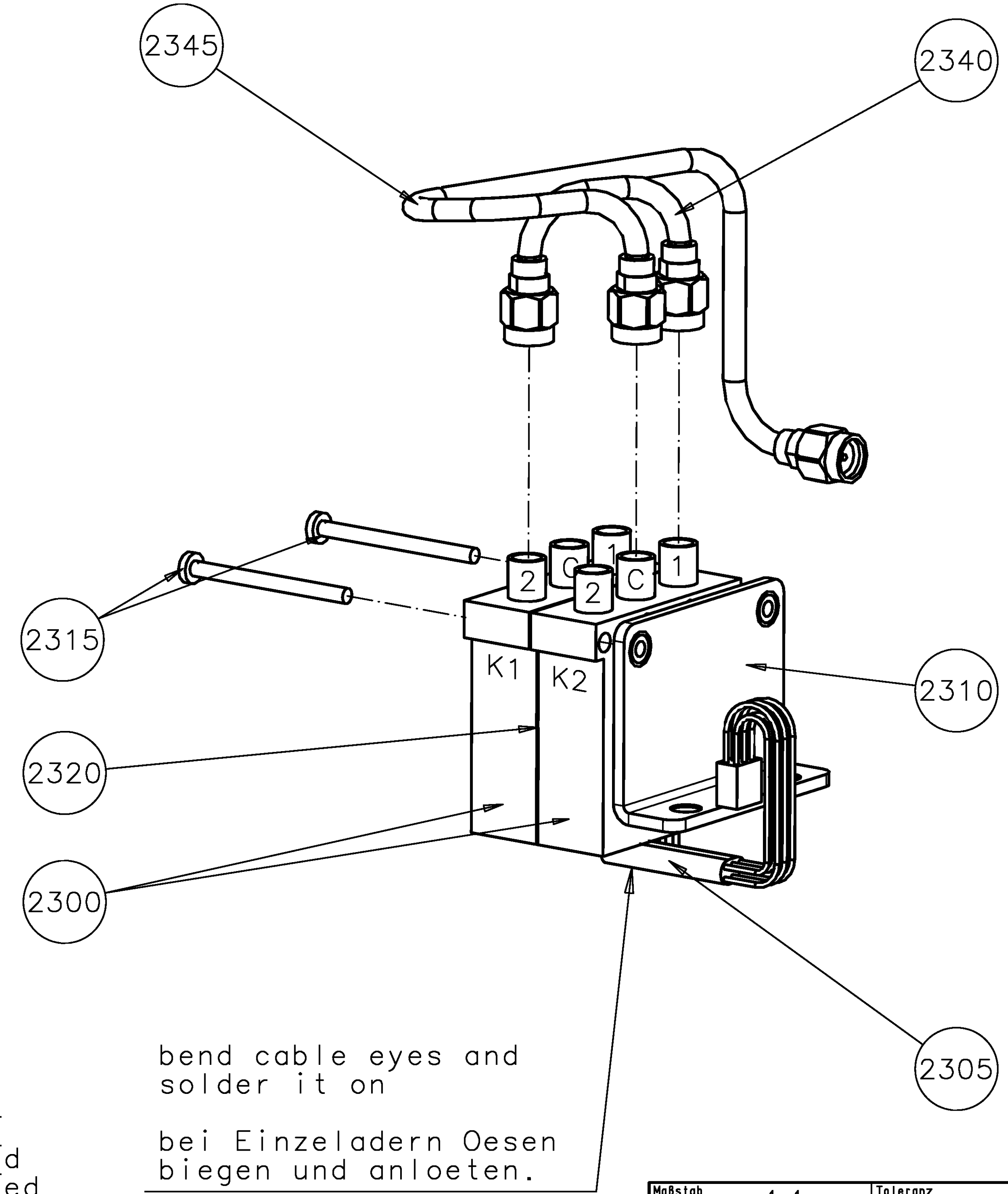
Projektions-methode
Projection Method



Projektionsmethode / *Projection Method*

Maßstab / *Scale* 1:1	Toleranz / *Tol.*	Werkstoff / *Material*			
ROHDE&SCHWARZ	Benennung / *Designation*: MW CONVERTER UNIT 26.5 GHZ / MW CONVERTER UNIT 26.5 GHZ		Sprache / *Lang.* de en	Aei. / *C.I.* 03.00	Blatt / *Sh.* 4
Typ / *Type* FSU			Zeichn.Nr. / *Drawing No.* 1166.2338.01 D		
I.Z. / *used in*	Datum / *Date* 2006-12-06	Abteilung / *Dept.* 1ESK	Name / *Name* Wn		





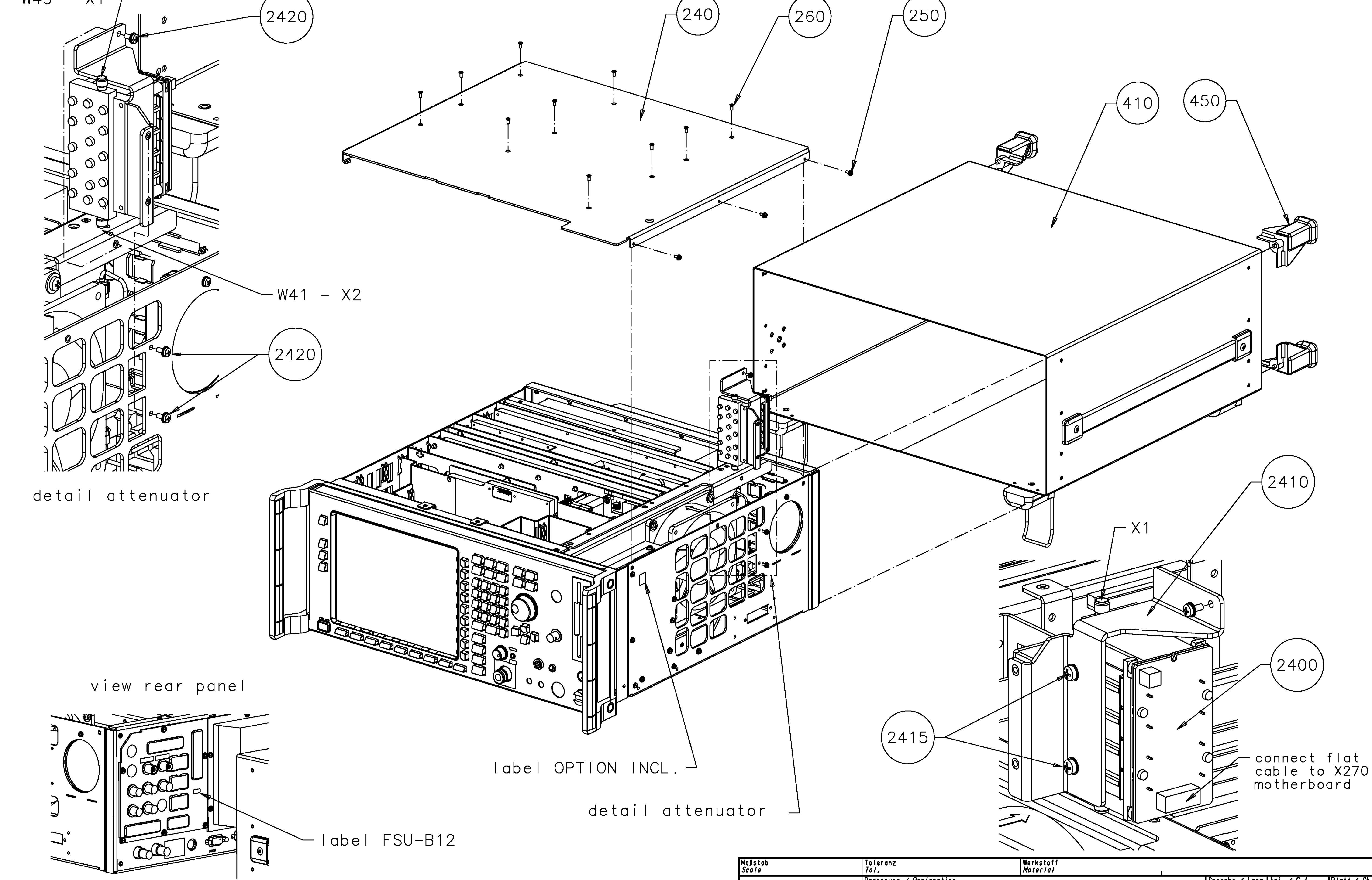
Projektions-methode
Projection Method

connection / Anschlussbelegung:

cable/Kabel	relay/Relais	
1 black/sw	K1 C	+12V
2 green/gn	K1 1	Yig enabled
3 blue/bl	K1 2	Yig disabled
4 red/rt	K2 C	+12V
5 yellow/ge	K2 1	Yig disabled
6 white/ws	K2 2	Yig enabled

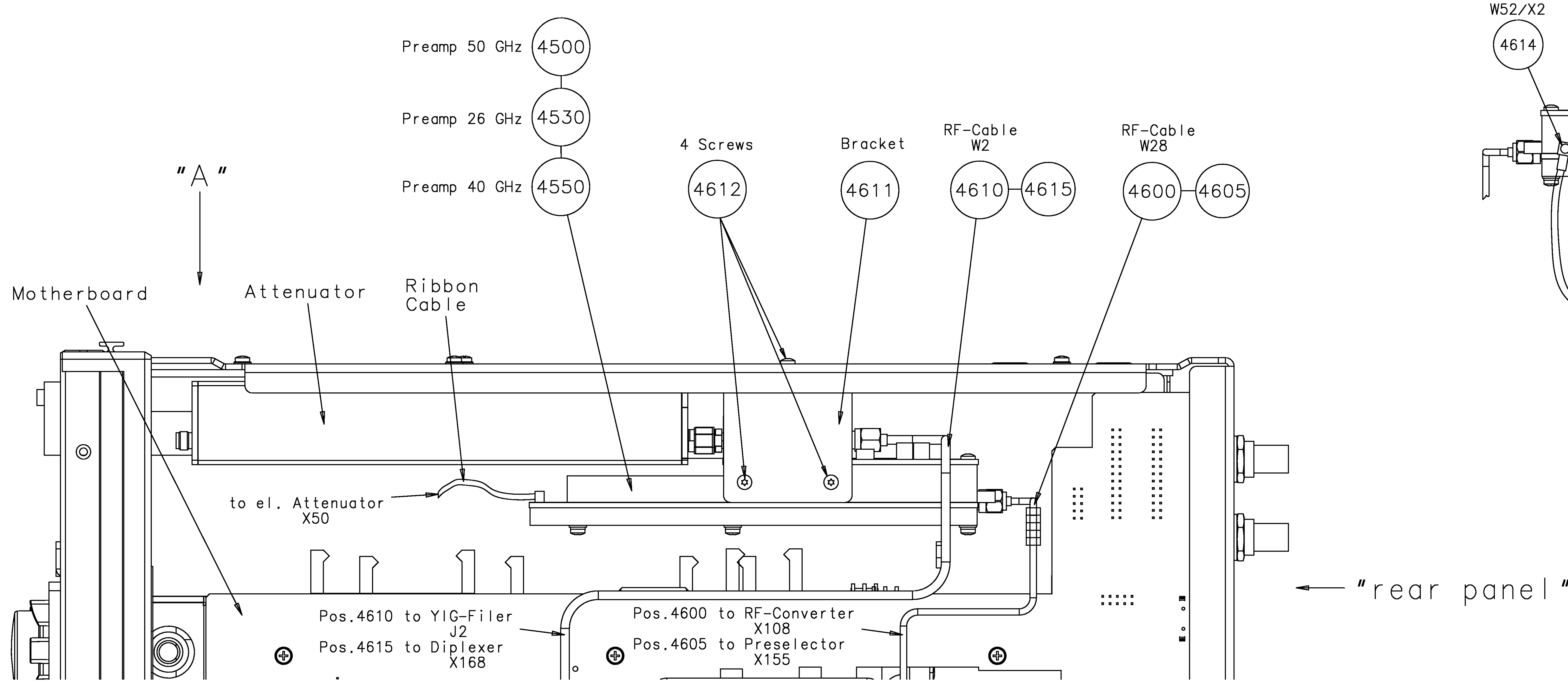
VARIANTENERKLAERUNG/
VERSIONS:
VAR 02 = FSQ26 / FSQ-B23
MOD 02 = FSQ26 / FSQ-B23

Maßstab / *Scale* 1:1	Toleranz / *Tol.*		Werkstoff / *Material*				
ROHDE&SCHWARZ	Benennung / *Designation* Relais Unit 26.5 GHz				Sprache / *Lang.* de en	Aei. / *C.I.* 06.00	Blatt / *Sh.* 1
Typ / *Type* FSQ26					Zeichn.Nr. / *Drawing No.* 1130.3405.01 D		
i.Z. / *used in* 1130.3240.01	Datum / *Date* 18.11.2002	Abteilung / *Dept.* 1ESK	Name / *Name* Wn				

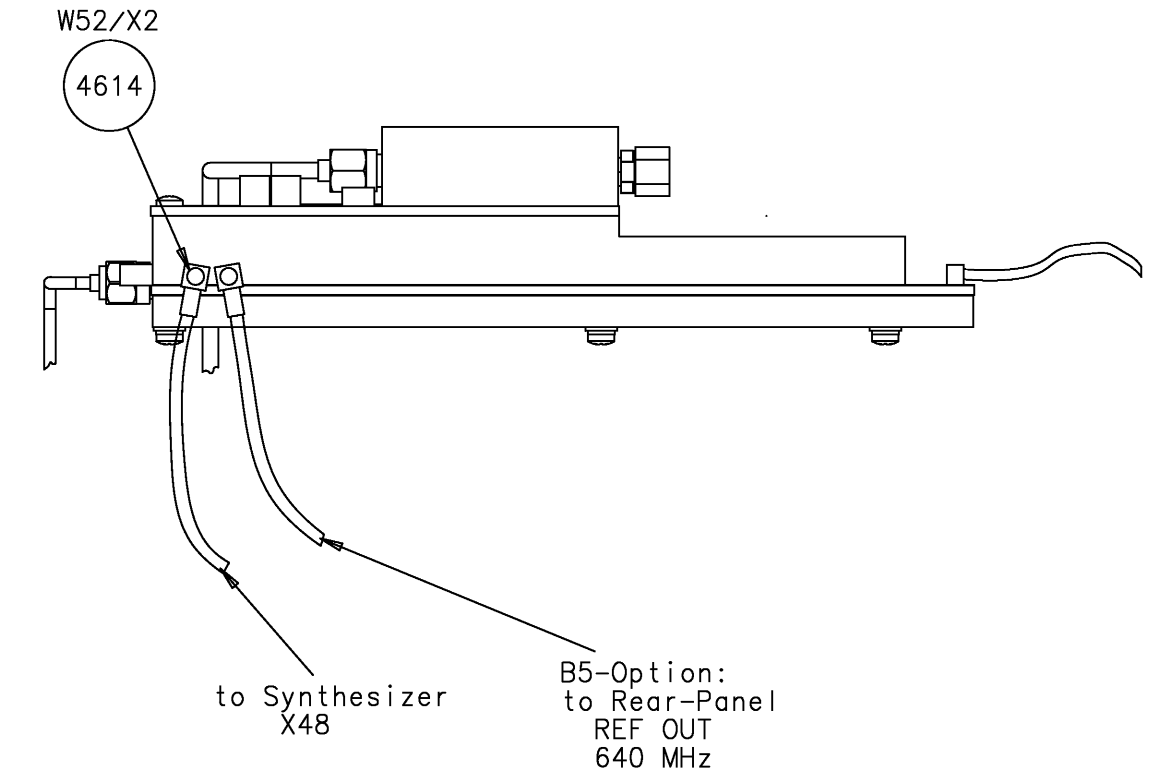


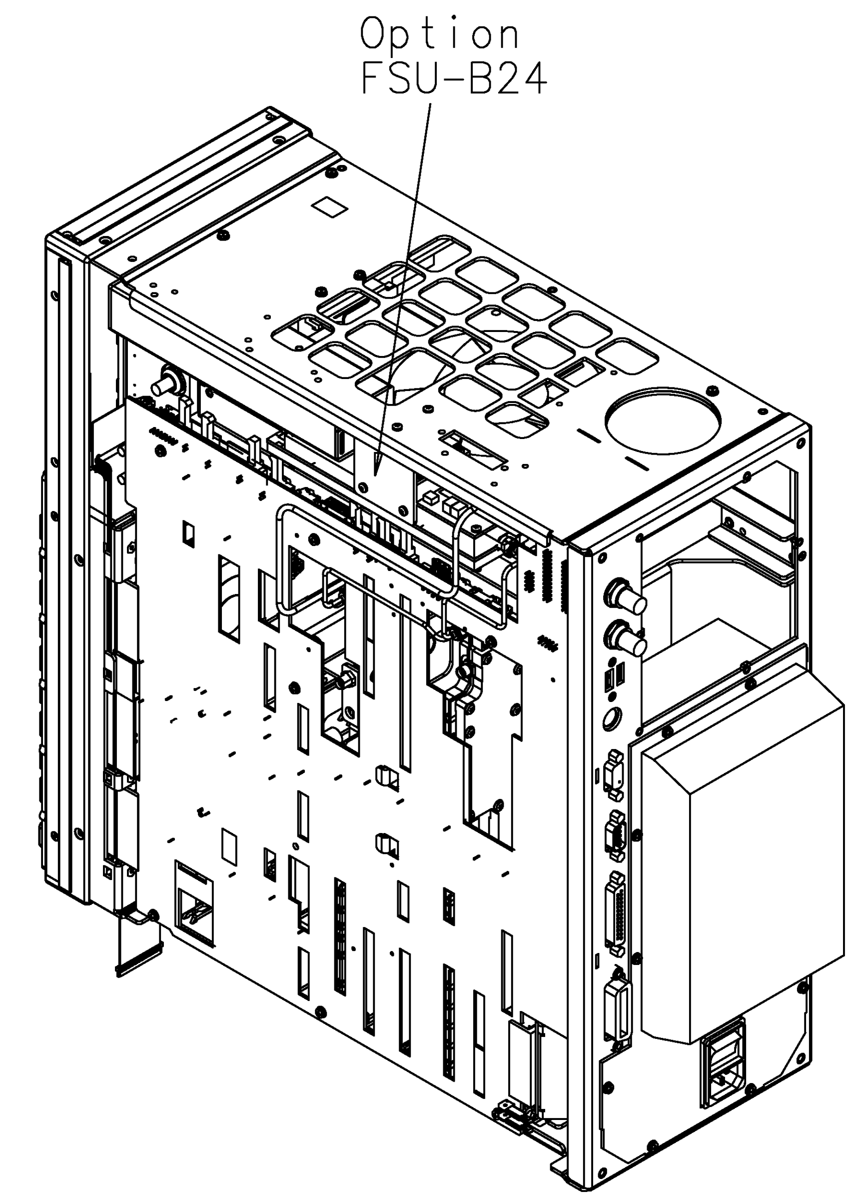
Projektionsmethode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation*: Einbauanweisung / Assembly Instruction		Sprache / *Lang.*: de en	Aei. / *C.I.*: 01.00	Blatt / *Sh.*: 1
Typ *Type*: FSU-B12			Zeichn.Nr. / *Drawing No.*: 1142.9361.00 D		
i.Z. *used in*: 1142.9349.01	Datum *Date*: 19.09.2002	Abteilung *Dept.*: 1ESK	Name *Name*: TF		

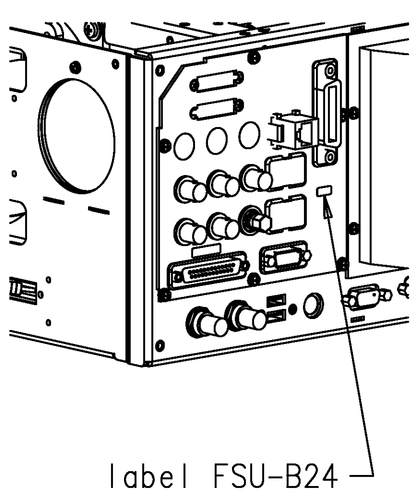


Back View - Option FSU-B24

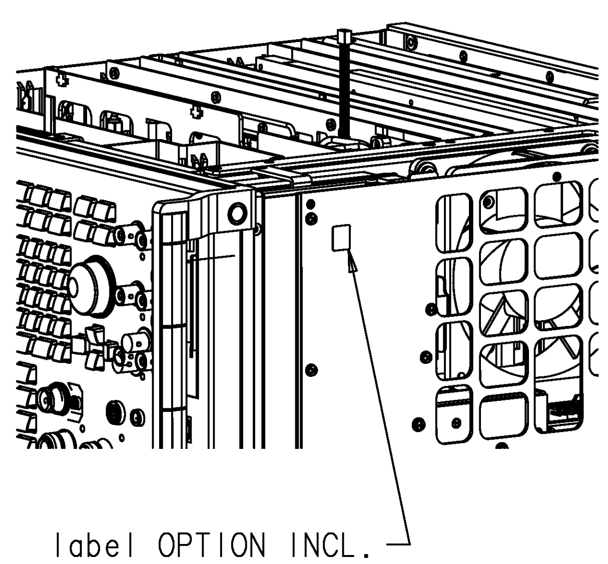




view rear panel



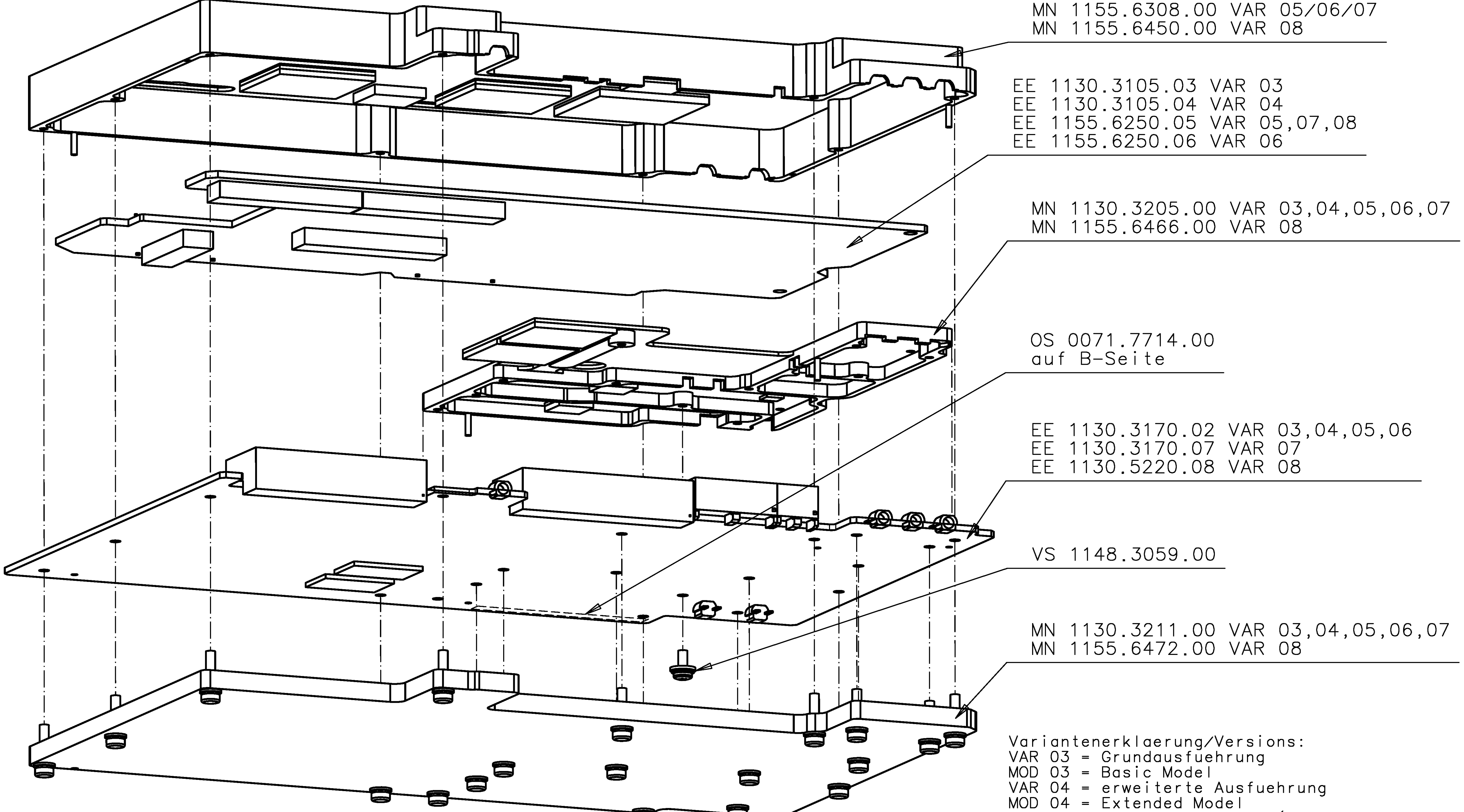
view A

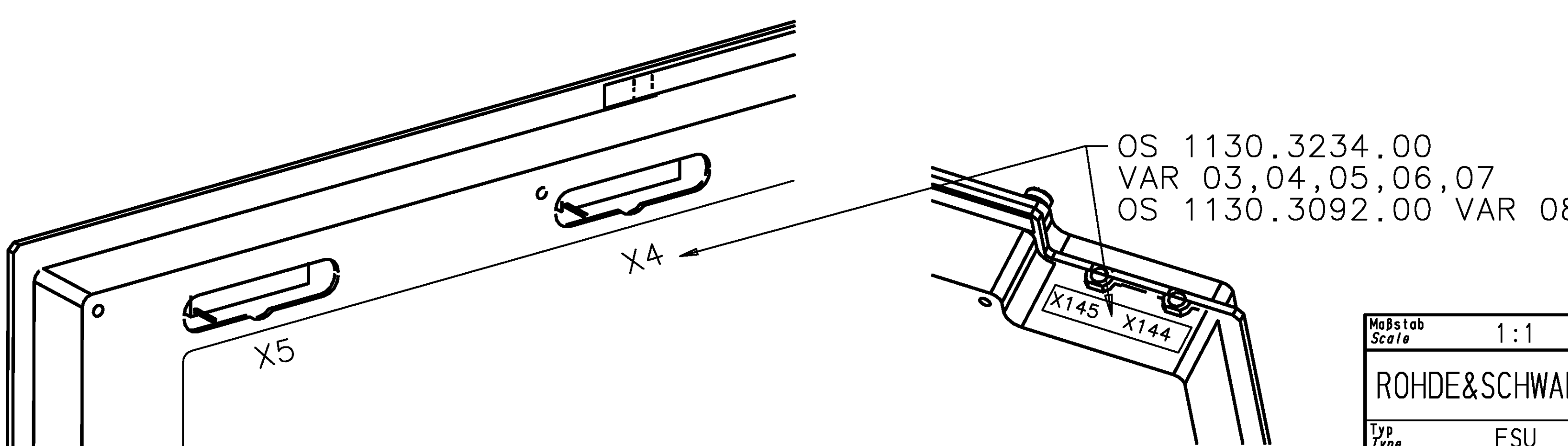


Versions:
MOD26 = Preamplifier 26 GHz
MOD40 = Preamplifier 40 GHz
MOD50 = Preamplifier 50 GHz

Maßstab / Scale	Toleranz / Tol.	Werkstoff / Material	Sprache / Lang.	Änd. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation: INSTALL. INSTRUCTION INSTALL. INSTRUCTION		de en	05.00	1
ESU-B24	Datum / Date: 2007-06-13	Abteilung / Dept.: 1ESK; Name: Wn	Zeichn.Nr. / Drawing No.: 1157.2116.00 D		

Projektionsmethode / Projection Method





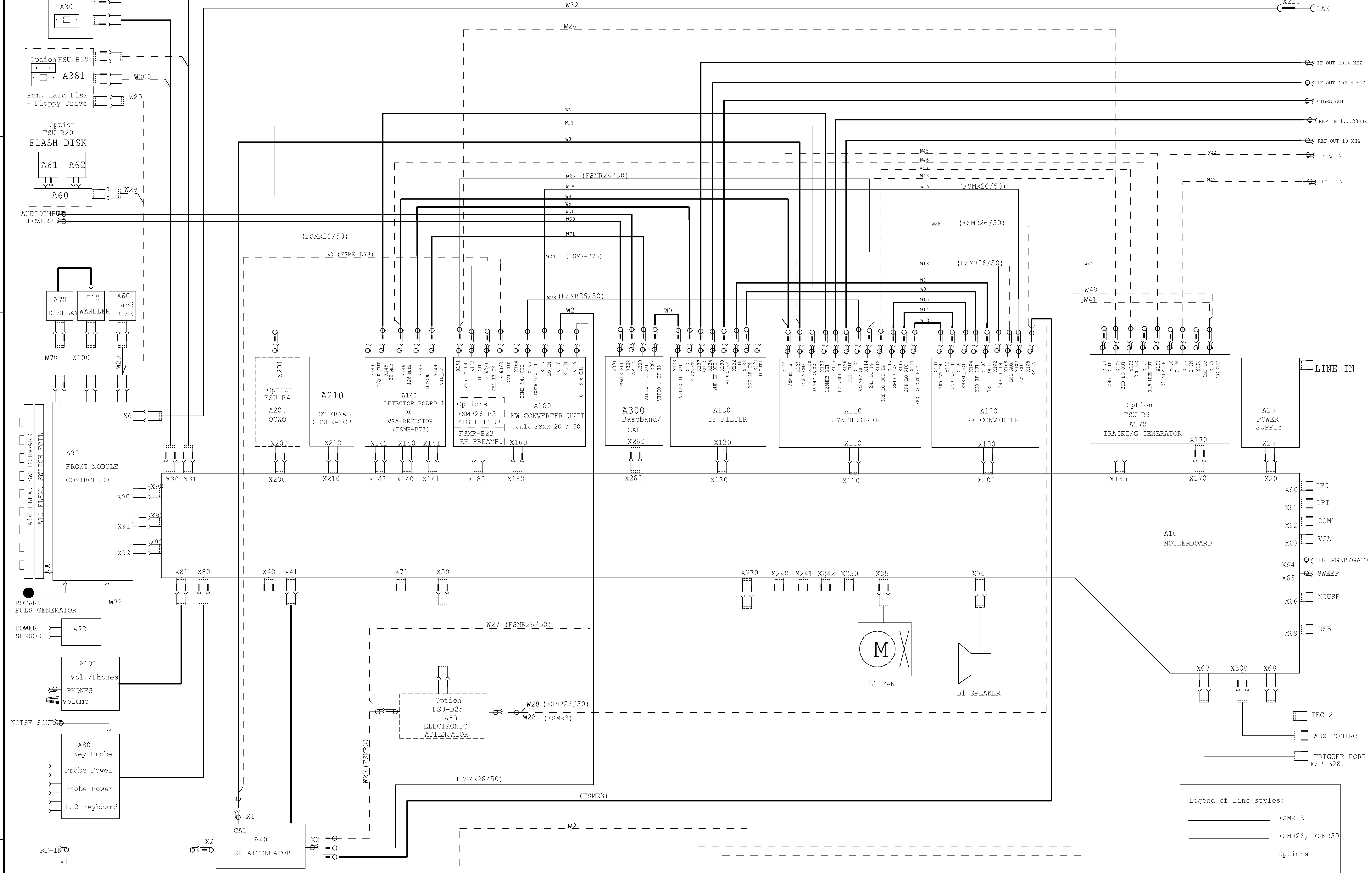
Variantenerklaerung/Versions:
VAR 03 = Grundausfuehrung
MOD 03 = Basic Model
VAR 04 = erweiterte Ausfuehrung
MOD 04 = Extended Model
VAR 05 = Grundausfuehrung (mit neuer VSA Section)
MOD 05 = Basic Model (with new VSA Section)
VAR 06 = erweiterte Ausfuehrung
(mit neuer VSA Section)
MOD 06 = Extended Model (with new VSA Section)
VAR 07 = Funktionserweiterung FSUP/ESU
MOD 07 = Additional Functions for FSUP/ESU
VAR 08 = wie VAR 05/06/07 mit zusätzlichem
60MHz ZF-Eingang für FMU
MOD 08 = as MOD 05/06/07 with Additional
60MHz IF Input for FMU

Projektions-methode
Projection Method

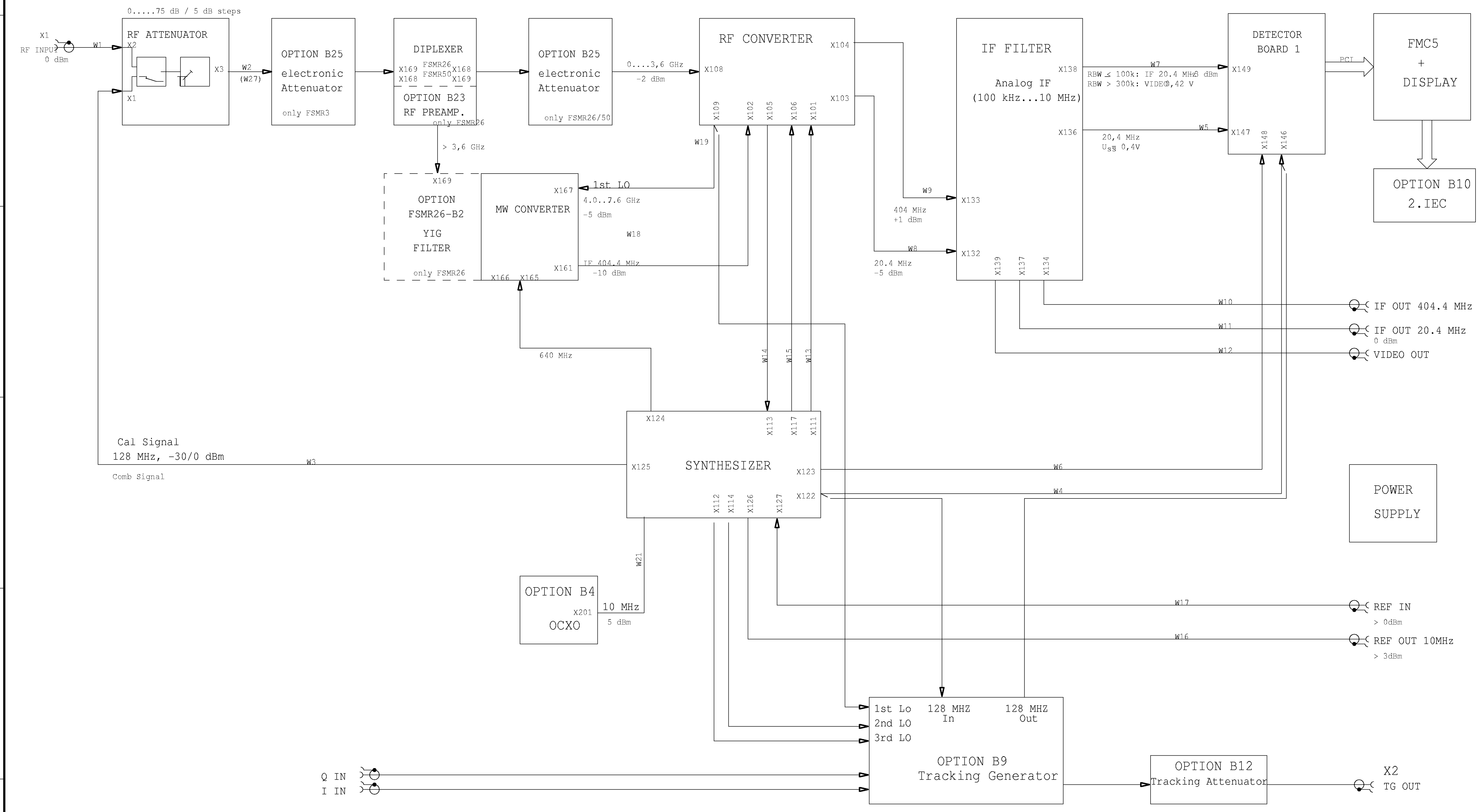
Maßstab / Scale 1:1	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: Wideband Detector Unit		Sprache / Lang. de en	Aei. / C.I. 07.00	Blatt / Sh. 1
Typ / Type FSU			Zeichn.Nr. / Drawing No. 1130.3086.01 D		
i.Z. / used in 1129.9003.01	Datum / Date 2006-05-11	Abteilung / Dept. 1ESK	Name / Name Wn		

ROHDE&SCHWARZ

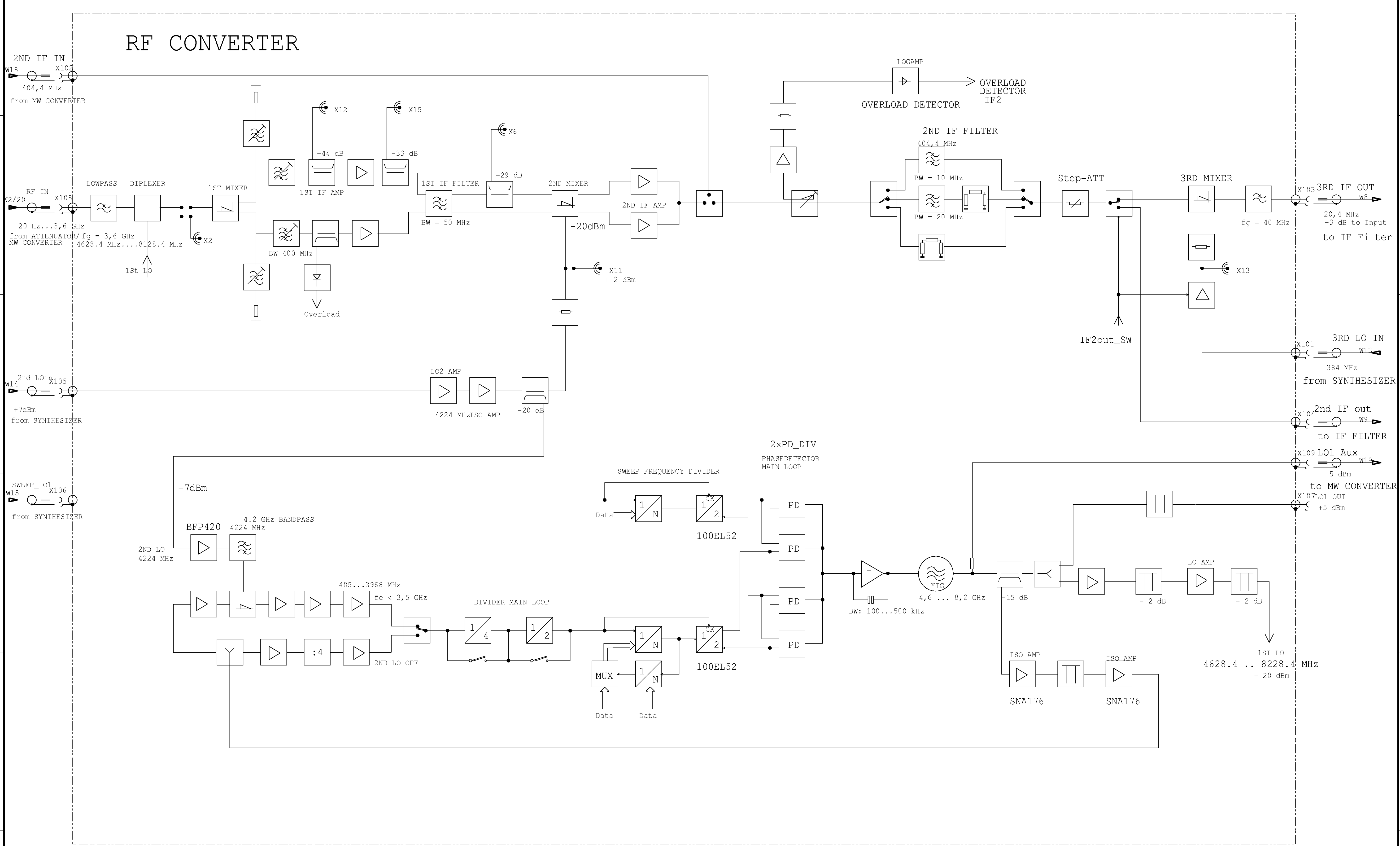
Block Circuit Diagram



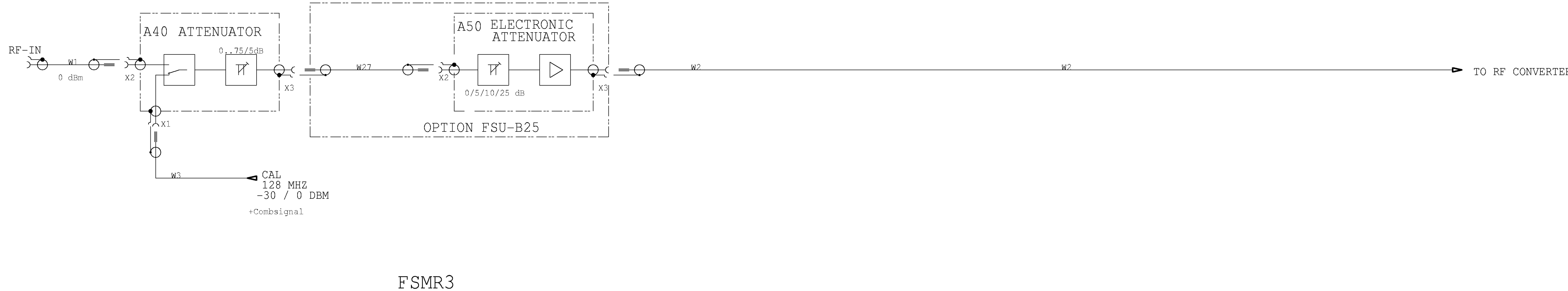
ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER / FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 1 +
FSMR	Datum:/Date: 06-07-24; Abteilung:/Dept.: 1ESK; Name:/Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S		

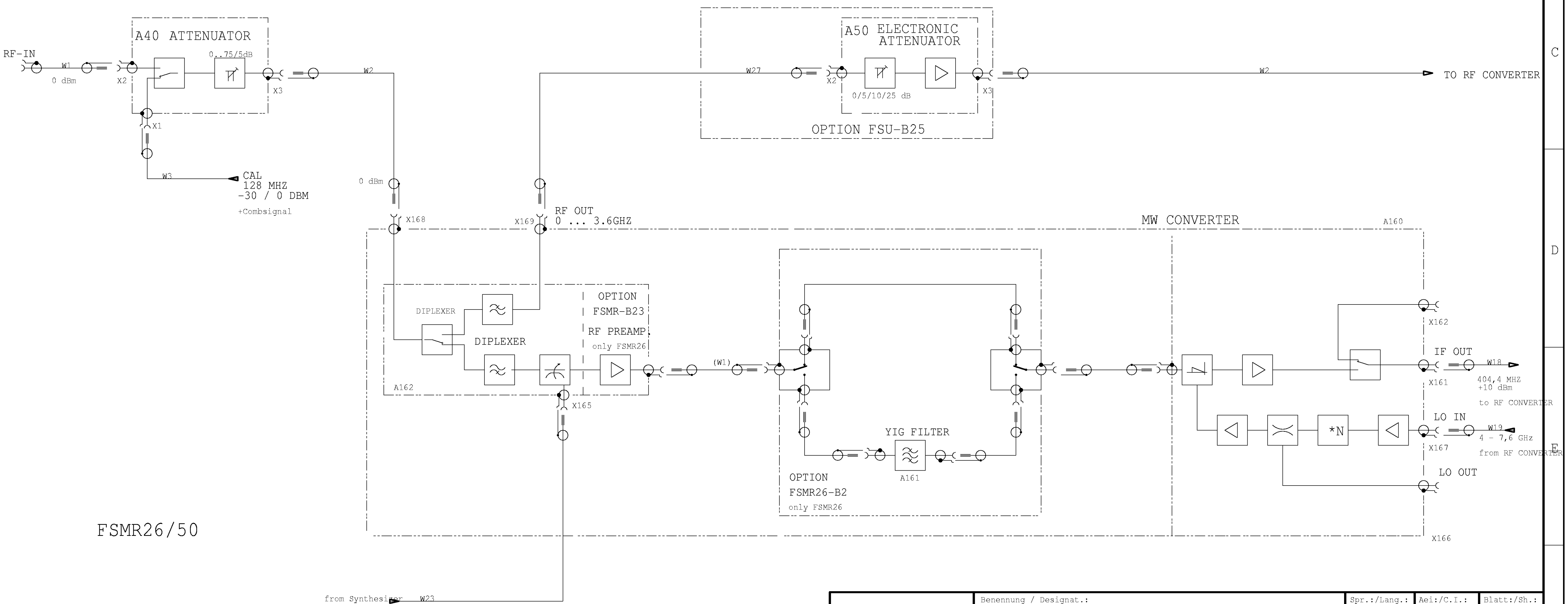


ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 2 +
FSMR	Datum:/Date: 06-07-24 · Abteilung:/Dept.: 1ESK · Name:/Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S		

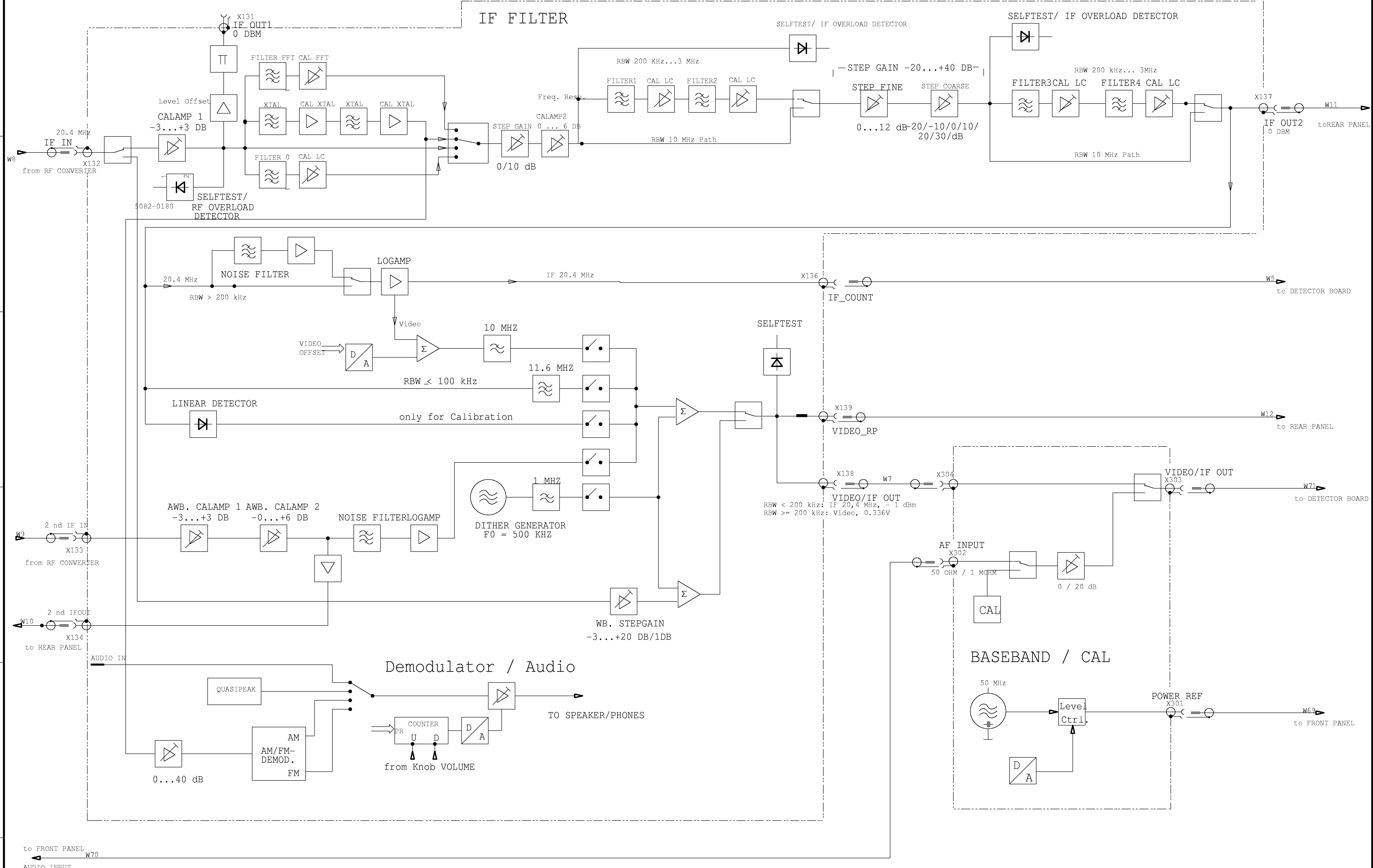


ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 3 +
FSMR	Datum:/Date: 06-07-24 · Abteilung:/Dept.: 1ESK · Name:/Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S		

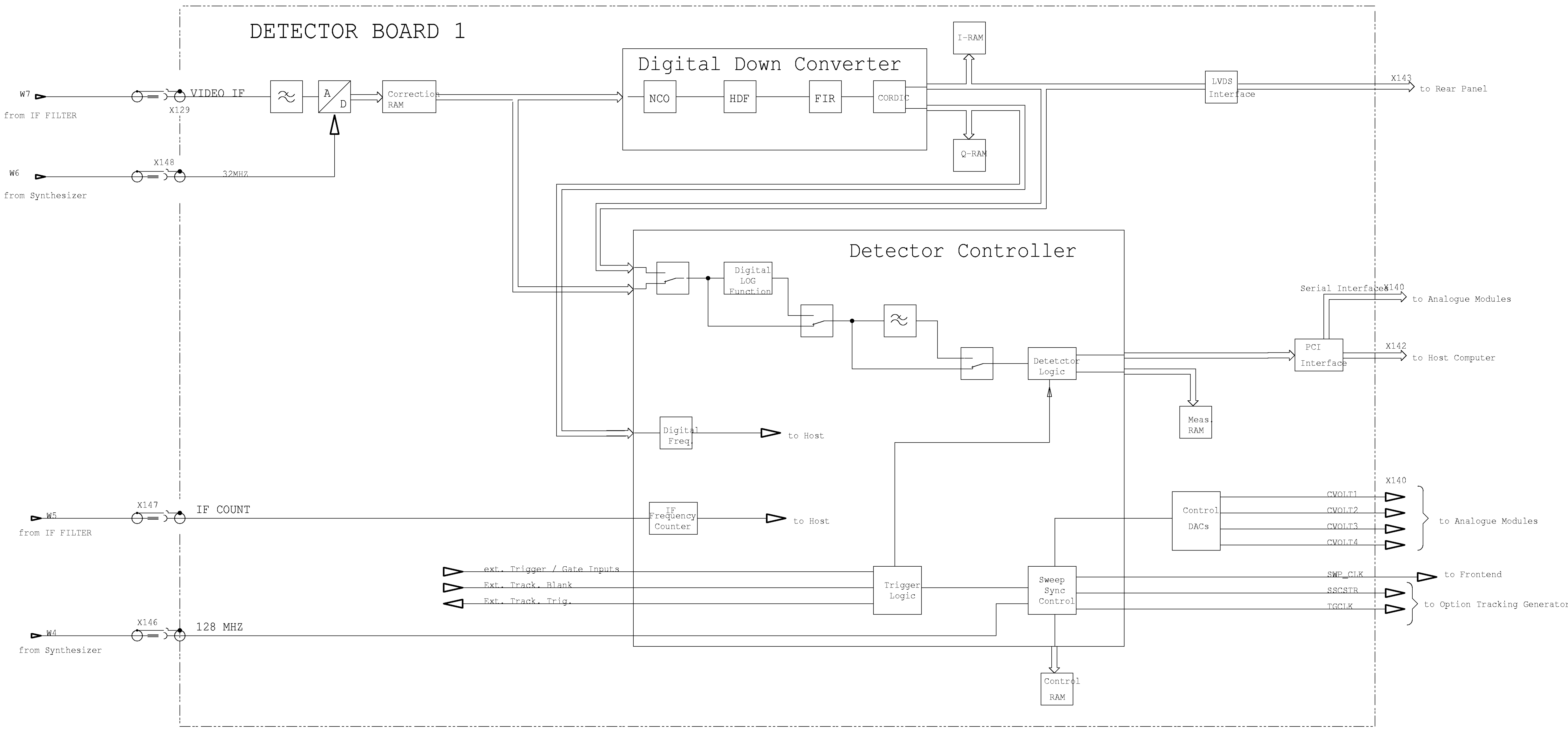




ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 4 +
FSMR	Datum: Date: 06-07-24 · Abteilung: Dept.: 1ESK · Name: Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S		

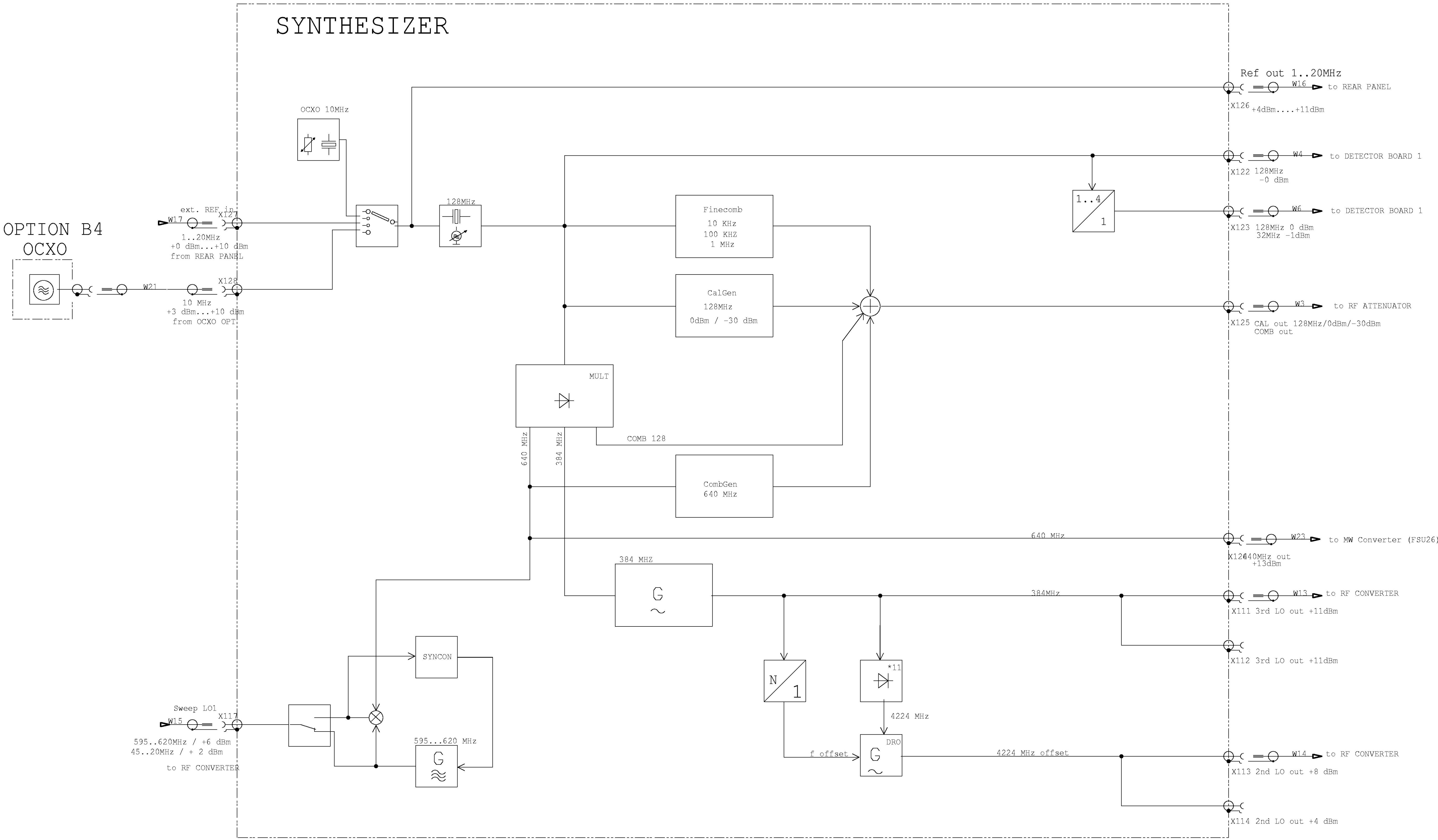


ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 5 +
FSMR	Datum:/Date: 06-07-24 · Abteilung:/Dept.: 1ESK · Name:/Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S		

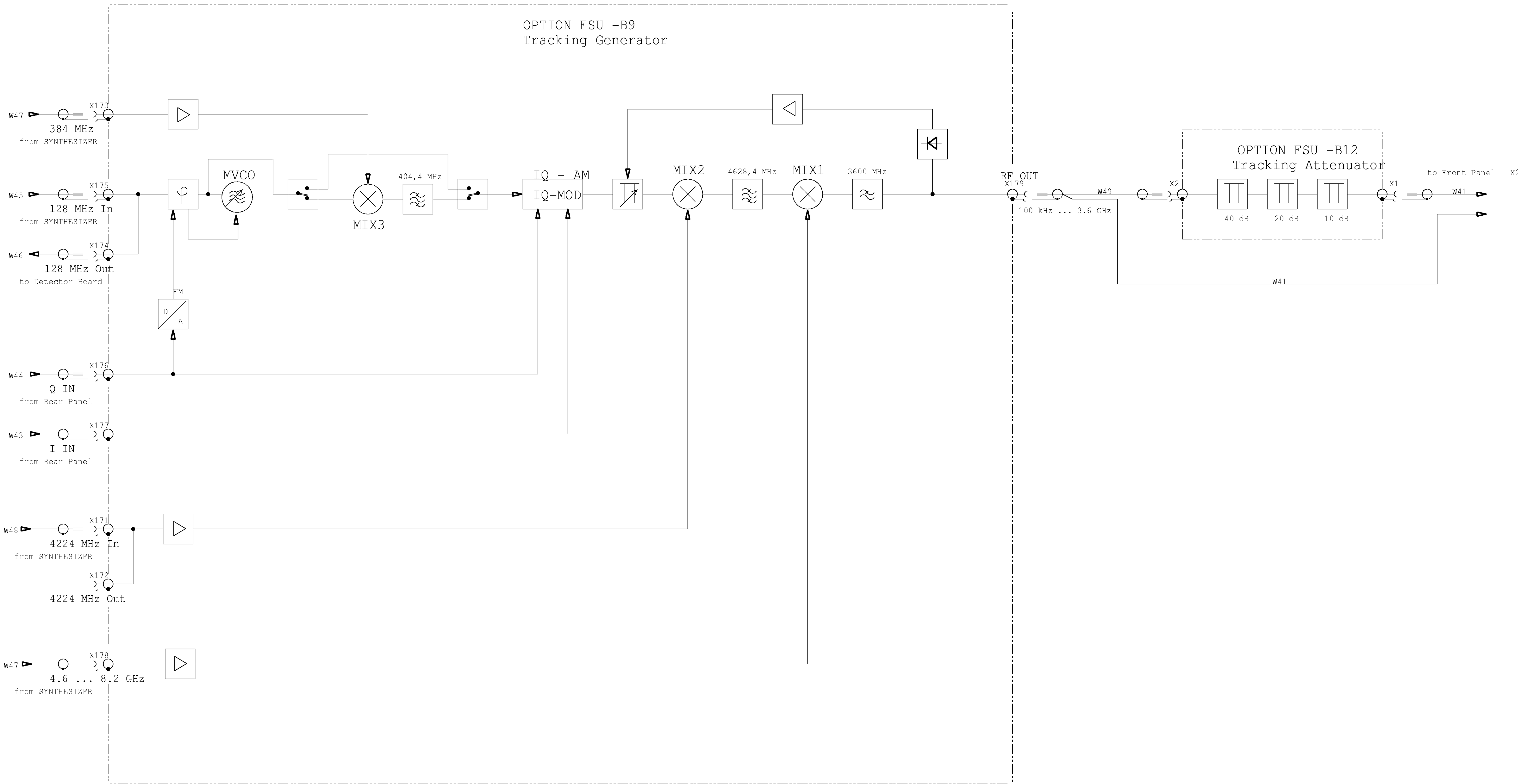


E

ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00
		Blatt:/Sh.: 6 +	
FSMR	Datum: Date: 06-07-24	Abteilung: Dept.: 1ESK	Name: Name: schoettl
		Zeichn.Nr.:/Drawing No.: 1166.3311.01 S	



ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER	Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 7 +
FSMR	Datum: Date: 06-07-24	Abteilung: Dept.: 1ESK	Name: Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S



E

ROHDE&SCHWARZ	Benennung / Designat.: FSMR MEASURING RECEIVER FSMR MEASURING RECEIVER		Spr.:/Lang.: de	Aei:/C.I.: 02.00	Blatt:/Sh.: 8 -
FSMR	Datum: Date: 06-07-24	Abteilung: Dept.: 1ESK	Name: Name: schoettl	Zeichn.Nr.:/Drawing No.: 1166.3311.01 S	